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THE

AMERICAN ENCYCLOPEDIA

OF

PRACTICAL KNOWLEDGE,

CONTAINING PRACTICAL AND SYSTEMATIC TREATISES ON SUBJECTS CONNECTED WITH THE INTERESTS OF EVERY INDIVIDUAL, ALPHABETICALLY ARRANGED, AND ESPECIALLY DESIGNED FOR POPULAR USE,

SUCH AS

THE BUILDING OF RESIDENCES, BARNS AND OUTBUILDINGS; THE SELECTION AND CARE OF CARRIAGES, WAGONS, FURNITURE, AND ALL VEHICLES, INSTRUMENTS OR IMPLEMENTS OF A RURAL OR DOMESTIC NATURE; OF ALL THE DOMESTICATED ANIMALS OR FOWLS OF AMERICA; WITH A TREATISE ON THE CAUSES, SYMPTOMS AND CURE OF ALL DISEASES TO WHICH ANY OR ALL ARE SUBJECT; ALSO, EMBRACING FULL INFORMATION ON THE BREEDING, REARING AND MANAGEMENT OF ALL ANIMALS AND FOWLS DOMESTICATED IN THE UNITED STATES; OF THE GROWING OF FRUITS AND VEGETABLES; OF CEREALS AND GRASSES; OF FLOWERS AND SHRUBS; OF ALL SUBSTANCES USED AS FOOD, WITH THE

MOST APPROVED METHODS OF PRESERVING AND COOKING;

OF AMERICAN AGRICULTURE; OF LANDSCAPE GARDENING; OF FIELD SPORTS; OF FRAUDS AND SWINDLES; OF TRAVELING, BOOK-KEEPING, LEGAL AND BUSINESS FORMS.

ALSO OF

PRESERVATION OF HEALTH,

DOMESTIC MEDICINE, ACCIDENTS AND EMERGENCIES.

THE MATERIALS EMPLOYED IN THE DRESS AND THE TOILET; ETIQUETTE; LAUNDRY; PERSONAL AND HOME ADORNMENT, AND OF EVERY SUBJECT PERTAINING TO DOMESTIC ECONOMY, AND ALSO CONTAINING

SEVERAL THOUSAND TESTED RECIPES OF ALMOST EVERY NATURE.

F. M. CHAPMAN, M. D.
CHAS. C. CHAPMAN,
Editors

Over One Thousand Illustrations.

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PREFACE

THE AMERICAN ENCYCLOPEDIA OF PRACTICAL KNOWLDGE is designed for popular use, and it has been arranged, as far as human forethought and the minutest care could effect, to meet the every-day wants of the American people. It embraces the entire domain of home and rural life, of domestic economy, and of such knowledge of the arts, trades and professions, as is of practical utility to the non-professional individual. It contains the essence of thousands of volumes, prepared by the most scientific, experienced and practical men on this and the European continents. Not only has the broad and varied scope embraced by the work caused much careful and incessant labor, but an almost incredible amount of persistent work was rendered unavoidable in order to extract and separate the practical matter from the theoretical and speculative, which is of great value to the expert or professional artisan, but would be foreign to the scope of a popular work.

Years of practical experience, observation and general reading have been brought to bear in the compilation and arrangement of this work. Vast libraries, containing the most modern and thorough works of evey nature that have ever been published, both in this country and in Europe, were at hand. A partial list of the well-known authors and writers, who have been quoted and who have contributed in the preparation of this Encyclopedia, is given immediately following the preface. The list is sufficiently long, however, and contains such well-known names, that the utmost confidence must certainly be accorded every department of the work. The one prominent thought ever in mind was to make this a reliable and standard encyclopedia of such practical knowledge as is constantly needed by the mass of the American people, and to make it pre-eminently practical in its arrangement and in the treatment of every subject. All the compilation has been as thoroughly digested and as carefully composed as though it consisted entirely of original matter. Such articles as were thought to incur any risk of either error or dificiency of statement, have been submitted to the revision of well-known practical men. All scientific, technical and professional language has been discarded, and everything made as plain as possible.

While this work is designed for popular use by all classes, it is of special significance and importance to the American farmer and his family. As a work of this nature, we believe it stands to-day without a peer in all the agricultural literature of the English language, and it is the only work yet published that fully and properly represents the great farming interests of the greatest agricultural country on the globe. There is not a theme or a subject in all the varied departments of farm labor or farm life, but what is fairly and properly treated in this Encyclopedia. It condenses out of the reports and periodicals masses of important agricultural matter at which other works scarcely glance; it discusses many subjects of farming, gardening and stock raising which

they but slightly touch; it introduces entire departments of valuable knowledge which they altogether exclude; it contains in a practical form a considerable body of useful scientific matter which they entirely ignore. In short, the American Encyclopedia of Practical Knowledge is the most complete, practical and exhaustive work for the American farmer ever published. The whole domain of agricultural literature of both Europe and America was gleaned in its compilation.

The alphabetical arrangement of the work affords the utmost facility of consultation. To direct the reader to all the related parts of each subject references are made from article to article. The various sub-heads or divisions under every subject, such as diseases of cattle, horses, etc., are also treated alphabetically. To still farther add to the facility and ease of consulting the Encyclopedia, an elaborate index of all topics treated has been prepared and is given at the close of the volume. Subordinate subjects, or those treated under the head of the principal topics, as given in their regular alphabetical order, are also given in the index, thus enabling one to turn to every paragraph in the book that is connected with any given subject. The correct pronunciation of all words which are apt to be mispronounced is also given.

While we do not believe that every person should be his own physician in all cases (all should, however, study the laws of health), yet we feel that every person should have sufficient knowledge in this direction to identify a disease and judge what is best for the patient, and if professional aid is necessary, to know what should be done before the physician may arrive. A book of reference, therefore, which is destined to be in many homes that are far from villages or cities, where much time must often intervene in a case of emergency, before medical aid can be obtained, will certainly be of enhanced value if it contains descriptions of the symptoms of such diseases as occur most frequently, with the proper treatment given in plain and simple language. In such treatment of diseases we have not conformed to the theories or teachings of any particular school, nor attempted to substitute our own treatment in all cases, but have given such directions and prescribed such treatment as may be the quickest obtained and easiest administered, the safest to handle by the non-professional, and such as are recognized by many of the most eminent physicians as excellent remedies. Only the diseases of the human family are treated in their regular alphabetical place, the diseases of stock being treated alphabetically in the articles on the respective animals. In giving the causes and describing the symptoms of diseases, simplicity in style and diction, yet scientific exactness, has been our motto; and in prescribing treatment, those remedies which can without difficulty be procured and administered are first given.

The illustrations form a most attractive and valuable feature of this work. Few books of any nature have been more profusely illustrated, and with as high class of engravings as we have the pleasure of presenting in this volume. Special care has been taken to represent every animal in its most life-like form, and every machine, implement or contrivance, after the most improved pattern.

This volume, as a work of reference and general instruction, will be found an ever-present help to the person of great or little knowledge. Everything has been made as plain as possible, as minute and detailed as necessary, as exhaustive, elaborate and varied as the broadest scope of the work would permit; and when intelligently and carefully consulted, we sincerely believe no person in America but will find it contains a vast mine of useful information.

CHICAGO, ILLINOIS.

Authors and Works Consulted and Quoted, and Contributors.

WE give below a list containing the names of many of the authors and books that have been consulted and quoted in the compilation of this Encyclopedia, together with the names of special contributers to the work. In connection with these and many others not mentioned, we have had the horticultural, agricultural and entomological reports of many of the States a hand, and also the reports of many prominent local and national societies for the dissemination of practical knowledge. In addition to all of these aids, we have also gleaned from the most ably edited papers and journals published in this country and England. Thus, with all these helps in the hands of an efficient corps of writers and compilers, and with the thoroughly prepared articles contributed by well-known writers, the publishers are confident that they can present this work to the American people as an authoritative and standard Encyclopedia of practical knowledge.

Allen, Horace R., *Farm and Home Encyclopedia.*
Allen, Lewis F., *American Cattle.*
Rural Architecture.
New American Farm Book
American Standard of Excellence in Poultry.
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Arnold, Prof. L. B., *Cheese Making.*
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Atwood, Prof. H. F.
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Baker, R., *Dairy Cows*
Barker, Geo. F., M. D., *Chemistry.*
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Bateham, M. B.
Beale, W. J., Prof. Botany in Michigan Agr'l Coll.
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VICK, JAMES, Florist.
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THE

AMERICAN ENCYCLOPEDIA

OF

PRACTICAL KNOWLEDGE.

A DICTIONARY OF PRACTICAL KNOWLEDGE.

ACCIDENTS and Emergencies. In all cases of Burns, Scalds, Wounds, Bites, Poisoning, Drowning, Smothering, etc., see under these respective heads, and in all dangerous cases send at once for a physician. In the following condensed paragraphs may be found instructions for miscellaneous accidents, and cases of emergency. These are simple, and if observed will avoid much suffering, and often save life.

For dust in the eyes, avoid rubbing; dash water into them; remove cinders, etc., with the round point of a lead pencil.

Remove insects from the ear by tepid water; never put a hard instrument into the ear.

If an artery is cut, compress above the wound; if a vein is cut, compress below.

If choked, get upon all fours, and cough.

For light burns, dip the part in cold water, or cover with saleratus or cooking soda. If the skin is destroyed, cover with varnish.

Smother fire with carpets, etc.; water will often spread burning oil, and increase danger. Before passing through smoke, take a full breath, and then stoop low; but if carbon is suspected, walk erect.

Suck poison wounds, unless your mouth is sore. Enlarge the wound, or, better, cut out the part without delay. Hold the wounded part as long as can be borne to a hot coal, or end of a cigar.

In case of poisoning, excite vomiting by tickling the throat, or by water and mustard. For acid poisons give akalies; white of egg is good in most cases. In cases of opium poisoning, give strong coffee, and keep moving. If taken with cramps in in water, float on the back.

For apoplexy, raise the head and body; for fainting, lay the person flat.

If a child lay hold of a knife or razor, do not try to pull it away, or to force open the hand; but, holding the child's hand that is empty, offer to its other hand anything nice or pretty, and it will immediately open the hand and let the dangerous instrument fall.

When in a carriage during a runaway, it is safer, as a general rule, to keep your place than to jump out. Getting out of a gig over the back, provided you can hold on a moment and run, is safer than springing from the side. But it is best to keep your place and hold fast. In accidents, people act not so much from reason as from excitement; but good rules, firmly impressed upon the mind, generally rise uppermost, even in the midst of fear.

Accounts, in farming and household affairs: see Book-keeping.

Acetate of Lead. Antidote for Poisoning by: After a thorough emetic, give a solution of soda in water; or milk, white of egg and water. Send for a physician.

Acetic Acid, the acid principle of vinegar. The easiest way to separate it from the water in vinegar is to freeze the liquid; the water becomes ice, while the acid remains fluid. This acid is a caustic, and may be applied to the skin as a blister, like Spanish flies. It is also a good corrosive of warts and corns, and is used in various medicinal and other preparations. It will preserve meat almost as well as salt, but leaves it much more insipid. A person poisoned by swallowing this substance will have an intense burning pain in the mouth, throat

and stomach, will vomit blood, have violent purging, collapse and stupor. Give chalk, magnesia, lime, or even soap, in large quantities of water, producing an emetic. Then give milk, or white of egg, mixed with water.

Acids. Hydrochloric, or spirit of salt; nitric, or aqua fortis; sulphuric, or oil of vitriol. Poisoning by any of these produces an acid, burning taste, acute pain in the gullet and throat, vomiting of bloody fluid, which effervesces when chalk is added to it; hiccough, tenderness of the belly, cold sweats, pinched face, convulsions and death. Give *calcined* magnesia, chalk, soap and water. Administer frequent draughts of water to weaken the acid; the carbonate of soda, potash, or magnesia, to neutralize it; thick soap-suds, made with common soap; chalk; or in default of the alkalies and chalk, break down the plaster of the wall or ceiling, mix in water, and give the sufferer. Excite vomiting, and repeat the remedies till all the acid is neutralized. For poisoning by mineral acids, or acetic and oxalic acids, give quickly large draughts of chalk, whiting, magnesia, soap and water, about as thick as cream, followed by albuminous diluents, such as milk, and white of egg mixed with water. Or, if these cannot be procured at once, warm water; and promote vomiting by tickling the throat.

Aconite, as a poison, produces acrid, biting, bitter taste, choking sensation, dryness of the throat, retching, vomiting, purging, pains in the stomach and bowels, difficult breathing. Give emetics of chamomile, mustard, or sulphate of zinc, large draughts of warm milk, or other bland fluids; foment the region of the stomach, and give strong coffee.

Acorns. Some of the sweeter acorns, as white-oak, burr-oak, and a few others, are good for food. They are, however, somewhat too astringent for extended use. Besides the raw state, they are prepared in four different ways; as, roasted, boiled, ground, and made into mush or bread. For the two latter purposes they are first roasted. They are first-class food for swine.

Acre, 160 square rods, which is equal to 4,840 square yards, or 43,560 square feet. A strip of ground one rod wide must be 160 rods, or half a mile, long, to be an acre; two rods wide, it must be one-fourth of a mile long to be equal to an acre; five rods wide, 32 rods long; 10 rods wide, 16 rods long. A square acre would be about 12⅔ rods on a side. There are 640 acres in a square mile, and 23,040 in a full congressional township of six miles square. A square chain being four rods square, or 16 square rods, there are 10 square chains to the acre; 160 acres constitute a "quarter" of a section, and if square, is one-half mile each way. A "lot" is 80 acres, or one-eighth of a section.

NUMBER OF PLANTS TO THE ACRE.

DIST. APART.	NO. PLANTS.	DIST. APART.	NO. PLANTS.
1 ft. by 1 ft.	43,560	7 ft. by 7 ft.	888
1½ " 1 "	19,360	8 " 8	680
2 " 1 "	21,780	9 " 9	537
2 " 2 "	10,890	10 " 10	435
2½ " 2 "	6,969	11 " 11	360
3 " 1 "	14,520	12 " 12	302
3 " 2 "	7,260	13 " 13	257
3 " 3 "	4,840	14 " 14	222
3½ " 3 "	3,555	15 " 15	193
4 " 1 "	10,890	16 " 16	170
4 " 2 "	5,445	17 " 17	150
4 " 3 "	3,630	18 " 18	134
4 " 4 "	2,722	19 " 19	120
4½ " 4 "	2,151	20 " 20	108
5 " 1 "	9,712	25 " 25	69
5 " 2 "	4,356	30 " 30	48
5 " 3 "	2,904	40 " 40	27
5 " 4 "	2,179	50 " 50	17
5 " 5 "	1,742	60 " 60	12
5½ " 5 "	1,417	66 " 66	10
6 " 6 "	1,210		

For intermediate numbers in the above table one can readily make the required calculation.

AMOUNT OF SEED TO THE ACRE. The following gives the quantity of seed and number of plants requisite to crop an acre of land, and will prove valuable to farmers and gardeners, and to families generally who may have only a small garden. It can always be referred to to set one right in any matter of doubt connected with the subjects involved:

Asparagus, in 12-inch drills, 16 quarts.
Asparagus, plants, 4 by 1½ feet, 8,000.
Barley, 2½ bushels.
Beans, bush, in drills 2½ feet, 1½ bushels.
Beans, pole, Lima, 4 by 4 feet, 20 quarts.
Beans, Carolina, prolific, etc., 4 by 3, 10 quarts.
Beets and mangolds, drills, 2½ feet, 9 pounds.
Broom-corn in drills, 12 pounds.
Cabbage, outside, for transplanting, 12 ounces.
Cabbage sown in frames, 4 ounces.
Carrot in drills, 2½ feet, 4 pounds.
Celery, seed, 8 ounces.
Celery, plant, 4 by ½ feet, 25,000.
Clover, white Dutch, 13 pounds.
Clover, lucern, 10 pounds.
Clover, Alsike, 6 pounds.
Clover, large red, with timothy, 12 pounds.
Clover, large red, without timothy, 16 pounds.
Corn, sugar, 10 quarts.
Corn, field, 8 quarts.
Corn salad, drill 10 inches, 25 lbs.
Cucumber, in hills, 3 quarts.
Cucumber, in drills, 4 quarts.
Egg plant, plants 3 by 2 feet, 4 ounces.
Endive, in drills, 2½ feet, 3 pounds.
Flax, broadcast, 20 quarts.
Grass, timothy with clover, 6 quarts.
Grass, timothy without clover, 10 quarts.
Grass, orchard, 25 quarts.
Grass, red top or herd's, 20 quarts.
Grass, blue, 28 quarts.
Grass, rye, 20 quarts.
Grass, millet, 32 quarts.
Hemp, broadcast, ½ bushel.
Kale, German greens, 3 pounds.
Lettuce, in rows, 2½ feet, 3 pounds.
Leek, 4 pounds.
Lawn grass, 35 pounds.
Melons, water, in hills 8 by 8 feet, 3 pounds.
Melons, citrons, in hills 4 by 4 feet, 2 pounds.
Oats, 2 bushels.
Okra, in drills, 2½ by ½ feet, 20 pounds.
Onion, in beds for sets, 50 pounds.
Onion, in rows for large bulbs, 7 pounds.
Parsnip, in drills 2½ feet, 5 pounds.
Pepper, plants, 2½ by 1 foot, 17,500.
Pumpkin, in hills 8 by 8 feet, 2 quarts.
Parsley, in drills 2 feet, 4 pounds.
Peas, in drills, short varieties, 2 bushels.
Peas, in drills, tall varieties, 1 to 1½ bushels.
Peas, broadcast, 3 bushels.
Potatoes, 8 bushels.
Radish, in drills 2 feet, 10 pounds.
Rye, broadcast, 1¾ bushels.
Rye, drilled, 1½ bushels.
Salsify, in drills 2½ feet, 10 pounds.
Spinach, broadcast, 30 pounds.
Squash, bush, in hills, 4 by 4 feet, 3 pounds.
Squash, running, 8 by 8 feet, 2 pounds.
Sorghum, 4 quarts.
Turnips, in drills 2 feet, 3 pounds.
Turnips, broadcast, 3 pounds.
Tomatoes, in frames, 3 ounces.
Tomatoes, seed, in hills 3 by 3 feet, 8 ounces.
Tomatoes, plants, 3,800.
Wheat, in drills, 1¼ bushels.
Wheat, broadcast, 2 bushels.

Adornment, of Home: see Home Adornment, Lawn, Landscape Gardening, and Residence.

Adulteration, of Foods, etc.: see the respective articles. Agitation is now started for more stringent legislation, both local and national, to prevent adulteration of foods, condiments, and other

articles of domestic use. We take this opportunity to encourage this agitation, until the unprincipled practice of running the great Juggernaut of the almighty dollar over the health and lives of innocent people is utterly ended.

Aftermath or **Rowen**. The second and third crops of grass in the same season: generally devoted to pasturage.

Agriculture: see Farming.

Ague. The symptoms are weakness, languor, and an uncontrollable disposition to gape and stretch; the patient is seized with a severe chill; he begins to shake all over, the teeth chatter, and the face and hands become pale. After the chill has passed, a warm sense of feeling returns, and gradually the whole system becomes flushed with heat. The patient grows thirsty, the head begins to ache, and a profuse sweat breaks out. It is not generally a dangerous disease, though very distressing and weakening. Persons subject to it should wear flannel next to the skin, and avoid exposure to damp air or by wet feet. Treatment—REG.: One to four grains of quinine, once or twice a day; hot herb teas. HOM.: One grain of aconite every two hours; or six globules of ipecacuanha or nux vomica in a tumblerful of water, of which take a tablespoonful every two hours. ECL.: Three times a day take two pills (usual size) of quinine and extract of flowering dogwood, in equal parts; after the paroxysms cease, take twice a day, for three days, a pill of extract of blood-root and waahoo in equal parts. For the biliousness give a cathartic of extract of dogbane, two parts, and one of podophyllin (a precipitated extract of May-apple root). HYG.: Hot pack at the commencement of the cold stage, sponging off during the hot stage, continued rest, diet mainly on fruits, abstaining from condiments. It is said that a positive cure for chills and fever is to drink the juice of one lemon during the dry and thirsty stage, and to rub the whole body with the juice of another lemon.

Air, in health and disease: see Hygiene.

Alabaster ornaments are generally made of a kind of translucent gypsum. They are easily stained or colored with metallic solutions, tinctures, and colored oils; polished with finely powdered pumice stone or dried scouring-rush, and afterward with a paste formed of finely powdered and sifted slacked lime and water, and finally with French chalk. Grease spots may also be removed from such articles by rubbing with French chalk, or talc. A general cleaning may be effected with soap and hot water: if very dirty and stained, the piece should be first washed with dilute nitric acid.

Alcarraza is a porous vessel of earthenware for cooling water. Supplying its own surface with the water from within, it saves the trouble of keeping a wet linen or cotton cloth around it. A similar article, called "olla," is used in some parts of the South.

Alcohol, a semi-poisonous chemical made from the starch of grains, colorless, volatile and inflammable. It is extensively used in the arts, especially pharmacy, as it dissolves resin, essential oils, camphor, soap, sugar, wax, the gums and the alkaloids, most of which substances are imperfectly soluble in water. It curdles milk and albumen, separates starch and gum from their mucilages, and conserves all organic substances. It cannot be frozen. Hence its great utility; but, as with any other luxury, mankind could get along without it. "Proof spirit" contains 52½ per cent. of alcohol in volume, the rest being water. This is the strength usually employed in medicines and perfumery. "Dilute alcohol" has 53⅜ per cent. water, by volume.

To purify alcohol, filter it through alternate layers of sand, wood charcoal, boiled wheat and broken oyster shells. The fusel oil, which may be detected by mixing with an equal quantity of pure sulphuric acid, discoloring the liquid, can be easily extracted from small quantities of alcohol by adding a few drops of olive oil, shaking well, and decanting, after settling.

Alden Process of drying fruits and vegetables: see Drying.

Ale, a beverage made from an infusion of malt by fermentation. Having a smaller proportion of hops than beer, it is sweeter, and of a lighter color. Burton ale is the strongest, containing eight per cent. of alcohol; brown stout contains six per cent., and common beer only one per cent. As a beverage, ale is more popular in Great Britain than elsewhere, the people there considering it the most healthful of all drinks. In the United States, the Germans, being more numerous than any other class of foreigners, have well nigh supplanted other intoxicating drinks with their lager beer, except among the Irish and the more old-fashioned people.

To mull ale, take a pint of it, good and strong, put it into a sauce-pan with three cloves and a little nutmeg, and sugar to the taste; set it over the fire until it boils; then mix with it the beaten yolks of four eggs, which must be first mixed with a little cold ale.

Wassail, or lamb's-wool, is ale heated, sweetened and spiced. Very nice with hot toast, roasted apples, etc.

For brewing ale, adulteration, etc., see Beer.

Alfalfa, a forage plant akin to clover; Lucern, which see.

Allspice, or Jamaica pepper, takes its first name from the idea that it has the properties of all spices, particularly cinnamon, cloves and nutmeg. In purchasing, never buy ground or pulverized spice, as all such is adulterated with saw dust, ground peas, grains and even the dirt and dust of the mills.

Almonds (am′undz), nuts which are naturally akin to peachstones, but having softer shells. Sweet almonds are among the best nuts, and are used in fancy cookery; bitter almonds are poison. They cannot be profitably raised in the Northern United States. The "earth almond," recommended by a few parties as a farm product, is decidedly unprofitable anywhere in the North.

Aloe (al′o), a medicinal plant of tropical countries. The hot, bitter, purgative drug called "aloes" (al′oze), is the dried juice or extract of this plant.

Alpaca (al-pac′a), a camel-like animal of South America, about the size of a sheep, and furnishing a valuable wool. Attempts have been made to introduce it into this country, which may yet prove successful in certain mountainous regions. The word "alpaca" also denotes the cloth made from the wool, or hair, of the animal. To wash alpaca, see Laundry.

Alsike (al-se′ka) **Clover**: see Clover.

Alterative (ol′tera-tiv), a medicine which insensibly and gradually alters certain conditions and functional actions. Used in chronic cases. The term is also used adjectively.

Alum, the sulphate of alumina (an earthy mineral constituting the body of clay) and potash. It is astringent, and is good to stop bleeding. When burned, the powder becomes a good caustic. The astringent lotion is made by dissolving 6 to 8 drachms of alum in a quart of water. The various uses of this valuable substance are given under the respective heads in this volume.

Amalgam, a compound of quicksilver with another metal. An amalgam with lead, tin, and bismuth, is the coating on the back side of looking-glasses, and is poison. Costly mirrors are generally coated with pure silver. It is not advisable to re-coat old mirrors of the cheaper class.

Ammonia, or **Heartshorn**, is a volatile alkali, superior to soap for many domestic purposes, and is the old-time "smelling salts," so often resorted to in nervous affections, spasms, etc. When too much is swallowed, by mistake, there is a burning, biting taste, heat in the throat and stomach, vomiting of bloody matter, etc. As antidotes, give vinegar, and then oil of almost any kind, as sweet or linseed.

Anæsthetic (an-es-thet′-ic), destroying sensibility. Also the drug which has such an effect, as chloroform, ether, or any drug vapor inhaled to take away sensibility. Sometimes one is preferable, sometimes another, according to circumstances, but in general, chloroform is the most dangerous of all, while it is the most effectual. For short operations in surgery, violent breathing for a few seconds is sufficient to enable the patient to stand the operation.

Anbury (an′bu-ry), or **Ambury**, a soft tumor on horses and cows, containing blood; also, a swelling produced by insects on the roots of turnips, cabbages, etc.

Anchor. To "anchor" a building is to fasten it in an upright position by any special contrivance so strongly that it can withstand violent winds.

Anchovy (an-cho′vy), a small fish about three inches long, of the herring family.

Anchovy-pear, a plant and its fruit, found in the West Indies.

Andiron, a dog-iron, or fire-dog; a simple iron stand or frame for supporting wood in a fire-place.

Aneurism (an′u-rizm), a pulsating tumor situated in a section of an artery. The inner coat of the artery is ruptured, or gives away to the pressure of blood, and a dilation is thereby caused. When an aneurism has once commenced, it continues to enlarge until it attains a great size; often it bursts. No home treatment can be recommended, except fomentations to alleviate the pain.

Angelica, an aromatic herb sometimes cultivated as a salad or for medicine. The leaf-stalks are pealed and eaten raw, or are boiled with fish or other meat. The root, leaves and seeds are sometimes used medicinally as a tonic. It is sown and cultivated like carrots or parsnips. The root should be dug up in the autumn of the first year and dried.

Angling: see Fishing.

Aniline (an′i-lin), a base similar to ammonia, distilled from indigo and other plants, coloring a strong violet blue, with chloride of lime. One of the most valuable ingredients in Dyeing, which see.

Animal Charcoal: see Charcoal.

Anatomy. Anatomy is the science of the structure of the human or any other organized body; of all the parts or organs of which it is composed, and their relative positions in it. The body in its description is divided into four general divisions—head, trunk, upper and lower extremities.

While anatomy gives us a knowledge of the form, character and situation of the various parts of the body separately, physiology shows us the functions and uses of the different parts and organs of the system. In studying anatomy we examine separately the different parts of a complicated machine, while physiology shows the machine in motion and the forces that produce the latter.

Technically speaking, physiology is the science of the functions of living beings; including in its widest acceptation, the study of all the changes which they undergo. There may be, therefore, vegetable

PLATE I.

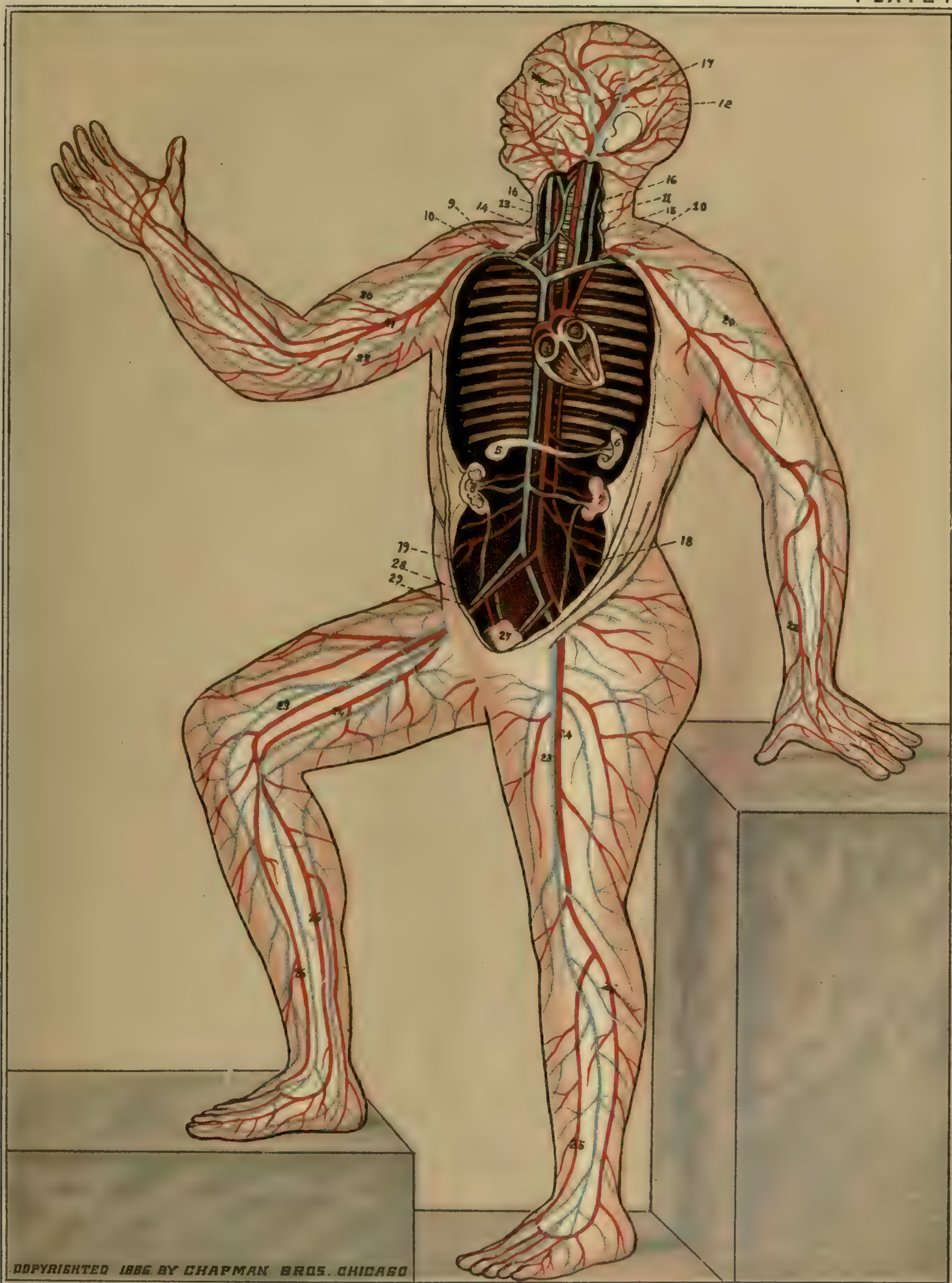
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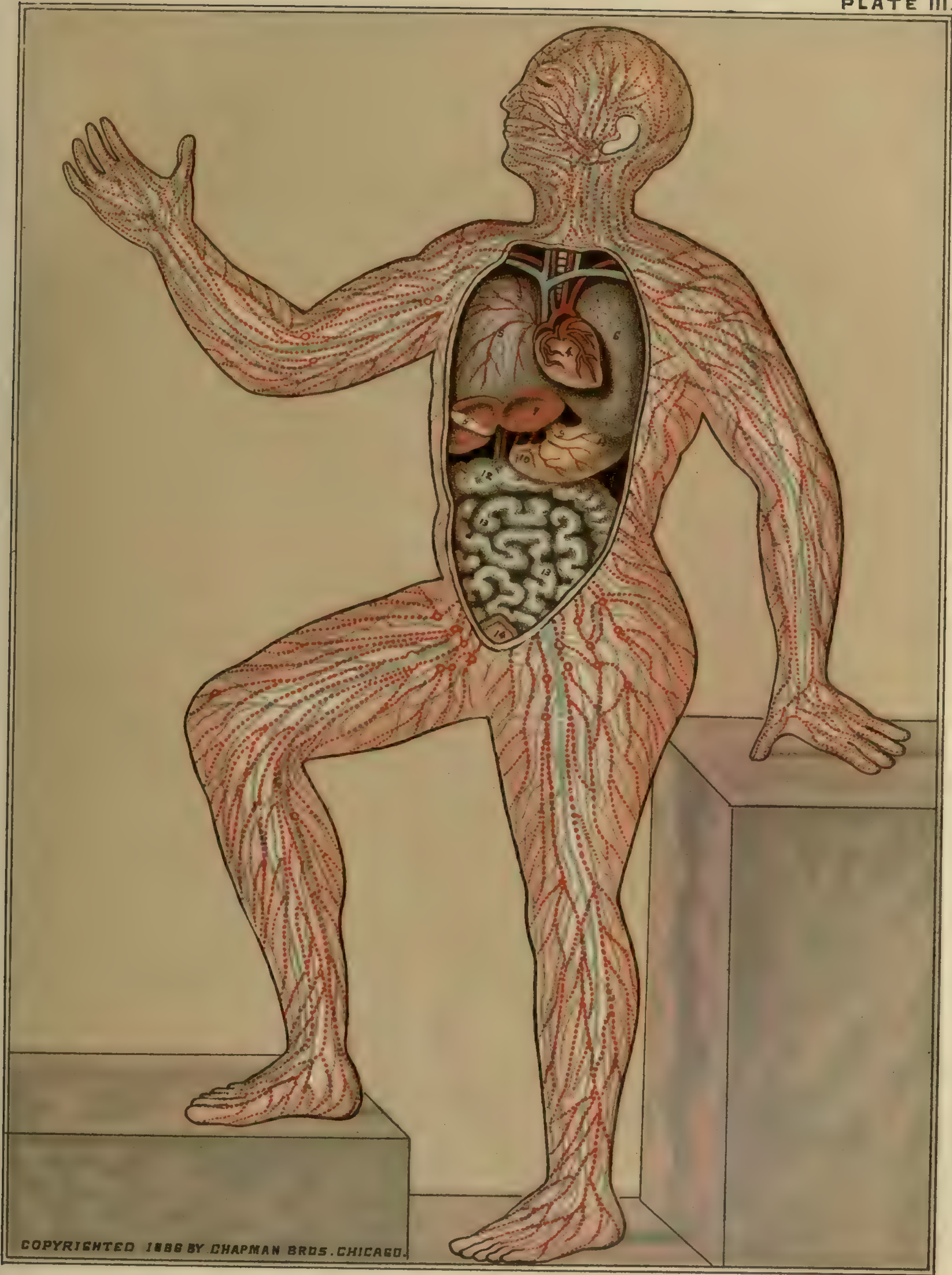
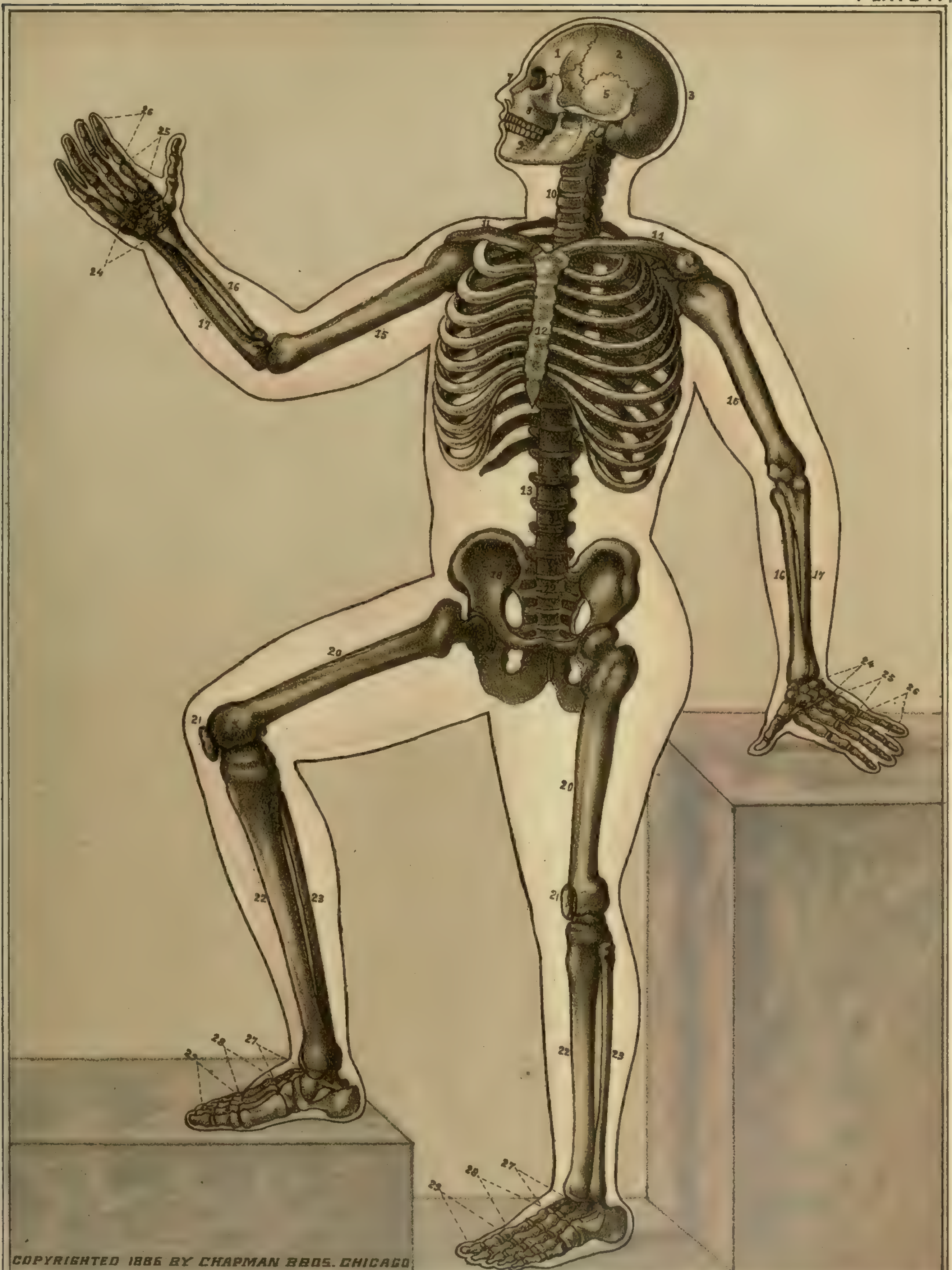
PLATE III.

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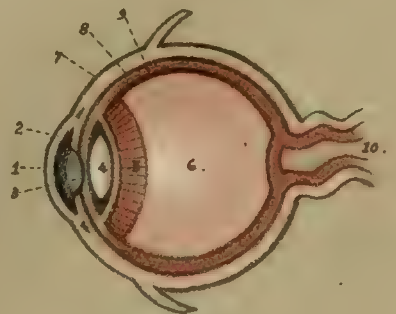


Fig. 3.

Fig. 1.

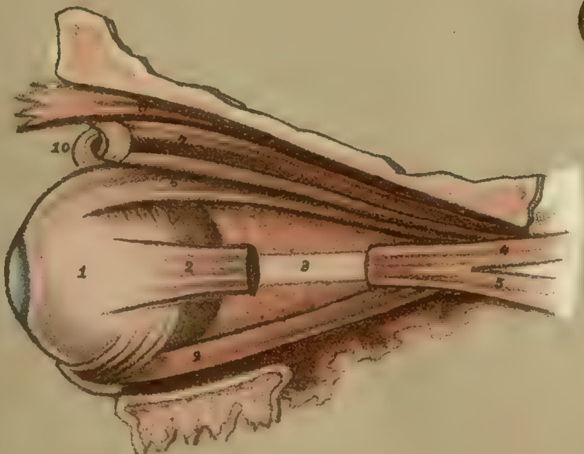


Fig. 4.

Fig. 2.

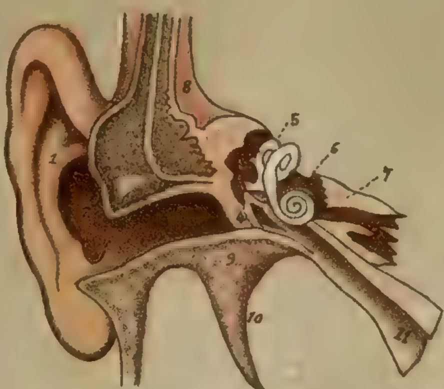


Fig. 5

and animal physiology; also human and comparative physiology. Biology is a word now much used, meaning the whole science of life. Pathology is the physiology of the body and its organs in a state or states of disease; it is fundamental to the scientific practice of medicine.

General physiology considers the materials, forces and forms of organized bodies. The matter of which plants and animals are or have been composed is called, from its being or having been present in their organs or instrumental parts, organic matter. All other substances, with properties not affected by the presence of life, are inorganic. A distinction is perceptible and important between—1st, organizable matter; 2d, organized material, *i. e.*, that present in living organs; and 3d, that which has been organized, but is no more capable of active function or new formation; for the last, the term post-organic would be convenient, although it is not usual.

Between the organic and inorganic materials differences exist—1st, in complexity of composition; 2d, in instability; 3d, in the forms which they tend to assume, especially under the influence of life. Of the whole number of elements in nature supposed by chemists to be simple or undecomposable, scarcely twenty are found taking part in the composition of plants or animals. In mineral and other inorganic bodies, binary compounds are not rare, and ternary ones common; while in organic substances, four, five, or a still larger number of elements are more often combined; with, also, a large number of equivalents of each. From this complexity of composition results great instability; shown by the rapid decay or putrefaction to which vegetable and animal structures are liable after their death. This complexity is greatest in animal bodies; most of all in the highest animals.

Carbon, hydrogen, oxygen and nitrogen are the most nearly universal elements in organic matter. With them occur sulphur, phosphorus, calcium, iron, potassium, sodium, chlorine, silicon, fluorine and some others, in variable quantities. Animal tissues, except fat (and some very few other partial exceptions among the lowest animals), always have carbon, hydrogen, oxygen and nitrogen; vegetable substances may consist of the first three of these without nitrogen; although the latter is also frequently present in plants.

Reason exists for designating by a special name that agency in organized bodies, *i. e.*, plants and animals, which gives them the character of living beings; and the best name for it is vital force, or life force.

This ought to be studied like the other forces of nature. By exclusion, we find that, after most functions of the animal or vegetable organs have been explained by reference to chemical, mechanical or other ordinary physical laws, something is still left. That is formation, growth, development; the construction from a formless liquid (blood, sap) of definitely formed structures, going through a series of changes for a definite period. We call the cause of this adaptive formation and change life. When it ceases, death is characterized by the loss of all that was peculiar to the being, and the return of its materials to the inorganic (through the post-organic) state.

We may enumerate the main facts established concerning vital force, as follows: 1. It is common to animals and plants. 2. It never originates except from parentage; *omne vivum ex vivo*. 3. Its action is essentially formative and reparative. 4. In the living body it controls and directs the other physical forces, as chemical affinity, etc., modifying their results. 5. It acts expansively, from centers outward, as shown by the production of rounded forms, cells, etc. 6. Sometimes it may be transmuted into other forces during life, and is altogether so at death. 7. Other forces, especially heat, sustain it, or are converted into it. 8. Sometimes it may be suspended for a time; as in the winter torpor of certain animals. 9. It is always definitely limited in duration under any particular form; that is, each individual can live only for a certain time, longer or shorter, according to its species. 10. Life-force may vary in a degree, in the same body at different times, and in the different parts of the same organism. This last proposition affords the best foundation for rational pathology. Yet it would be a serious error to suppose that all disease consists merely in diminished vitality, general or local.

Liquids and solids together make up every organized body which has active functions. The liquids in plants are the sap, and sometimes special juices; in animals, the blood, lymph, chyle and various secretions. The solids are the organs, composed of various tissues; and these of elementary forms, viz.: molecules, nuclei, cells, fibers, membranes and tubes.

As seen under the microscope, the blood consists of a colorless liquid (liquor sanguinis) in which float the red and the white or colorless corpuscles; from fifty to five hundred of the red to one of the colorless in human blood. Of the former the diameter is about 1-3300 of an inch; of the white corpuscles, 1-2500. The latter are nucleated; the red corpuscles in man are not. The shape of the red corpuscles is disk-like or carwheel-like; *i. e.*, circular, flattened, and concave at the middle. Carbonic acid and some other gases, when absorbed, swell the corpuscles into a more globular form; oxygen widens and flattens them.

The osseous or bony system is the framework or foundation and support of the various other departments of a body. In bone, earthy and animal constituents are intimately combined. Of the former there are about 66.7 parts to 33.3 of the latter. Phosphate of calcium is the most abundant mineral material; being about 51 parts in the 100 of bone. Carbonate of calcium 11.3 parts; fluoride of calcium 2 parts. The mineral matter of bone increases with age, making the bones of the old more brittle. There is more of it also in some bones, and parts of bones, than in others. When the framework is connected, in their proper order, they form the skeleton, as shown

of the man on Plate IV, and of the horse on Plate IX. The number of bones in the human body is 206, excluding the 32 teeth. This also excludes the sesamoid bones, which are not uniform in number. There are supposed to be the same number of bones in all animals, although in many some of the bones are not developed. Bones are composed of both earthy (chiefly lime) and animal matter, and, like all other parts of the body, are formed from the blood. There is wonderful wisdom displayed in the development and harmony of the anatomy of the human body.

Beside the bones there are cartilages, ligaments and membranes, which go to make up the framework of the body. The cartilages are smooth, white, elastic substances, which unite the bones and cover the ends of those which move upon each other, as illustrated in the joints. These, which are frequently called gristle, resemble bone in appearance, but are much softer. Ligaments, like the bones, possess slight sensibility when in a normal condition, but are extremely painful when inflamed. They are strong, white, fibrous bands or cords, which hold bones in their places and connect them at the joints. Membranes vary in appearance and structure as well as in function. They are thin substances which line the cavities of the body and envelop all the organs. The muscles compose that portion of the body which is usually known as the lean meat. They number over 500, and while forming one continuous mass, as indicated by the external appearance, the body, however, is composed of separate pieces of various length and shape, acting independently or in connection with others. The muscles of both the human body as well as that of the horse are given at greater length in the descriptions given of Plates I and VI, while the arteries, veins, the nervous and glandular systems, as well as description and actions of the principal organs of the body, are given in the descriptions of their respective plates.

PLATE I.

This plate illustrates the superficial muscles of the body. They vary both in their form and length. In the limbs they are of considerable length, while in the trunk they are broad, flattened and expanded. Upon the arms and legs they surround the bone and form an important protection, both to the bones and the joints, while upon the trunk they spread out to enclose cavities and form a wall of defense, which readily yields to internal pressure. The term origin, in describing a muscle, is meant to apply to its more fixed or immovable attachment, while the term insertion, to the movable point or part to be acted upon. As an example we might cite the principal muscles which move the arm. These are attached at one end to the shoulder-blade, which is called their origin, while the other end is attached to the bone of the arm and is known as their insertion. Those muscles by which a limb is bent are known as flexors, and those that straighten it as extensors. These two sets of muscles antagonize each other, one pulling one way and the other the opposite. The muscles are also classified as voluntary and involuntary. The former are under control of the will or motor nerves, while the latter, like the muscles of the heart, are beyond its influence.

The motive power of muscles is in the nerves. The nerve fluid—the stimulus applied to the muscles—acts upon them like electricity. While the motor nerves actuate the muscles, the sensory nerves carry impressions to the brain. The rapidity with which the muscles contract and relax is remarkable. As above cited, there are over 500 different muscles, generally, however, arranged in pairs. These all bear Latin names, some of which are extremely long, as for example the levator labii superioris alæque nasi. This is a small, triangular muscle, placed by the side of the nose and extending to the upper lip, the action of which is to raise the upper lip and dilate the nostril. These names, however, have reference to the character, use and position of the muscles. To attempt to give the latter with their relative uses and positions, their origin and insertion, would require a large volume and would be entirely beyond the province of this work. The accompanying plate, however, with the following description, gives an excellent idea of the character, shape and appearance of the superficial muscles, and gives as accurate knowledge of the muscles of the body as can be gained outside the dissecting room.

The following are the names and the uses of the muscles shown on Plate I:

1. Occipito frontalis—to move the scalp and raise the eyebrows.
2. Orbicularis palpebrarum—to close the eyelids.
3. Compressor naris—to expand the nostril.
4. Levator labii superioris alæque nasi—to elevate the upper lip and dilate the nostril.
5. Levator labii superioris—to elevate the upper lip.

6 and 7. Zygomatic minor and Zygomatic major—to raise the upper lip and draw it somewhat outward, as in laughing.

8. Masseter—to bring the jaws together in chewing.
9. Orbicularis oris—to close and pucker the mouth.
10. Risorius—to draw the corner of the mouth outward.
11. Attollens aurem—raises the ear.
12. Attrahens aurem—draws the ear upward and forward.
13. Retrahens aurem—draws the ear backward.
14. Sterno-cleido-mastoid—to carry the head toward the shoulder and rotate it, so as to carry the face to the other side.
15. Trapezius—to draw the shoulder up and backward.
16. Platysma myoides—to bend the head forward.
17. Depressor labii inferioris—to depress the lower lip.
18. Pectoralis major—to draw the arm inward and forward, or downward if raised.

19. Serratus magnus—to draw the scapula forward and downward, or raise the ribs.
20. Obliquus—to sustain the abdomen.
21. Linea alba—a tendenous union of the muscles of the abdomen.
22. Deltoid—to raise the arm.
23. Biceps—to bend the arm at the elbow.
24. Triceps—to extend the forearm.
25. Supinator longus—to turn the lower arm and hand.
26. Extensor carpi radialis longior—to bend the hand backward.
27. Extensor communis digitorum—to extend the fingers.
28. Extensor carpi ulnaris—to extend the hand at the wrist.
29. Flexor carpi ulnaris—to bend the hand toward the little finger.
30. Supinator longus—same as 25.
31. Palmer facia—the palm of the hand.
32. Brachialis antirus—to flex the forearm.
33. Flexor carpi radialus—to bend the hand at the wrist.
34. Palmaris longus—to bend the hand at the palm.
35. Flexor carpi ulnaris—same as 29.
36. Adductor pollicis magus—to draw the thumb toward the forefinger.
37. Rectus femoris—to extend or straighten the leg.
38. Vastus externus—to assist No. 37 in extending or straightening the leg.
39. Vastus internus—in connection with Nos. 37 and 38 assist to extend or straighten the leg.
41. Peroneus brevis.
42. Biceps—to bend or flex the leg.
43. Tibialis anticus—to bend the foot at the ankle.
44. Extensor communis digitorum—to flex the phalanges of the toe.
45. Peroneus longus—to depress the foot and incline the sole outward.
46. Soleus—to steady the leg upon the foot and prevent the body from falling forward.
47. Annular ligament—a band to hold the muscles in position.
48. Sartorius—to draw one leg over the other, in the position of a tailor when sewing. This is the longest muscle in the body.
50. Pectineus—to draw the thigh inward and upward and rotate it outward.
51. Adductor longus—to draw the thigh inward and upward.
52. Gastrocnemius—to raise the heel and depress the foot.

PLATE II.

This plate shows the arterial and venous circulations. The arteries are membranous tubes, very strong and elastic, which arise from the heart by two trunks, and by their innumerable branches convey the blood from that great center throughout every portion of the system. The larger arteries are hidden away deeply in the flesh and thus protected. The aorta shown by Fig. 9, which is the main trunk of all the arteries of the body, ascends from the upper part of the left ventricle for a short distance and then forms an arch backward over the root of the left lung, thence descending upon the left side of the spinal column.

The heart is a hollow muscular body, situated behind the lower two-thirds of the sternum, or breast bone, with its apex pointing downward and to the left. It is about five inches long in an adult and about three and one-half inches wide in its broadest part, and two and one-half inches in thickness, and in the male weighs about 12 ounces. The heart in man is double, as though two hearts were placed side by side. In fœtal life they communicate directly, but after birth indirectly only. One-half of the heart—the right—receives the venous blood from the body and propels it to the lungs. The other—the left—receives arterial blood from the lungs, and through the aorta and its branches sends it all over the body. The right half might, therefore, be called the respiratory heart and the left, systemic.

Each of these halves of the heart has two cavities, an auricle and a ventricle. The first is a receiving and the latter a propelling cavity. Fig. 1, the right auricle, receives the venous blood from the venæ cavæ and pushes it into the right ventricle, Fig. 2. This then propels it through the pulmonary artery to the lungs. Fig. 3, the left auricle, receives the blood from the lungs and transfers it to the left ventricle, Fig. 4, which then propels it out by the aorta.

From the top of the arch of the aorta there are three main branches: The central, as shown by Fig. 16, is the left common carotid artery, which conveys the blood to the head. The one to the left is the left subclavian, and the one to the right is the innominata, which soon divides, a branch going to the right arm, as shown by Fig. 10, and known as the right subclavian artery, and the other going to the head, forming the right, common carotid. Fig. 10, on the left side, shows the left subclavian artery, which arises directly from the aorta.

The thoracic aorta may be seen descending from the heart, down the middle of the figure.

16. The carotid artery (one on either side of the neck).

17. Temporal artery.	24. Femoral.
18. Left common iliac.	25. Tibial artery.
21. Brachial artery.	26. Peronial.
22. Radial.	29. Right internal iliac.

All of these arteries are in pairs, that is, one on each side or in each extremity.

The capillaries are intermediate vessels, forming the connecting link between the arteries and the veins, receiving the blood from the former and carrying it to the latter. They form a fine network, and are distributed throughout the body. So numerous are they, that it is impossible to insert the point of a needle into the skin or flesh without wounding them and causing blood to flow. They are smaller than the finest hair, and can only be seen with the aid of a microscope. They perform

the important function of secretion and nutrition—extracting from the blood its nutritious qualities and converting them into bone and muscle. Coming in contact with the fine air-cells of the lungs, they absorb oxygen and convey it to the blood throughout the system.

The Veins are the vessels which serve to return the blood from the capillaries of the different parts of the body to the heart. They consist of two distinct sets of vessels, the pulmonary and the systemic. They are more delicate in their structure than arteries, and the blood flows from them much slower, not being propelled by force as in the arteries. They are, however, larger and more numerous than arteries. They communicate very freely with one another, especially in certain regions of the body. Starting like little springs, they soon form branches and then rivers, uniting form still larger channels, until they finally terminate in the large trunks which convey the blood direct to the heart. The veins which receive the blood from all parts of the body follow in the same general course as the arteries, and finally, by uniting, form two large trunks, known as the ascending and descending venæ cavæ. The former receives the blood from the lower extremities and the regions of the abdomen, while the latter is the receptacle for the blood of the upper portion of the body; these uniting empty their contents into the right auricle. This pours its blood into the right ventricle, which, by the pulmonary artery and its branches, sends it for purification into the lungs. Thence by the four pulmonary veins the blood is brought to the left auricle. It is then passed into the left ventricle, from whence it is then again thrown into the aorta, which by its branches is distributed to all parts of the body. The small arteries terminate finally in capillaries, and the capillaries unite to form veins. Figs. 13 and 11 are the internal jugular veins. Fig. 15, external jugular vein. 19 shows the right iliac vein, and 28, the right internal iliac. Those shown opposite correspond with these and are known as the left iliac veins. 20 represents the right and left cephalic. Fig. 23 the right and left femoral veins, Fig. 5 the pancreas, 6 spleen; 7 and 8 represent the kidneys.

PLATE III.

This plate represents a view of the organs of the chest and abdomen, and the nervous and glandular systems. Figs. 2 and 6 represent the respiratory organs or lungs, the former showing a section illustrating the circulation. These are soft, spongy bodies, located in the cavity of the chest on either side of the heart, and communicate with the throat through the trachea or windpipe as shown in Fig 1. Just below the top of the breast bone the windpipe divides, forming two branches called the bronchia, which go direct to the lungs. The function of these organs is the aeration or oxidation of the blood. It is accomplished by the exposure of the venous blood brought from the right half of the heart to the air received into the air-vessels of the lungs. The immense number of these vesicles, about six hundred millions, provides a very large expansion of surface. The heart sends a new supply of venous blood to the lungs every time it contracts, while the lungs receive a fresh supply of air with each inhalation.

Fig. 7 shows the liver, which is situated in the upper part of the abdominal cavity, mainly in the right side under the ribs, and is divided into two principal parts, called the right and left lobes. The liver, in some diseases, becomes enlarged and hard, and may frequently be felt in such cases projecting below the ribs in the right front of the abdomen, and sometimes even in the left. The function of the liver is the secretion of bile, which is an essential material in the process of digestion. Only the liver, of all the glands of the body, is supplied with venous as well as arterial blood.

The gall bladder is shown by Fig. 8. This is an adjunct to the liver and is attached to the under side of its right lobe. It is a membraneous bag, and seems to serve as a reservoir for surplus bile.

Figs. 9, 10 and 11 show the stomach. This is the principal organ of digestion, and is situated mainly in the left side of the upper part of the abdominal cavity. Its form is irregularly conical, curved upon itself, and presents a rounded base turned to the left side. The left portion of the stomach, which is much larger than the right, is known as the splenic end. The stomach has two openings; the upper, which is shown at Fig. 9, is formed by the termination of the œsophagus, and is known as the cardiac orifice; the other opening is at the right of Fig. 10, which communicates with the duodenum and known as the pyloric. The stomach is supplied with blood vessels and nerves, and a branch of the great sympathetic nerve is also distributed here, which causes the stomach to so quickly sympathize with other parts of the body. This is the cause of sickness of the stomach when other parts of the body are affected, and also causes headache when the stomach is affected.

Fig. 12 represents the transverse colon, and Fig. 13 the small intestines. This plate, also, by the blue lines, shows the nervous system of the body. The great seat of this system is the brain. Nerves only transmit impressions, and each nerve transmits such impressions only in one direction. Their analogy to telegraphic wires is very close, although there is nothing that flows along them, the term current being metaphorical. There are two kinds of nerves—the nerves of motion and those of sensation. The latter are capable of only one kind of sensibility, and carry all impressions to the brain. Some are nerves of touch, some of sight, others of hearing, taste and smell. These nerves usually report, so to speak, their impressions, as if coming from their terminations. What is commonly called the crazy bone, at the elbow, is the ulnar nerve. When it is struck, the pain is not at the elbow, but in the last two fingers, to which its terminations are distributed.

After the amputation of a limb, sometimes, sensations in the stump seem to the patient to be in the missing toes. This may be termed relative sensation. The transmission of nerve impressions is from ninety to one hundred and forty feet in a second. The motor nerves, which do not have the sense of feeling, cause motion. The brain, the great center, is communicated with as by telegraph, by the sensory nerves, when a sensation is felt at any point, and immediately by the motor nerves telegraphed to action. Thus, when a finger is put in the fire, the sensory nerves communicate the pain to the brain, which, by the motor nerves, causes the removal of the hand. If the latter nerve were paralyzed, the pain would be felt without the power to remove the hand.

The red lines on Plate III show the lymphatic glands. They are very numerous throughout the body; the largest, however, are situated in the groins, the arm pits and along the sides of the neck. The latter often become swollen and form ulcers, as in scrofulous affections. They derive their name from the appearance of the fluid called lymph, which is contained in their interior; they are also known as absorbents, from the property which they possess of absorbing certain materials from the tissues and conveying them into the circulation. They are exceedingly delicate vessels, the coats of which are so transparent that the fluid they contain is readily seen through them.

PLATE IV.

This plate shows the human skeleton, which is divided by anatomists into eight divisions, classified as follows: Cranium, 8; bones of the ear, 6; face, 14; oshyoides and sternum, 2; ribs, 24; vertebral column, 26; upper extremities, 64; lower extremities, 62, making a total of 206.

1. Frontal bone, constitutes the front part of the head.
2. Parietal, or side bones of the cranium.
3. Occipatal bone, constitutes the base of the head.
4. Sphenoid bone, the bone forming the front part of the base of the cranium, and in shape resembles a bat with wings spread.
5. Temporal, is situated at the side and base of the skull.
6. Malar, or cheek-bone.
7. Nasal bone, or bone of the nose.
8. Superior maxillary, or upper jaw-bone.
9. Inferior maxillary, or lower jaw-bone.
10. Cervical vertebræ, that portion of spinal column in the neck.
11. Clavicle, or collar-bone.
12. Sternum, or breast-bone.
13. Lumbar vertebræ, that portion of the spinal column in the small of the back.
14. Scapula, or shoulder blade.
15. Humerus, the upper large bone of the arm.
16. Radius, outer bones of the forearm.
17. Ulna, the inner and larger bone of the forearm, and so called from its forming the elbow.
18. Pelvis, so called from its resemblance to a basin; it is composed of four bones.
19. Sacrum, the portion of the spinal column.
20. Femur, or thigh-bone, the large bone of the leg, and the longest, largest and strongest bone in the body.
21. Patella, or the knee-cap.
22. Tibia, the large bone of the leg, and next to the femur in size.
23. Fibula, the outer bone of the leg, and, in proportion to its length, is the most slender.
24. Carpus, or wrist joint, composed of eight little bones.
25. Metacarpus—five bones, constituting the palm of the hand.
26. Phalanges, the bones of the fingers.
27. Tarsus, or bones of the instep.
28. Metatarsus, consisting of five bones corresponding to the metacarpus of the hand.
29. Phalanges, the bones of the toes.

PLATE V.

Fig. 1, on this plate, represents a lateral section of the human head. No. 1 is the scalp; No. 2, the cranium; 3, the cerebrum or large brain; and 4, the cerebellum, or small brain; 5, the corpus callosum; 6, the septum lucidum; 7, fornix; 8, spinal cord; 9, condyless of the occipital; 10, ethmoid bone; 11, malar bone; 12, soft pallet; 13, inferior maxillary; 14, œsophagus open; 15, the outer wall of the œsophagus; 16, the trachea, or windpipe.

Fig. 3 represents the lateral section of the eye. No. 1 shows the cornea; 2, the cillary; 3, iris; 4, the crystallized lens; 5, cillary process; 6, vitreous humor; 7, sclerotic, or outer membrane; 8, choroid, or middle membrane; 9, retina, the inner membrane of the eye; 10, the optic nerve.

Fig. 4, sclerotic, or white of the eye; 2, external rectus, divided to show the optic nerve, No. 3; Nos. 4 and 5 are the upper and lower heads of the external rectus; 6, superior rectus; 7, superior oblique muscles; 8, lavator palpebræ superior; 9, inferior rectus; 10, pulley through the superior oblique passes.

Fig. 5 represents the human ear; No. 1, pinna, or external ear; 2, concha; 3, external meatus; 4, membrana tympani, or drum of the ear; 5, internal ear or labyrinth; 6, cochlea; 7 and 8, the petrous portion of the temporal bone; 9 and 10, styloid process; 11, the eustachian tube. It was upon the action of the three small bones (of the inner or *true* ear) known as the incus, malleus and stapes, that Prof. Graham Bell founded his earliest telephonic experiments.

FIGURE II.

The science of Phrenology is based on the theory that the faculties of the mind are shown on the surface of the human skull. It points out those connections and relations which exist between the conditions and developments of the brain and the mani-

festations of the mind, discovering each from an observation of the other.

Franz Joseph Gall, born at Tiefenbrunn, in Baden, March 9, 1758, was the first to mark the separate functions of the human mind and trace the location of the respective organs in the human brain. As a boy he had observed that among his schoolmates good memories were invariably indicated by large eyes, and from this he conceived the idea that individual characteristics could be determined by external signs. The result of long-continued observation in schools, prisons, lunatic asylums and other places was the conviction that the brain, and not the heart, was the seat of all mental manifestations. After twenty years of study he decided the location of some twenty distinct mental organs, and satisfied himself that their degree of activity could be determined from the shape of the skull.

Other things being equal, the size of the head and of the brain, the different portions of which are called organs, and classified according to their particular functions, constitutes the principal phrenological condition by which character is determined. Most great men have had great heads.

The general rule laid down for head-measurement of adults is as follows: The smallest size compatible with fair talents, 20¼; moderate, 20¾ to 21¼; average, 21¼ to 22; full, 22 to 22¾; large, 22¾ to 23¾; very large, above 23¾. Female heads ½ to ¾ below these averages; but as some heads are round, others long, some low and others high, these measurements cannot be depended upon to carry any accurate idea of the actual quantity of brain.

In judging of the manifestations of the mind, the activity of the brain is a consideration quite as important as its size. While size gives power or momentum of intellect and feeling, activity imparts quickness, intensity, willingness and even a restless desire to act, which go far to produce efficiency of mind, with accompanying effort and action.

The following is the key to the location of the various faculties of the mind, as illustrated by Fig. 2 on Plate V. In studying character by these they are classed under the six following heads: Very large, large, full, average, moderate and very small. The size, however, must be taken in connection with the mental activity of the individual.

1. Language. Power of expression.
2. Calculation. Mathematical talent.
3. Order. Love of order, system.
4. Color. Perception of colors.
5. Weight. Balancing power.
6. Size. Measurements with the eye.
7. Individuality. Observation in detail.
8. Eventuality. Memory of facts and dates.
9. Comparison. Reasons by comparison.
10. Human nature. Judges character.
11. Benevolence. Kindness, sympathy.
12. Veneration. Reverence.
13. Firmness. Decision of will.
14. Self-esteem. Thinks self all right; self-respect
15. Continuity. One thing at a time.
16. Inhabitiveness. Love of home.
17. Philoprogenitiveness. Parental love; love of children.
18. Amativeness. Loves many
19. Vitativeness. Longevity; love of life.
20. Conjugality. Loves but one.
21. Friendship. Loves friends and makes them.
22. Cautiousness. Restraint, care.
23. Approbativeness. Love of praise.
24. Conscientiousness. Sense of right.
25. Hope. Anticipation.
26. Spirituality. Faith, belief.
27. Imitation. Draws or writes from copy; will mimic.
28. Agreeableness. Ability to please.
29. Causality. Reasons from cause to effect.
30. Locality. Memory of location.
31. Time. The innate time-keeper.
32. Tune. Musical talent.
33. Bibativeness. Trifling.
34. Alimentiveness. Relishes food.
35. Destructiveness. The cat instinct to destroy.
36. Combativeness. Force, courage; defense of self and opinions.
37. Secretiveness. Reserve policy.
38. Acquisitiveness. Love of money; the saving ability.
39. Constructiveness. Originality, invention.
40. Mirthfulness. Sense of ludicrous.
41. Ideality. Love of the beautiful; poetic.
42. Sublimity. Love of grandeur.

Animals, Treatment of Young. With regard to the foal or other creature which may be born in the fetal membranes, it is evident that it must be freed from them immediately, or it will perish from suffocation; as, through having no longer any communication with the mother by means of the umbilical cord, the blood cannot be oxygenated. If the umbilical cord is not ruptured, it may be double ligatured about two inches from the umbilicus, and then divided between the ligatures; or it may be severed by scraping it through with a jagged knife. Immediately after delivery, and having removed the mucus which sometimes clogs the mouth and nostrils, and hinders respiration, the young animal should be examined to ascertain whether it be strong or weak, whether all the natural apertures exist—such as the eyes, mouth, anus, vulva, urethra—and if any of them chance to be absent, to make

artificial ones soon, if possible, by a kind of puncture, enlarging afterward by the knife and sound, and preventing union by pledgets of lint, etc. Whenever the connection with the mother is interrupted by rupture or occlusion of the umbilical cord, the young creature must breathe, respiration being now carried on by the lungs, through the nostrils. It sometimes happens that the young creature is in a state of syncope when born, or very soon after, and gives no sign of life; and observers have distinguished syncope from weakness—in which the animal is cold and does not breathe, the mucous membranes being pale and the body flaccid—and syncope from plethora or the blue disease, when the mucous membranes are of a livid blue tint, the lips and tongue swollen, and the eyes injected. In the first form, resuscitation is to be attempted by pouring cold water on the head, beating the body with a cloth dipped in cold water — particularly about the face and chest—dry-rubbing the limbs, titillating the nostrils with a feather, puffing tobacco-smoke into them, imitating the respiratory movements, as in a case of asphyxia, and inflating the lungs by means of a pair of bellows, acting through the nostrils. So long as the heart pulsates there is a probability of restoration to life. In the second form, allowing a little blood to flow from the umbilical cord, and even cutting this, or fomenting it with hot water to induce hemorrhage, is very useful, in conjunction with cold water to the head and cold-water enemas. But, as a rule, death is always imminent in these cases of syncope. It is not rare to find newly-born animals, particularly when parturition has been laborious, injured more or less from the manipulation of the obstetrician during birth, the lesions being more or less serious. The most frequent injuries are those due to obstetrical instruments and appliances. The wounds may be dressed with cold water, with slightly alcoholized water, or some dilute tincture—such as that of arnica—but salts of lead, or other poisonous salts, should not be employed. Abrasions, which are generally superficial, may be treated with glycerine and water, to which a very little carbolic acid has been added, or by lard, or any mucilaginous substance. Sprains should have cold-water irrigation, if possible, refrigerant lotions, or friction with soap liniment. Wounds and lacerations, if very severe, must have appropriate surgical treatment.

With the larger animals, the newly born creature should be placed before the mother, if it is not near her; and it generally follows that she instinctively licks off the viscid matter which covers its skin; and in doing this the cutaneous circulation is excited, and, by sympathy, the other organs of the young animal. Consequently, it becomes revived, soon endeavors to get up, and though it may fall several times, yet it generally quickly succeeds in maintaining itself on its limbs, and instinctively seeks the maternal teat. It is very rare that the mother does not voluntarily, and at once, commence to cleanse her progeny; nevertheless, there are exceptions, chiefly among the primiparæ, and especially when the labor has been long and painful. But it will generally be found that sprinkling the young animal with a little flour, bran, or salt will excite the attention of the mother and induce the cleaning process. Should it not do so, then the creature must be well dried and rubbed with a sponge, hay-wisp, or a cloth, and kept warm. This is more particularly necessary when the mother is indifferent to it, which sometimes happens with primiparæ when people are present. Indeed, some mares become quite savage after parturition, and will not allow their foal to come near them, and will even kill it; though this most frequently happens when they are tormented by spectators. Other mares, vicious before parturition, sometimes become remarkably quiet when they have a foal by their side. When they exhibit any aversion to their progeny, it is well to leave them quietly together for some time.

If the foal or calf is weak, and cannot reach the teat within half an hour or so after birth (for in uniparous animals the mammæ are inguinal, so that the young are always suckled in a standing posture), it will be found necessary to assist it by bringing it to the mother, and applying the teat to its mouth, at the same time caressing and soothing the parent if disinclined to it by temper or painfulness of the udder. This coaxing and handling should be performed by some one accustomed to the animal. It may be necessary to have a second person at hand to hold the mare by the head or lift up her fore foot.

Sometimes, from weakness or inexperience of the foal, and temper of the mare, the former runs the risk of perishing from starvation. The mare should be safely secured, and two persons ought then to push and support the young animal behind, by joining one of their hands, while the other hands are employed in directing it toward the teat, which it should be allowed to use for two or three minutes. After one or two attempts of this kind, the foal begins to find its way to the udder by itself, while the mare becomes reconciled to it. When the foal exhibits great debility, it may be preferable to feed it for a day or two with the milk of the mare which has been drawn by hand.

With the cow these difficulties are seldom present; and if an animal will not take to its calf, this is generally transferred to another cow, or it may be artificially reared. The foal may even be reared in this manner, though not so easily as the calf. The milk of the cow or goat will suffice; and there is generally little difficulty in teaching it to drink it, by at first pouring a little into its mouth while

the finger is inserted therein; or a piece of cloth steeped in milk, or even a bottle and tube may be used.

Calves are often harshly treated after birth; they are not allowed to suck, even for a number of days, for fear of damaging the cow, but are kept apart and fed on drawn milk. Calves intended for slaughter may be artificially fed, and especially if nutritive substances are added to the milk; but for those intended to be reared, it is a mistake to separate them from the cow during the early days of their existence.

Lambs, when able to stand, if they do not readily find their way to the teat, should have a little milk from it pressed into their mouths. With twin lambs, if the ewe is in good condition, the udder well filled, and the weather and pasture favorable, both may be suckled; in the opposite conditions, it may be necessary to remove one. If the ewe does not yield sufficient milk, this may be largely supplied by giving a liberal portion of good food.

Multiparous animals, such as the bitch and sow, usually lie when suckling their young, so that there is seldom any difficulty with them. The only care generally required in the case of young pigs is to prevent their being crushed by the sow in the act of lying down or moving. If the litter is large, plenty of good food is necessary. If a sow has more young in the litter than teats, unless watched, the weakest will die of starvation. Each young pig has its own particular teat, to which it is persistently attached; and if the creature is ill and does not suck, or if there is not a claimant for the teat, the gland there will cease secreting milk. The pectoral teats and glands are the largest and most active, and the weakest of the litter should be put to them. In general, a sow should not be allowed to rear more than ten in a litter. Cleanliness and warmth are required for young pigs.

Puppies do not require any special care beyond a warm, clean and dry abode.

After the first milk has been taken, there is usually an abundant evacuation of black, resinous matter — meconium — from the intestines of the young animal, caused by the "colostrum," as this milk is named; and it is well to notice if this evacuation occurs, as when it does not serious constipation may ensue. With new-born animals which, for some reason or another, are deprived of this colostrum, a mild laxative—such as castor oil, or honey and water—should be administered, to obviate this condition.

At birth the feet of hoofed animals are covered with a soft yellow horn, which in some countries it is the custom to remove, from a belief that this removal hardens the succeeding horn. It is unnecessary to state that this is a popular fallacy, and that it is really injurious to deprive the foot of this temporary protection.

The young, with their parents, should be kept apart from others, for some time at least, and especially the equine species; and it must not be forgotten that a mild, dry temperature is most favorable for all young creatures.

Gentle exercise is as necessary for the foal or calf as it is for their parents, a few days after birth; therefore it is that a meadow is preferable to a stable, as, in addition to the more favorable nature of the food, sufficient exercise is afforded. Indeed, with the mare light and regular work may be imposed a short time after foaling, and with much benefit to it and the foal. The latter will follow its dam, provided the pace is not too fast, and a halt be frequently allowed for it to get to the teat. It is astonishing sometimes to observe how well foals travel soon after birth, even over bad roads and during inclement weather, and for great distances, provided the journey is short each day.

Anise (an′is), an aromatic plant of the same order as the parsnip, bearing seeds like it, but smaller. The seeds are principally used for flavoring liquors. Medicinally they are stimulant, like ginger. Sometimes they are used for seasoning confectionery, and the leaves of the plant for garnishing dishes and seasoning food.

Annatto (an-at′to), or **Annotto**, a yellowish-red coloring substance, prepared from the pulp of the seeds of an evergreen tree of the same name in the West Indies and Brazil, and extensively used in coloring Butter and Cheese, which see. Dietetically, it is an abominable drug, and it is often adulterated with poisonous substances, as lead and mercury.

Annual, yearly. An "annual" plant is one which lives but for one season: see Biennial and Perennial.

Anodyne (an′o-dine), a medicine which allays pain. The following is said to be Perry Davis' "pain-killer:" Alcohol, 1 qt.; gum guaiacum, 1 oz.; gums myrrh and camphor, and cayenne pulverized, of each, ½ oz. Mix. Shake occasionally for a week or ten days and filter or let settle for use. Apply freely to surface pains, or it may be taken in teaspoon doses for internal pains, and repeated according to necessities.

Anodyne Plaster. Melt an ounce of adhesive plaster, or diachylon, and while cooling, add a drachm of powdered opium, and the same quantity of camphor, previously dissolved in a small quantity of olive oil. Spread this on leather. This soon relieves an acute local pain.

Anodyne Powder. Opium, ½ oz.; camphor, 3 drs.; valerian, 1 oz.; cayenne pepper, 1 oz. Put the opium and camphor into a close bag; place it on the oven top to harden. Powder and mix. Take a quarter of a teaspoonful at a time. Most valuable in colic, cramp and severe pains.

Antidotes: see Poisoning, and the respective poisons.

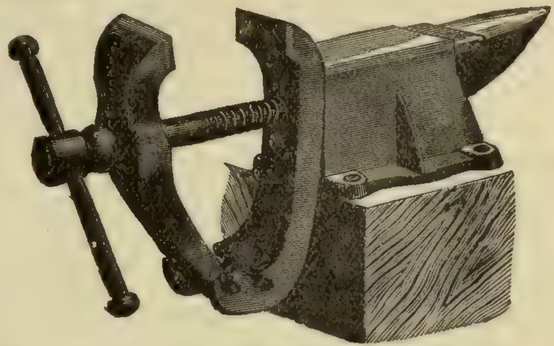
Antimony, and its preparations, as tartar emetic, antimonial wine and kermes mineral, when taken in improper doses, produce faintness and nausea, soon followed by most painful and continued vomiting, severe diarrhœa, constriction and a burning sensation in the throat, cramps or spasmodic twitchings, with symptoms of nervous derangement, and great prostration. Antidote: If vomiting has not been produced, it should be effected by large draughts of warm water and salt, and tickling the inside of the throat, or the stomach pump should be used. Then drink strong astringents, as tea of oak bark, Peruvian bark, gall or green tea. To stop the vomiting, should it continue, put a blister over the stomach by applying a cloth wet with hartshorn, and then sprinkle on the part one-eighth to one-fourth of a grain of morphia.

Antiseptic, preserving flesh from decay; also, anything which preserves flesh from decay is called an antiseptic, as salt, arsenic, creosote, charcoal, alcohol, etc. A septic is that which promotes putrefaction, as warm air, moisture, etc.

Ants, both black and red, are often a great pest about the cupboard and larder. The "remedies" for driving them away are numerous; as, powdered lime, borax, soda, chalk, cayenne pepper, cloves, green sage, wormwood, gas tar, vapor of tar-water, kerosene, anise-seed oil, etc., etc. Most of these remedies seem often to fail, probably because they are not thoroughly applied. Some persons resort to mechanical appliances, like the following, for example: Place the dish to be protected upon a little frame or cup, which is set in another dish of shallow water: the ants will not cross the water. Renew the water two or three times a week, to keep it fresh. A dish of hickory-nuts will attract the large black ants, when they can be easily caught and destroyed. Fresh bones can be used in a similar manner. It is also said that a dish greased with lard and set in the way of red ants, with little sticks for them to climb up on, will soon catch all these pests, by melting off the first lot or two and renewing the dish.

Anvil. The annexed engraving speaks too plainly for itself to need any extended commendation here. It is an anvil and vise combined, the former constituting a very solid foundation for the latter. The anvil is recessed to receive the nut of the vise and the clamp which retains it. The nut can remain in the anvil when the vise is removed. There goes with this apparatus (which is manufactured by A. L. Adams, Cedar Rapids, Iowa), a bolt-header.

The vise is of improved construction, which permits of quickly adjusting the movable jaw so that the two jaws are parallel. This is accomplished by means of notches opening outwardly and upwardly in the forked lower end of the fixed jaw, the movable jaw having a pivot adapted to the notches.



Anvil and Vise, Combined.

Aperient (a-pe′ri-ent), a medicine acting as a laxative, opening and quickening the excretories. They are principally rhubarb, magnesia, Epsom salts, senna, sulphur, ipecacuanha, ginger, etc., made up in various ways. Here is a good one for adults: Epsom salts, ½ oz.; infusion of senna, 6 drs.; tincture of senna, 2 drs.; spearmint water, 1 oz.; distilled water, 2 ozs.; best manna, 2 drs. Mix; and take three or four tablespoonfuls every morning, or every other morning. This is a valuable mixture. A decoction of Peruvian bark will render it a tonic aperient. One for children: Rhubarb, 5 grs.; magnesia, 3 grs.; white sugar, 1 scr.; manna, 5 grs. Mix these and give one or two grains at a dose.

Apiary (a′pi-a-ry), a place where bees are kept: see Bee-keeping.

Apoplexy, a disease in which persons fall down suddenly, being deprived of all sense and motion. The face is red and swollen, eye-lids half closed, and veins of the temples and neck are enlarged and full of blood. The first thing to be done is to check the flow of blood to the head. *Reg.:* The patient should be immediately bled, and a poultice of ground mustard should be applied between the shoulders. A dose of some active physic should be given, and the feet of the patient be soaked in warm water. Give plentifully of warm teas, so as to produce profuse sweating. When the feet are taken from the water, apply strong mustard poultices. Let the diet be very spare. *Ecl., etc.:* The bleeding should always be dispensed with, when it can be done with safety, and the other directions referred to carried out. *Hom.:* A few drops of the strong tincture of aconite in a tumblerful of water; give a tablespoonful every 15 minutes; or, belladonna, 6 globules in 10 tablespoonfuls of water, of which take a teaspoonful every half hour. For the stupor, give opium, in same doses as belladonna. *Hyg.:* Raise the head, loosen all

tight clothes, strings, etc., and do all the other things recommended above except the administration of drugs.

Appetite, the desire of food. As to the character and extent of the perversion of appetite, the controversy is too great for us to enter here. Some maintain that it is scarcely pervertible, holding that a confusion is made of appetite, taste and instinct. Appetite is the desire of food, and refers to quantity, and not to quality; taste is for the enjoyment of food, good or bad; and instinct is the only guide to quality, or, as some have it, instinct coupled with reason and experience. But it is a maxim among physiologists that every organ has but one function, and each function but one organ. Be these things as they may, it stands us all in hand to study physiology and hygiene *when we are well*, so that we will not be at a loss what to do when we are sick.

Apple. For use to man the apple stands at the head of the fruit kingdom. For its cultivation and the selection of the best varieties for each locality and situation, etc., there is of course a great variety of opinion, but we will give the substance of the results of experienced horticulturists.

CULTIVATION. The best soil and situation is a deep, rather dry, hard-wood soil, at a moderate elevation, sloping to the north, and with but little exposure to the west wind; in a level country, the highest elevation to be found. Good under-drainage is essential, of course, for the apple, as well as for almost all other plants. A gravelly sub-soil affords such drainage, but this is seldom found thorough enough; therefore artificial drainage must be had, tiling every two rods: see Drainage. Ground of this selection should be prepared by plowing into it about fifty loads of barn-yard manure to the acre. Do not sow with clover, grass or wheat. In the Eastern States, fertilize with marl or quick-lime; on the Western prairies, with lime and salt. Plant corn the first year on wild land, plowing shallow; the second year plow deep and plant to corn or potatoes; also plant the trees; mulch the trees pretty thoroughly before the wet weather of early summer ceases; in planting the trees lean them a little to the southwest, in order to counteract the effect of the strong and constant southwest winds, and to shade the trunk from the violent heat of the afternoon sun of late summer. The third year sow grain, giving a liberal top-dressing of four parts ashes, two of lime, one of plaster, and one of common salt. Plant in the spring when the soil is dry, in rows varying from fifteen to thirty-five feet apart, according to the habit of the trees selected, as some varieties have very spreading tops and some upright. Some prefer close planting, in order for mutual protection and uprightness of limbs. Prune the tops in proportion to the loss of root. Dig the hole large enough to admit all the roots without cramping; put mellow dirt around them, and tramp down carefully, that is, without leaving any of the roots bent out of their natural position. In Southern Ohio it is found profitable to set out good, healthy seedlings, and after two years' growth, graft them three to four feet from the ground. As to pruning, there are doubtless some trees in some situations that will bear very good crops for many years without any pruning at all; but the general advice is to prune moderately, and always do the work with a specific object in view with every branch or twig cut off,—that is, there must be some reason, in the case of every limb cut off, with reference either to removing diseased wood, superfluous branches that are chafing one another, the beauty of the head, keeping the tops low, etc. Better prune too little than too much. Low heads (Fig. 1) should be encouraged

FIG 1.—*Apple-Tree: Low Head.*

for Western cultivation; the limbs should be left on the trunk to within a foot or two of the ground. For this purpose the strong central branches have to be shortened back occasionally. The hemispherical form is the most beautiful for the head of an apple-tree. Remove about one-third of the top the first year, and less and less subsequent years; but be timely, so that no large limbs will grow where they should not be allowed, for limbs larger than an inch in diameter should not be cut off, so far as concerns the good of the tree. Let no limbs be longer than eight feet, and when large limbs are cut off, the stub should be painted as soon as it is dry, to prevent its cracking and rotting. Keep the ends of the limbs well thinned out, to let the sunlight in.

Girdling apple-trees to make them bear is advisable under rare circumstances, namely, when the trees are too thick on the ground, and you can afford to risk the sacrifice of some of them, and the girdling can be carefully done, in April. The cut should be narrow, and may be done by fastening a wire around the tree and letting it remain. Girdling will only do for a special object, for it is an attack

upon the life of the trees, and recovery from the attack depends upon the extent of the damage and recuperative energy of the tree; some varieties of trees, like some human individuals, will recover, or

Fig. 2.—*Apple-Tree: High Top.*

partially so, from attacks to which others would succumb. It is a law pervading the entire vegetable kingdom that the dying energy of a tree is expended in reproducing its species; and the very fact of the result spoken of, in more and larger fruit, is a sure indication that the tree or branch is nigh unto death. Its full recovery is next to impossible, and its premature decay or death quite probable; hence girdling should be practiced only when trees or branches can well be spared.

Look out in time to avoid uncouth high tops, as Fig. 2, which generally become more scraggy than is here represented. Such high tops as Fig. 3 are to be avoided in countries subject to high winds, as the prairies of the West.

Keep away all suckers promptly. When a tree is beginning to lean too much, straighten up by tying to stakes. Allow no grass to grow near the tree until it has a top heavy enough to shade the ground under it and prevent too strong a sod. Some advocate seeding down to orchard grass the third or fourth year, and others think it should be deferred to several years later. In plowing and hoeing be careful not to tear the bark or the roots; hence the cultivation must be shallower every year until the sod takes complete possession of the ground. See also Grafting, Pruning, etc.

Nursery Cultivation. The more branches you allow to the scions the more roots they will have. During the first year, prune only those that have thrifty forks and assume an upright growth. The idea of trimming is to keep one trunk straight for the future tree.

Examine the young trees carefully in March, after one summer's growth. If the inner bark be much discolored, don't take a shoot off, but if the inner bark and wood looks white and sound, cut away the strong side shoots; again, in June, take off the most upright side shoots, though if very numerous do not remove over one-fourth at one time. In August go over the trees again, still cutting the strong upright shoots, leaving the smaller bracts as before. The work in nursery in the way of pruning is now done. About the middle of October, or before, run a tree digger under the tree roots, draw out the trees and put them in piles on moist soil. Mix in soil among the roots and tops, covering all up completely. In four days the leaves will all drop off when taken up, and the sap flowing will be measurably stopped. In this condition they may be more safely exposed to sun and air. When first taken up with leaves on, evaporation is very rapid, and they must be guarded from the sun and wind. When denuded of leaves in the way indicated, they should go into the hands of the planter, who should bury them root and branch beyond frost. In the spring they will be found as sound as when in nursery the summer before.

Fig. 3.—*Apple-Tree: High Top.*

Plant as early as the condition of the soil will permit in spring, watering each tree as planted with a pail full of water. A fair growth on each tree may be guaranteed with a loss of not over one per

cent., always presuming that the soil about the young trees the first season be kept loose and free from weeds. This care in taking up and burying in the fall is to ensure a sound tree to commence with in orchard. The planter must observe the same rules in pruning prescribed for the nursery. It is understood that there will be a considerable amount of limbs on the trees as delivered from the nursery. These extra branches must not be removed until after the buds have begun to swell, and then not all at one time.

INSECTS AND DISEASES. By far the most omnipresent insect among apples is the codling moth, or apple-worm (Fig. 4). It appears in the spring and deposits its eggs in the young apple; the larves hatched from these eggs subsist upon the fruit, causing it to fall before it is grown, and remain even in many winter apples. It is about half an

FIG. 4.—*Codling Moth.*

inch long, of gray ashen color and marked with brown and bronze. Remedies: Wisps of hay or cloths put around the tree in one or two places between the ground and the first limbs, in early spring, so that they will catch the moths as they crawl up; every few days take these bands off and kill the worms; keep up this practice all summer. During the month of June, the time of cocooning, is the most important time for this work. Another plan is to pasture the orchard to hogs, which will eat up the young, wormy fruit as it falls, and also help to cultivate by their rooting. Still another good method is to envelope a few inches of the base of the tree with glossy paper during the latter part of May and all of June (in Northern States), so that the larves cannot crawl up. The windows of fruit rooms and cellars where apples have been kept through the winter should be covered with wire gauze during May and June, so that the moths which have come from the fruit may not escape to the orchard. Other methods of catching the moths are: Setting a candle or lamp over a tub of water, in the orchard; hanging old oyster cans to the trees, half filled with vinegar; putting old clothes in the fork of the tree; tacking stiff, brown wrapping-paper around the trunk, with the lower edge flaring out, to catch the larvæ crawling up, when they can be mashed with a mallet; the Weir trap, which consists of a number of shingles fastened together so as to leave crevices between them, where the larvæ will hide, and can be caught, etc., etc.

It is also recommended to hunt their nests about sheds and apartments where apples are kept, and to destroy all old birds' nests and other rubbish which may serve as harbors for the moth. Codling moth can be killed by spraying upon the trees, with a pump syringe, as soon as the fruit sets, a solution of one pound of arsenic boiled in 100 gallons of water; or, Paris green, a small tablespoonful to the barrel.

FIG. 5.—*Flat-headed Apple-tree Borer.* (Chrysobothris femorata.) *a, larva; b, pupa; c, under side of head; d, beetle.*

The next greatest pest perhaps is the borer, of which there are two kinds, the flat-headed (Fig. 5), and the round-headed (Fig. 6). The latter is the most common kind, and works near the ground, throwing out his saw-dust castings. Look for depressions or discolorations in the bark, and with a flexible wire, knife or narrow chisel, hunt up the larves and kill them one by one. Cover the wounds made in the tree with grafting wax. To kill the eggs and prevent them from being laid, thoroughly scrub the trunks of the trees every year, during the last half of June, with hot soft soap. A cheap sheet-iron pail can be made, having a second bottom below, containing room for a kerosene fire or lamp of some kind, or charcoal or pine wood, and by this means it is easy to keep the soap hot while it is being carried from tree to tree. Later in the year,

FIG. 6.—*Round-headed Apple-tree Borer.* (Saperda candida.) *a, larva; b, pupa; c, developed form.*

and indeed at any time, the bark should be examined and suspected places dug into with a knife in search of borers. The above is also the best general treatment against all species of bark lice and many other insects, as well as fungoid diseases. Strong soap-suds, soda, kerosene or lye is often used. If these are immediately washed off by a rain, the application should be made again. Carbolic acid is an excellent ingredient, in weak soap-suds or water, in the proportion of one ounce of the acid to 50 trees. The old practice of whitewashing is condemned, as it prevents a free exhalation through the bark; acts too much like a coat of paint.

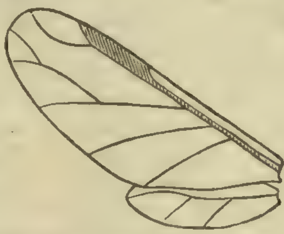


Fig. 7.—*Wing of Apple Louse, magnified.* (Aphis mali.)

Caterpillars should be kept off by using a brush, say a mullein spike tied to the end of a pole, or something of the kind. It is well, also, to destroy all the caterpillars on wild cherry-trees in the vicinity of the orchard. The brush used may be dipped in strong soap-suds, or a weak solution of coal oil or carbolic acid.

The cankerworm is an increasing pest, going westward in its march. There are two species, the spring and the fall, and they strip the foliage, not only from apple-trees, but also from peach, cherry, elm, etc. To prevent the females from ascending the trees to deposit their eggs, a band of coarse cloth, six inches or more wide, may be put round the tree and then smeared with tar or a mixture of tar and molasses.

Fig. 8.—*Canker-worm.*

A hay rope may be put round the tree and over this a ring of tin wide enough so that there will be free tin below the rope, and the whole securely fastened, being careful that there are no crevices between the tin and the tree through which the insects may pass. The tin should be smeared on the inside with printer's ink, tar, or a mixture of castor oil and kerosene. In both these cases the moths will lay their eggs below the bands if prevented from going above them. To insure success, these should be sought and killed, as, if allowed to hatch, it will be much more difficult to keep them from ascending the trees than it was the moths. Coal tar should be used only on old trees. When the tar hardens a little, the application must be renewed.

When the worms are already in the tree, if the trees are not too large, a sudden jarring will cause them to be detached from the leaves or twigs, and hang suspended, when they may be swept down by passing a switch between them and their support, and they may be destroyed.

Washes of Paris green and other substances may be resorted to when they are in the tree, but it is probable that where the tree is small enough to make the application of washes practicable, a few times jarring will answer the same purpose.

If the worms have entered the ground and changed to chrysalids, fall plowing will, if the ground be mellow, break up their slender cocoons, and expose them to the action of the weather, which, with the birds, will destroy most of them. Co-operation of neighboring orchardists is necessary to perfect success.

Fig. 9.—*Apple-leaf Crumpler.*

The bunches of crumpled leaves seen remaining on apple and other trees during the winter, are the work of the apple-leaf crumpler, Fig. 9. The caterpillar when full grown, in summer, is of a dull green color, the head darker. Pick the leaves off in winter and pile them up at some distance from the orchard, where the vermin will starve to death, and at the same time their parasites will live, to prey upon the crumplers of future generations.

Fig. 10.—*Apple-root Louse.* (Schizoneura lanigera.) *a, the infested rootlet; b, the woolly larva; c, the winged insect, with the woolly matter all removed; d, leg of the perfect insect; e, the beak; f, antennæ of the winged insect; g, antennæ of the larva.* (Natural size shown by straight lines.)

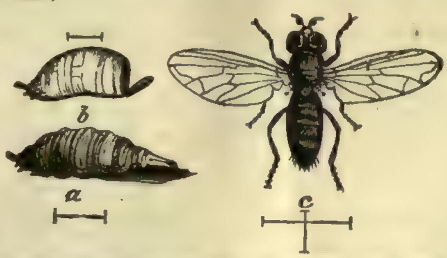


Fig. 11.—*Root Louse Syrphus Fly.* (Pipiza radicum.) *a, larva; b, pupa; c, perfect fly.*

The "woolly blight," or apple-root louse (Fig. 10), is the work of a woolly louse, causing warty excrescences about the roots. Remedy: Washes

of strong soap-suds. The Syrphus fly (Fig. 11) preys upon it, and is thus indirectly a friend to human interest. The straight lines in the cuts indicate the natural size of the insects.

The New York weevil (Fig. 12) works in the twigs. Insects of this species can be readily jarred off, collected in sheets, and destroyed. Two or three species of Ips (Fig. 13) eat their way into mature fruit, but they are not very troublesome. Proper care in removing decaying fruit and gathering carefully and in due season that which is ripe, will probably prevent any injury from this little creature. The apple curculio (Fig. 14) eats into the young fruit. The only two remedies are gathering the infested fruit and destroying it, and the selection of varieties not subject to its attacks, if indeed there are such varieties. The insect is rare in the North. For the two species of Buprestid borers, the white-lined Psenocerus, the cylindrical bark borer and the apple-twig borer, look over the trees in autumn and cut off the infested twigs. The scale insect is destroyed by the usual alkaline washes. The bud worm is a small, naked caterpillar about one-third of an inch long and brown in color, with small warts, and black ring near its head. No special remedy. The palmer worm is destroyed with whale-oil soap and water. The 17-year locust preys upon the roots of the apple-tree for a portion of his 16 years' apparent absence, and the 17th year the females score the twigs for the deposit of eggs. No remedy. If rabbits or mice show signs of their work on the trees, remove the mulching a few inches from the tree and put on some distasteful drug, or in the fall put around the trees for about two feet up, old sheet-iron or tinware from old stove-pipes and refuse kitchen furniture. Remove this in the spring as soon as herbage becomes green. Mice alone can be guarded against by simply piling up, late in autumn, a conical mass of earth about 16 inches high around the tree and spatting it down smooth. This should be removed again in the spring.

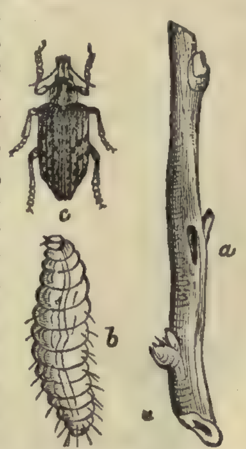


FIG. 12.—*New York Weevil.* (Ithycerus Noveboracensis.) *a, infested twig; b, larva; c, perfect insect.*

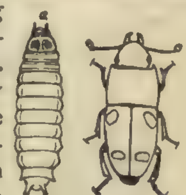


FIG. 13.—(Ips faciatus.) *a, larva; b, beetle.*

FIG. 14.—*Apple Curculio.* (Anthonomus quadrigibbus.) *a, natural size; b, side view; c, back view.*

The most common disease among apple-trees, especially in the West, is twig blight, supposed to be caused by a microscopic bacterium. No remedy is known, except to plant the trees on hillsides and in light soils, for the disease affects mainly those trees which are set in a rank, rich soil, like that of the Western prairies. One ounce of copperas to eight or ten gallons of water forms a good wash, and is advised for trial as preventive against blight. A Wisconsin man, in one instance, reports that he found the pruning knife a success. In using the knife, dip it in a strong solution of carbolic acid every time in passing from one limb to another, in order to kill the disease matter on the knife and prevent the spread of the blight by inoculation.

The most effectual safeguard against having spotted fruit is to avoid planting those varieties which bear it. Those most subject are Newtown Pippin, Fall Pippin, Early Harvest, Rambo, Fameuse and Canada Red. The varieties most free are the Russets, Baldwin, Red Astrachan, Gravenstein, Duchess of Oldenburg, etc.

HARVESTING, PACKING, ETC. As soon as the seeds turn brown and before the fruit begins to soften or become mellow, pick them from the tree. For long keeping and for high prices they should be handled as carefully as eggs, and never poured from one vessel to another as we do potatoes. Use step-ladders. For marketing it will always pay to carefully sort the apples into two or three classes. All those in one lot should be of a uniform size and appearance as nearly as practicable. Allow no poorer apples to go into a lot of better apples designed for market. Barrel tight, so that the apples will not rattle about in shipping and become bruised. Keep in a cool place in an out-door shed until freezing weather, and then put into a cellar or other room where they will be next to freezing until used.


FIG. 15.—*Fruit Ladder.*

To keep winter apples in the very best manner, they should be gathered by hand on a dry day, as late in the autumn as is safe from injurious frosts, then put them into new, tight flour barrels, shaking them down and placing

the head in tightly, with considerable pressure upon the apples; place them in a cool, shady exposure, as a dry shed or on the north side of a building, until the weather is cold enough to justify putting them into the cellar. If practicable, it is well to ventilate them with the cool air of dry nights and protect them from the circulation of the warm air of day. The cellar should be kept just at or above freezing point, dark, clean and well ventilated. Some prefer placing the fruit on a dry floor, as soon as they are picked, and after a week they examine them, to see if the "sweat" is about gone, and if so, they look them all over, and wipe perfectly dry those which are not already so, and pack them in the barrels. Some put clean rye straw between the layers of apples in the barrels. In the cellar the barrels are placed on their sides, in tiers. Boxes and barrels containing apples should be self-ventilating; but the sorts which incline to wilt, like the Russets, may be kept more confined, to prevent evaporation.

Apples are often kept by burying them outdoors like potatoes, but there is some risk in this method, and the fruit always soon decays after exposure to the air. Fig. 16 shows an excellent style

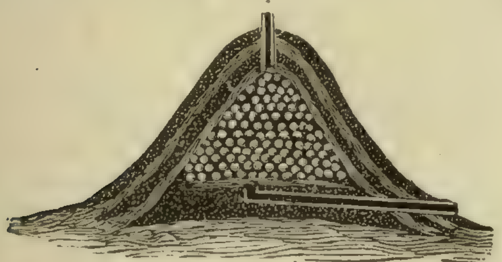


Fig. 16.—*Apple or Vegetable Pit.*

of pit for this purpose. The only peculiar feature about it is the provision for ventilation. The bottom of the pit should be high enough to prevent water from reaching it. This may be accomplished by means of a drain if desired, or the bottom may be raised a few inches above the surrounding surface. Place a small gas-pipe (or any other) in the bottom, as shown in the cut, connecting the apples with the outside air. Arrange a similar pipe at the top. This produces a current of air through the entire pile. In extreme cold weather it may be necessary to close the pipes, opening them again when the weather moderates. Put a screen over the protruding ends to keep vermin out. In covering, place alternate layers of straw and soil, as shown in the cut.

Varieties. To give a condensed description of many apples, both of the fruit and of the tree, it will be necessary to use a few short terms very frequently, which for beginners in fruit-raising we explain. The stem end of the apple is its base, and the flower end is the apex. The hollow portion at the base is the cavity, and that at the apex is the basin. In the center of the basin is the calyx, consisting of the small leafy tips of the flower cup. The general shape of an apple may be round, roundish, oblate, oblong (Fig. 18), conical, etc. The oblate is also termed "flat" (Fig. 17), and the conical is the shape of a cone or egg (Fig. 19). Truncate signifies flattened at the apex. Some apples are ribbed, having ridges; some corrugated, having depressed lines, furrows, or wrinkles; and some unsymmetrical, that is, having the sides unequal. The terms fair, good, very good, best, etc., have a sort of technical meaning, indicating the general comparative quality in the best situations and in good cultivation. The best time for using the fruits is indicated by the months named. As to the tree, it may be strong, vigorous, weak, slender, short-jointed, hardy, spreading, round-headed, etc. Young shoots are understood to be a dull reddish brown and downy, unless otherwise noted.

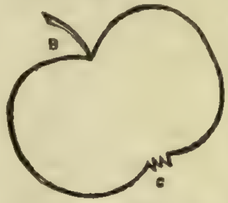


Fig. 17.—"*Flat*" *Apple. B, cavity; C, basin.*

Our list here comprises over a hundred of the best varieties of apple, the thousand others being purposely neglected by Northern orchardists. Pomologists for the last forty years have generally been endeavoring to restrict the number of varieties in cultivation. There are thousands of synonyms for apples, many varieties having 10 to 20 names; and should any one fail to find a good Western apple in the following list by the name known to him, he may ascertain the name we adopt by consulting Downing's work. We endeavor to give all the most popular names.

Alexander, *Emperor Alexander*, *Russian Emperor*, *Victoria.* Fruit scarcely good except for cooking, and falls badly from the tree; season, Aug. to Dec. Very large, fair and handsome, conical, truncated, sometimes obscurely angular, smooth, pale yellow, striped and splashed; distinctly bright red, sometimes shaded mixed red; basin medium; eye small, long, closed; cavity deep, narrow, brown; stem medium to short, stout; core wide, nearly closed; axis short; seeds large; flesh whitish, breaking, not fine grained, juicy, acid, not rich. Tree medium size, spreading, and an early bearer.

Fig. 18.—*Oblong Apple.*

American Golden Pippin. Medium to large, roundish oblate, inclining to conic, obscurely ribbed, yellow, sometimes brownish-blush in the sun, thinly sprinkled with gray dots, often slightly netted with thin russet; stem short, moderately stout; cavity large and deep; calyx closed; basin broad and slightly corrugated; flesh yellowish, breaking,

juicy, rather coarse, rich, aromatic, subacid; core rather large. Very good. Nov. to Feb. Good for both table and market. Tree strong, with round, spreading top, similar to R. I. Greening but less drooping; does not bear young, but very productive when advanced. Wood dark reddish, downy, with prominent flattened buds.

American Golden Russet. Small, roundish, ovate, dull yellow, sprinkled with a very thin russet; stem rather long and slender; calyx closed; basin narrow; flesh yellowish, very tender, juicy, mild, rich, spicy. For the table. Best. Oct. to Jan. The flesh of this apple is so tender as to resemble that of a buttery pear more than of an ordinary apple. Tree not very handsome or large.

American Summer Pearmain. Medium, oblong, wider toward the apex, red, spotted with yellow where grown in the shade, but when in the sun it is streaked with livelier red and yellow on the sunny side; stem three-fourths of an inch long and deeply inserted; calyx closed; basin abrupt and slightly corrugated; flesh yellow, remarkably tender, rich, pleasant-flavored, and often bursts in falling from the tree. For the table. Best. Core medium. Fruit ripens gradually from Aug. 10 to Sept. 30. Tree moderately vigorous, with slender branches and round head.

FIG. 19.—*Conical Apple.*

Bailey's Sweet. Large, roundish conical, often approaching oblong, obscurely ribbed, sometimes angular, yellowish, mostly shaded and obscurely striped with red and mottled or thickly sprinkled with minute dots; stem rather slender, inserted in a narrow, green cavity; calyx small, closed and set in a narrow, irregular basin; flesh white or yellowish, tender, not very juicy, almost melting, and of a honey-sweet flavor; core rather large, turbinate, open. Seeds numerous, angular, dark. Very good. Profitable for all purposes, but rather tender-skinned. Nov. to March. Tree vigorous, upright, spreading, productive.

Baldwin. The most popular apple in the North, on account of its good keeping qualities and general good properties. Large, roundish, narrowing a little toward the apex; yellow in the shade, but nearly covered with crimson stripes and red and orange when grown in the sun, dotted with a few russet dots, and with radiating streaks of russet about the base; calyx closed; basin narrow and plaited; stem three-fourths of an inch long, slender; cavity even and moderately deep; flesh yellowish white, crisp, sparkling, high-flavored. Very good. Table and market. Nov. to March. Tree a vigorous, upright grower and bears abundantly; top spreading.

Baltimore. Medium size, roundish-conical, regular, pale yellow shaded with light red, striped and splashed with dark red, almost purplish, having a grayish appearance of bloom, large light dots, with a dark center; stem short; cavity medium size, rather thinly russeted; calyx small, closed; basin shallow, nearly smooth; flesh whitish, tender, juicy, mild, subacid; core medium. Very good. Dec. to April. Tree healthy, hardy, moderately vigorous, head round; young shoots dull reddish brown. Fruit for table or market.

Belmont. Medium to large, globular, a little flattened and narrower toward the apex, sometimes oblong, light waxen yellow, often with a vermilion cheek; stem short; cavity generally large; calyx usually closed; basin rather deep, and corrugated; flesh yellowish, crisp, tender, juicy, sometimes almost melting, of a mild agreeable flavor. Very good. Table. Nov. to Feb. Tree vigorous, healthy and productive. Wood a smooth, light reddish brown.

Ben Davis. One of the most popular apples at the present time, more, however, on account of its fine appearance than of good eating qualities; but the people are learning to like them. Medium to large, roundish, truncated conical, often unsymmetrical; yellowish, but mostly overspread with stripes and splashes of two shades of red, and dotted sparsely with areole dots; stem medium, rather slender; cavity narrow, deep, russeted; calyx partly open; basin wide, abrupt and slightly wrinkled; flesh white, tender, moderately juicy, pleasant, subacid. Good. Market. Better in the South and Southwest. Dec. to March. Core medium to large. Tree a hardy, free grower, with very dark, reddish brown, slightly grayish young wood, erect round head, bearing early and abundantly.

Benoni. Table and market. Below medium size, roundish-oblate, conical, pale yellow, shaded, striped and marbled with dark crimson, and thinly sprinkled with bright dots; stem short, slender; cavity deep russeted; calyx closed; basin abrupt, quite deep and somewhat uneven; flesh yellow, juicy, tender, pleasant, subacid; core small. Very good. Aug. Tree vigorous, upright, spreading, hardy, productive, light reddish brown.

Bentley's Sweet. Medium, roundish, flattened at ends, sometimes unsymmetrical, pale yellowish green, shaded with pale red and moderately sprinkled with light and brown dots; stem long, slender, curved; cavity smooth, deep; calyx large, closed, or partially open; basin large, deep, corrugated; flesh fine, whitish, compact, sweet, somewhat honeyed flavor; core small. Very good. Jan. to May. Market and keeping. Tree mod-

erately vigorous, hardy, good bearer and keeper, and particularly valuable in the Southwest.

Bethlehemite. Table and market. Medium, oblate, inclining to conical, regular, pale yellow, striped, shaded and splashed with light and dark red nearly all over, with a thin grayish tinge, and thickly sprinkled with light and brown dots; stem rather short, slender; cavity large and russeted; calyx open or partially closed; basin large and slightly corrugated; flesh white, compact, crisp, juicy, rich, mild, subacid, slightly aromatic; core small. Seeds numerous, short, very plump, pale. Very good. Dec. to March. Tree upright, strong, stocky, short-jointed; young shoots dull reddish brown and downy, productive.

Black Gilliflower. Table. Medium, oblong conical; dark, dull red; flesh white, dry, mild, subacid. Good. Nov. to Feb. Tree very productive.

Bonum. Table and market. Medium, oblate, yellow, mostly shaded with deep crimson and indistinct stripes and splashes of dark red, rather thinly sprinkled with pretty large light dots, a portion of them having a dark center; stem long and slender; cavity medium to large, often with a little green russet; calyx closed; basin shallow, slightly corrugated; flesh white, often stained next the skin, firm, tender juicy, rich, mild, subacid; core small. Very good. Nov. to Dec. Tree upright, spreading, hardy, vigorous, and early and abundant bearer. Young shoots a smooth reddish gray.

Broadwell. Table and market. Medium, oblate, somewhat conic, clear bright yellow, brownish blush in the sun exposure, with carmine spots; dots few, greenish, suffused beneath; stem rather short; cavity broad, russeted; calyx closed; basin abrupt, regular; flesh whitish, firm, juicy, rich, sweet; core small. Very good. Nov. to Feb. Tree vigorous, quite hardy, very spreading, irregular, productive. This is an extremely valuable sweet apple.

Buckingham. Table and market. Medium to large, oblate, inclining to conic, greenish yellow and mostly covered, shaded, striped and splashed with two shades of crimson or purplish red, and many light brown dots; stem short; cavity broad, deep, slightly russeted; calyx closed; basin rather large, deep, slightly corrugated; flesh yellowish, rather coarse, breaking, tender, juicy, mild, sprightly, subacid; core small. Very good to best. Nov. to Feb. Tree hardy, healthy, moderately vigorous and productive, of a round head, spreading and of a medium size. Does best in the Ohio River Valley and Southwest.

Campfield. Cider, market and keeper. Medium, roundish, rather flattened, smooth, washed and striped with red over a greenish yellow ground; flesh white, rather dry, firm, rich and sweet. Good. April and May. Tree large, symmetrical, with straight, spreading limbs, and very productive. This is a capital New Jersey cider apple, and is also good for baking and stock-feeding.

Canada Reinette. Table and market, Oct. to April. Largest size, oblate, conical, flattened, rather irregular, with projecting ribs, broad at the base, narrowing toward the apex, with three deep, greenish yellow channels, slightly washed with brown on the sunny side, sprinkled with russet patches; stem short, inserted in a wide cavity; calyx short and large, set in a rather deep, irregular basin; flesh nearly white, rather firm, juicy, with a rich, lively, subacid flavor. Very good to best. Tree spreading, open, vigorous and productive. An extremely popular apple in Europe and Canada.

Carolina Red June. Very good, for table and market. Medium or below in size, oval, irregular, inclining to conic, smooth, and nearly all over shaded with deep red, and almost of a purplish hue on the sunny side, and covered with a light bloom; stem variable in length; cavity small; basin narrow, plaited; calyx closed; flesh very white, tender, juicy, with a brisk, subacid flavor; core rather large. Tree upright, vigorous, an early and abundant bearer, much esteemed at the South and Southwest as their best early apple; equal to the Early Harvest in flavor and more profitable as an orchard fruit. The Carolina Striped June is another variety of apple about as good as the Red, and indeed scarcely distinguishable from it; it is generally more striped.

Carthouse. See Gilpin.

Cayuga Redstreak. See Twenty-Ounce.

Chenango Strawberry. Very good for table. Medium, oblong conic or oblong truncated conic, indistinctly ribbed, whitish and shaded, splashed and mottled with light and dark crimson over most of the surface; light dots; stem short, small; cavity acute, somewhat uneven; calyx closed, or partially open; basin rather large, abrupt, slightly corrugated; flesh white, tender, juicy, peculiarly mild subacid; core rather large. Sept. and Oct. Tree vigorous, spreading.

Cogswell. Very good to best, for table and market, Dec. to March. Above medium, regular, roundish oblate, rich yellow, nearly covered with red, marked and streaked with bright red, pretty thickly sprinkled with areole dots; stem short, slender; cavity large, thinly russeted; calyx small, nearly closed; basin small, shallow; flesh yellowish, fine-grained, tender, juicy, scarcely subacid, rich, aromatic; core small. Tree vigorous, upright, spreading, abundant bearer, and fruit even-sized.

Cooper's Early White. Best summer apple for Nebraska, etc.

Crawford Pippin. A new variety.

Dominie. Excellent for table and market, from Dec. to April. It resembles the Rambo, being of medium size, flat, lively greenish yellow in the

shade, with stripes and splashes of bright red in the sun, and rather large russet specks; stem long and slender, planted in a wide cavity and inclining to one side; calyx small, in a broad basin, moderately sunk; flesh white, exceedingly tender and juicy, with a sprightly pleasant flavor, though not high. Young wood of a smooth, lively light brown. Trees hardy and the most rapid growers and prodigious bearers in existence.

Duchess of Oldenburg. Medium, regular, roundish oblate, smooth, finely washed and streaked with red on a golden or yellow ground; calyx pretty large and nearly closed, set in a wide, even hollow; there is a faint blue bloom on the fruit; flesh juicy and sprightly subacid; ripens early in September. Cooking and market. Tree vigorous, with roundish, upright, spreading head, requiring little or no pruning and is an excellent bearer. Young shoots smooth.

Dyer, *Pomme Royale*, *Golden Spice*. Medium, roundish, regular, smooth, pale greenish yellow, with a faint blush and a few dark specks on one side; stem about half an inch long, set in a smooth round cavity; calyx closed; basin plaited, moderately deep; core round, hollow; flesh white, very tender and juicy, of very mild and agreeable flavor, aromatic, slightly subacid. Very good to best. Table. Sept. to Oct.

Early Harvest, *Early French Reinette*, *July Pippin*, *Large White Juneating*. Very good to best, for table and market; the smallest collection of apples should comprise this and the Red Astrachan. Fruit medium size, roundish, often roundish oblate, very smooth, bright straw color, with a few faint white dots; stem half to three-fourths inch long, rather slender; cavity of moderate depth; basin shallow; flesh very white, tender, crisp, juicy, rich, sprightly subacid; core small. Tree moderately vigorous, an abundant bearer, having an upright, spreading head.

Early Joe. Best for table; ripens from middle of August to middle of September; fruit small, oblate, very slightly conic, smooth, yellowish, shaded and striped with red and thickly sprinkled with greenish spots; stem of medium length; cavity large, surrounded with russet; calyx closed; basin moderate; flesh whitish, tender, juicy, with an agreeable vinous flavor. Tree of slow growth, productive, and requires high culture. Luce's Early Joe is another apple, not so good, but larger.

Early Pennock, *Shaker Yellow*, *Harmony*, *Hominy*, *etc*. Good to poor, market and cooking, July to Sept. Large, variable in form, conic, handsome, smooth, yellow, partially covered with mixed and striped scarlet, splashed carmine,—often yellow prevails; dots numerous, dark; basin shallow, plaited or regular; cavity deep, brown; stem medium or short; core long, tapering to both ends, partially open in some; seeds large, numerous, dark; flesh yellow, breaking, rather coarse, acid. Tree thrifty, upright, early bearer, not long-lived.

Early Strawberry, *Red Juneating*. Very good, table and market. Roundish, narrowing toward the apex, smooth, fair, finely striped and stained with bright and dark red, on a yellowish white ground; stem inch and a half long, rather slender and uneven; cavity deep; calyx small; basin shallow and narrow; flesh white, slightly tinged with red next to the skin, tender, subacid and very sprightly and brisk in flavor, with an agreeable aroma. In market from July to Sept. A beautiful apple.

Edgar Redstreak, *Walbridge*. Jan. to May. Medium size, oblate, pale, whitish yellow, shaded with pale red in the sun, narrow stripes, and a few splashes of bright red over most of the surface where fully exposed; stem short, small; cavity sometimes slight russet; basin small, slightly plaited; flesh white, fine, crisp, tender, juicy, mild subacid; core small or medium. Tree hardy, upright at first, but spreading with age and weight of fruit.

English Russet. Good. Market and keeper. Jan. to May. Medium, roundish, slightly conical, regular, pale greenish yellow, about two-thirds covered with russet, which is thickest near the stem; calyx small; basin even, round and moderately deep; stem rather small and deeply inserted in a narrow, smooth cavity; flesh yellowish white, firm, crisp, mild, slightly subacid. Tree very straight, head upright, and the wood smooth and reddish brown.

English Sweet. See Ramsdell's Sweet.

Esopus Spitzenburg, or *Æsopus Spitzenberg* (spelled variously). Best for table and market, Dec. to Feb. Large, oblong, tapering roundly to the apex, smooth, nearly covered with rich, lively red, dotted with distinct yellowish russet dots on the shaded side, a yellowish ground with streaks and broken stripes of red; stem rather long, slender; cavity wide; calyx small and closed; basin shallow and slightly furrowed; flesh yellow, rather firm, crisp, juicy, deliciously rich and of a brisk flavor; seeds in a hollow core. Tree has slender shoots and long, hanging limbs. In progressing Westward, this fruit has become larger and more irregular and less brilliantly colored, less highly flavored and less productive. In some regions the tree is subject to blight, and unprofitable.

Evening Party. Best for table and market, Dec. and Jan. Medium to small, regular, quite flat, smooth, mixed red and carmine stripes, on waxen yellow ground; dots numerous, distinct, grey; basin abrupt, regular, deep; eye small, closed; cavity wide, deep, regular, brown; stem medium, green, slender; core small, regular, closed, touching the eye and short; seeds short, wide, dark; flesh light yellow, very fine grain, tender, juicy,

subacid, aromatic. Tree roundish, upright, spreading, with slender branches; young shoots dark greyish brown, many small dots; fruit hangs well to the tree and the foliage remains until very late.

Fallawater, *Tulpehocken*, *Pound Mountain Pippin*, *Winter Blush*, *etc.* Good for market and stock, Nov. to Feb. Large, round or oblate, conic, regular, greenish yellow, often blushed crimson or shaded with dull red, sprinkled with large grey dots, large specimens covered with whitish veined marks; basin deep, regular; eye large, open; cavity deep, regular, brown; stem short, stout; core medium, closed; seeds numerous, angular; flesh whitish, often greenish white, light, tender, juicy, very mild subacid or sweet, with little character. Tree vigorous, spreading, productive, not long-lived; shoots very stout, dark; leaves large.

Fall Pippin, *Pound Pippin*, *Pound Royal*, *York Pippin*, *etc.* Best for table, market and drying, Sept. to Dec. Large, handsome, globular, truncated, regular, smooth, rich yellow, frequently blushed at the North, with finer skin; dots minute, grey; basin deep, abrupt, regular, marked with concentric rings, which often crack open in large Southern specimens; eye large, open; cavity wide, regular, or narrow, deep; stem long; core large, regular, closed; seeds pointed, often imperfect; flesh yellow, breaking, compact, fine grained, acid, aromatic, delicious, becoming tender and mellow. Tree exceedingly vigorous, large, wide, branching, open head; not an early bearer; shoots stout, dark; leaves large, broad.

Fall Orange, *Holden Pippin*, *Orange*, *Red Cheek*, *White Graft.* Good for cooking in autumn. Large, roundish, pale yellow, sometimes with a dull red cheek, and sprinkled with brownish dots; stem short; cavity narrow, deep, slightly russeted; eye large, partially closed; basin deep, narrow; flesh white, tender, juicy, acid. Tree strong, erect, productive, hardy; young shoots smooth.

Fall Stripe, *Saxton.* Good to very good, Sept. Medium size, roundish, oblate, yellow, shaded, striped and splashed with light and dark red over the whole surface, having a few light and brown dots; stem short, small; cavity slightly russeted; eye closed; basin slightly corrugated; flesh yellowish, a little coarse, juicy, tender, subacid, slightly aromatic; core small. Tree has a handsome round head, is an early bearer and very productive on alternate years.

Fall Wine. Best for table, Sept. to Nov. Medium, oblate, handsome, inclined to crack open if left on the tree till ripe, very smooth, waxen yellow, almost completely covered with bright and often deep red, upon which it is indistinctly striped; numerous russet dots; basin abrupt, wide, regular or wavy; eye small, closed; calyx reflexed; cavity wide, regular, uniformly green; stem long, slender; core medium, regular, closed; seeds numerous, angular or plump; flesh yellow, breaking, tender, fine-grained, juicy, mild subacid, very aromatic. Tree of medium size, rather slender but healthy, spreading and annually productive.

Fall Winesap. Good, Oct. and Dec. Medium, roundish, yellowish green, with considerable blush in the sun; flesh white, fine-grained, tender, juicy, subacid. Tree clean grower, moderately spreading, somewhat drooping as it acquires age, productive and an early bearer.

Fameuse, *Snow.* Good for table and market, Oct. to Dec. Medium size, round, regular, pale waxen yellow, almost wholly covered with deep red, made up of stripes and splashes which become faint on the shaded portions; dots minute; basin medium, regular; eye very small, closed; cavity wide, wavy, green; stem short; core medium, heart-shaped; seeds numerous, pointed, rich brown; flesh snowy white, very tender, fine-grained, juicy, subacid, mild, delicately perfumed but not rich. Tree moderately vigorous, round-headed, hardy.

Garden Royal. Best for table, Aug. and Sept. Small, roundish, oblate, greenish yellow, shaded, striped and splashed with rich red, a little dull or greyish toward the stem, sprinkled with light and grey dots; stem slender; cavity deep, acute; basin shallow; flesh yellow, very tender, juicy, rich, mild subacid, aromatic; core small. Tree of moderate very upright growth, roundish, regular head, very productive.

Gilpin, *Carthouse*, *Little Romanite*, *Little Red Romanite*, *etc.* On account of the value of this apple for cider and for stock feeding, it has acquired in the West the sobriquet of "Dollars and Cents." Fruit medium size, round, truncated at the ends, large specimens often somewhat irregular, very smooth, deep red all over; stripes indistinct; dots minute and indented; basin wide, regular or folded; eye small, closed; cavity deep, acute, regular, brown; stem very short; core medium; seeds few, large, plump; flesh greenish yellow, firm, juicy, sweet, rich, but not good for the table except in the spring; bruises do not rot; valuable for its cider from the richness of the must. Tree remarkably vigorous, strongly branched, spreading, open, round head, very productive, bears early; shoots stout, dark; foliage rather scarce, somewhat curled and apparently covered with a bluish grey bloom.

Golden Pearmain. Very good for the table, Dec. to Feb. Medium size, roundish, conical, lopsided, truncated, yellow, blushed, russeted, orange in the sun; basin abrupt, wide, regular; eye large, open; cavity acute, regular; stem slender, short to medium; core somewhat open; seeds plump and imperfect; flesh yellow, breaking, fine-grained, acid, aromatic, sprightly. Other apples are described under this name. Tree vigorous but tardy and shy in bearing.

Golden Pippin, *York Pippin*, *Pound Royal*, *Mammoth*, etc. Very large, sometimes weighing 20 ounces, roundish, ribbed, greenish yellow, becoming quite yellow at full maturity, slight blush of brown crimson in sun-exposed specimens; flesh yellowish, coarse, juicy, tender, mild subacid; core small; good to very good, Nov. and Dec. Tree very productive and vigorous on deep, rich soil. Two other noteworthy apples are described under this name in the books.

Golden Russet. The variety of apple known under this name in the West, as well as under the name of Hunt Russet, English Golden Russet, New England Russet, we have described under the name of Hunt's Russet; but there is a Golden Russet of Western New York, quite distinct from the above, and is incorrectly called English Golden Russet by some at the West.

Golden Sweet, *Orange Sweeting*. Good to very good, for cooking and market, Aug. and Sept. Large, globular, regular, very smooth, waxen to rich yellow; dots scattered, indented, green; stem long, slender, yellow; cavity wide, regular; basin shallow, wide, regular; eye closed; calyx reflexed; core medium, regular, closed; seeds numerous, small, pointed, light brown; flesh yellow, breaking, fine-grained, juicy, very sweet, aromatic, like sassafras. Tree very robust, spreading, round head, early, productive; foliage large, dark.

Gravenstein. Best for cooking and market, Aug. and Sept. Large, slightly oblate, angular, smooth, yellow, partially covered with mixed and splashed scarlet; dots rare; basin medium, regular; eye small, closed; cavity deep, regular; stem short; core globular, closed, clasping the eye; seeds small, pointed; flesh yellow, fine-grained, breaking, juicy, subacid, aromatic. Tree spreading, vigorous and productive; leaves long, rolled, showing the white underside.

Green Cheese, *Green Crank*, *Southern Greening*, etc. Very good for table and market in Kentucky and Southwestern States, Dec. to Mar. Medium to large, somewhat flattened, conical, regular, green to yellow, sometimes bronzed; dots small, grey; basin medium, regular; eye medium, closed; cavity wide, acute, brown; stem medium, green, thick; core wide, closed, not clasping the eye; seeds numerous, plump, short, dark; flesh yellow, firm, fine-grained, juicy, subacid, aromatic, rich. Tree moderately thrifty; foliage small.

Green Newtown Pippin, *Newtown Pippin*, *Hunt's Fine Green Pippin*, etc. This is distinct from the common Newtown Pippin, which is yellow. Medium to large, globular, flattened, sometimes obscurely ribbed, smooth, green, becoming yellowish green when fully ripe, sometimes a little bronzed, and always showing white, irregular streaks near the base when first gathered; dots scattered, minute, dark; basin, shallow, folded; eye small, closed; cavity wide, wavy, brown; stem long, slender; seeds pointed, plump, dark; flesh greenish white, crisp, tender, acid, aromatic, rich, very agreeable. Best table and cooking, Dec. to March.

Grimes' Golden Pippin, *Grimes' Golden*. Very good to best, table and market, Dec. to Mar. Fair size, cylindrical, regular, yellow vein, russeted; dots numerous, minute; basin abrupt, folded; eye large, closed; cavity large, regular, green; stem long, curved; core small and pear-shaped; seeds numerous, plump, brown; flesh yellow, firm, breaking, very fine-grained, tender, juicy, subacid, aromatic, rich and refreshing. Tree healthy, spreading, productive, etc.; shoot stout, dark; foliage abundant, dark, green.

Grindstone, *American Pippin*. Good, keeping and market, April till June. Medium size, regular form, oblate, dull red in patches, and stripes on a dull green ground; flesh white, firm, juicy, with a somewhat brisk, acid flavor. Valuable only for its late keeping and for cider. Tree thrifty, spreading, with crooked shoots.

Haas. One of the hardiest apple-trees in Wisconsin. See Horse.

Hall, *Hall's Seedling*, *Hall's Red*. Almost best, table and market, South, Dec. to Apr. Small, round, slightly conical, regular, smooth, yellow, covered with bright red, mixed and striped; dots numerous, large, yellow; basin shallow, wavy, oblate, leather-cracked; eye small, closed; cavity wide, regular, brown; stem long, slender; core pear-shaped, regular, slightly open; seeds large; flesh yellow, tender, fine-grained, juicy, subacid, rich, agreeable. Tree medium size, thrifty, etc.; shoots long, rather slender, reddish.

Harrison. Good, cooking and dessert, in April, and cider. Small, round conical, somewhat angular and irregular, not smooth, yellow, rarely blushed, frequent rose-colored spots, and marks radiating from the cavity over the base of the fruit; dots small, distinct, grey; basin none, or very shallow, plaited; eye small, closed; stem long, red, knobby; core heart-shaped, closed; seeds numerous, small; flesh yellow, compact, dry till ripe, then juicy, acid, very rich, saccharine. Tree spreading, large, vigorous and productive.

Haskell Sweet. Very good to best, for table, Aug. to Oct. Large, flat, regular, green, bronzy; dots numerous, large, white; basin deep; eye small, closed; cavity deep, wavy; stem short; core closed; seeds numerous, plump; flesh yellow, juicy, sweet, rich.

Hawley. Aug. and Sept.; good, but soon decays. Large, oblate or slightly conic, waxy yellow, rather shaded or blushed, becomes greasy when kept; basin wide, wavy; cavity wide, sometimes folded; stem various; core closed; seeds generally imperfect; flesh yellowish white, very tender,

fine-grained, juicy, very pleasant, mild subacid, rich. Tree has a round, spreading head; shoots stout, olive.

Higby's Sweet, *Lady's Blush*, *Lady Cheek Sweet*. Good for cooking, Oct. Large, round, truncated, regular, smooth, greenish yellow, blushed; dots scattered, distinct, white and dark; basin abrupt, deep, wavy; eye medium, closed; cavity deep, acute, regular, brown; core small, heart-shaped, closed; flesh yellowish white, tender, fine-grained, juicy, very sweet. Tree an upright grower and early and good bearer; young shoots very short jointed with a few light specks.

High-top Sweet, *Sweet June*, *Summer Sweet*. Good, cooking and market, June to Aug. Small to medium, round, regular, smooth, greenish yellow; dots minute, black; basin medium, regular; eye small, closed; cavity deep, narrow; stem medium; core very small, oval; seeds numerous, angular, yellow; flesh white or greenish white, fine-grained, tender, sweet, juicy. Tree exceedingly productive and profitable.

Horse, *Summer Horse*, *Haas*, *Yellow Hoss*. Good, market and cooking, South, last of July and first of Aug. Large, round, somewhat conical, truncated, uneven, yellow, sometimes tinged with red and small patches of russet; dots scattering, indented, large, grey and greenish; basin abrupt, folded; eye medium, closed; cavity deep, acute, wavy, brown; stem medium to long; core large, somewhat open; seeds numerous, brown; flesh yellow, crisp, juicy, pleasant subacid. Tree an annual and abundant bearer; young wood, light reddish brown.

Hubbardston Nonsuch, *Hubbardston*, *Old-Town Pippin*. Very good, table and market, Oct. to Jan. Large, handsome, round, somewhat ovate, regular, uneven yellow, covered with mixed red and broken stripes, presenting a rich brownish appearance; dots scattered, grey, prominent; basin abrupt, wide, regular, leather-cracked or russeted, or both; eye medium or small, open; cavity wide, regular, brown; stem medium or short; core large, heart-shaped, regular, sometimes partially open; seeds few, pointed; flesh yellow, juicy, tender, fine-grained, crisp. Tree has all good qualities; leaves round; young shoots dull, greyish brown.

Hunt's Russet. Very good to best for table, Jan. to Apr. Small, roundish, oblate, yellow, mostly covered with thin, dull russet, with a blush of bright, rich red in the sun; cavity large, deep, acute; basin slightly corrugated; flesh yellowish white, fine-grained, tender, juicy, rich, brisk, subacid, slightly aromatic. Tree hardy, upright, spreading, an annual and good bearer.

Isham Sweet. A fine, large variety

Janneting: see Rawle's Janet.

Jersey Sweeting, *Jersey Sweet*. Very good, table and market, Aug. to Oct. Medium size, regular, globular-oblate, sometimes rather conical, smooth, yellow, nearly covered with red, mixed, striped and splashed carmine; dots minute; basin medium to wide, regular; eye small, generally closed; cavity wide, regular or wavy, rather deep; stem medium to long, green; core wide, regular, generally closed; seeds numerous, wide; flesh pale yellow, tender, fine-grained, juicy, very sweet and rich. Valuable also for baking and for feeding stock. Tree round-headed; shoots short, jointed and red; foliage abundant.

Jonathan. Best, dessert, cooking and market, Dec. to Jan. Medium size, round or oblong, conic, truncated, regular, smooth, waxy yellow ground but nearly covered with brilliant dark red, mixed and striped; dots minute, russet-veined; basin deep, regular; eye small, closed, green; cavity acute, deep, regular, reddish brown; stem long, slender; core medium, oval, closed; seeds numerous, large, angular; flesh whitish yellow, tender, breaking, very juicy, subacid, aromatic, equal to a Spitzenburg; a beautiful apple and should be in every orchard. Tree of slender growth, spreading, rather drooping, productive; shoots slender; buds small; foliage rather sparse, greyish.

Kentucky Sweet. Good to best, market, baking and stock, Nov. to Jan. Medium size, conic, smooth, deep red, stripes scarcely visible, the yellow ground rarely seen; dots scattered, large, yellow; basin narrow, leather-cracked; eye long, open; cavity acute, brown; core somewhat open; seeds numerous, large, imperfect, brown; flesh yellow, tender, fine-grained, juicy, very sweet, rich, slightly perfumed.

Keswick Codlin. Good, market and cooking, Aug. to Oct. Medium size, oblong, conical, truncated, ribbed, smooth, pale yellow; dots scattered, minute; basin medium, folded; eye medium to large, closed; cavity acute, regular, brown; stem long, yellow; core large, open; seeds numerous, angular; flesh greenish yellow, fine-grained, tender, juicy, acid. Tree an early bearer, hardy and productive; shoots branching in a peculiar manner, and are of a dark color.

King of Tompkins County, *King*, *Tommy Red*. Best, table, cooking and market, winter. Large, handsome, globular, irregular, angular, smooth yellow ground, covered with deep red, marbled and striped; dots numerous, grey, large; basin shallow, folded; eye large, short, closed; cavity wide, shallow, wavy; stem various, red; core very large, closed; seeds imperfect, angular; flesh yellowish white, tender, crisp, subacid, aromatic. Tree an abundant annual bearer; shoots very downy.

Klaproth. Good, table and market, Aug. to Oct. Medium size, regular, oblate, dull yellow, more or less covered with red stripes; dots numerous, light; basin wide, regular; eye closed, small;

cavity deep, regular, brown; stem short to medium; flesh white, crisp, tender, juicy, acid. Tree has all the good qualities; shoots a greyish brown.

Lady, *Api*, etc. Good for ornament, dessert and market. Very small, flat, regular, smooth, polished, pale waxen-yellow ground, nearly covered with bright carmine; a beautiful apple; basin rather abrupt; cavity acute; stem short; core wide, closed; seeds numerous; flesh white, crisp, tender and juicy, mild subacid. Dec. to Mar. Tree of medium size, very close and upright, healthy and productive; shoots very dark; foliage small, crowded, curled and very dark.

Lady's Sweeting, *Lady's Sweet*. Good to best, table, baking, market and stock feeding, Dec. to May. Large, round, somewhat conic, occasionally angular, smooth, light yellow, striped and splashed with red; dots distinct, large, grey; basin medium, often abrupt, folded; eye very small, closed; cavity medium or wide, regular, brown; stem various; core medium size, otherwise various; seeds angular and 16 in number; flesh white, crisp, fine-grained, juicy, sweet, agreeable. Tree thrifty and productive.

Large Bough, *Large Yellow Bough*, *Early Sweet Bough*, *Sweet Harvest*. Good to best, for table and market, July and Aug. Rather large, round, conic, regular, very light, smooth, white or pale yellow, dots few, minute, dark, indented; basin shallow, regular; eye small, closed; cavity deep, regular, sometimes brown; core regular, nearly closed; seeds medium, dark; flesh white, very soft, light, juicy, very sweet when ripe, somewhat bitter when green, rather flavorless when cooked, but too sweet for pies and sauce. Tree has a compact head and is rather productive; young shoots greyish brown, very slightly downy.

Late Strawberry, *Autumn Strawberry*. Best, table and market, Sept. to Dec. Medium size, roundish, conical, angular, furrowed, smooth waxen yellow, mixed and striped scarlet; dots minute, indented; basin folded, irregular; eye closed; cavity acute, wavy, irregular; stem slender, long; core medium, closed; seeds large; flesh yellow, very tender, fine-grained, very juicy, subacid, aromatic, vinous, refreshing. Tree upright, thrifty, etc.

Limber Twig. Good or very good, dessert and cooking, Jan. to April. Small, roundish, conic, rather smooth, mixed, dull purplish red on green ground, stripes scarcely to be traced; dots numerous, large, irregular, brown; eye small, open; cavity deep, brown; stem curved; core rather large, turbinate, closed; seeds numerous, small, plump, long; flesh greenish yellow, firm, subacid, rich, aromatic. Keeps very well in the ground, but wilts if exposed to the air. Tree thrifty and exceedingly productive; shoots slender and drooping with the heavy crops.

Lowell, *Greasy or Tallow Pippin*, *Queen Anne*, *Michigan Golden*, etc. Very good, market and cooking, Aug. to Oct. Large, round, slightly conic, truncated, regular, smooth, waxy yellow, not blushed or bronzed, becoming greasy when kept in-doors; dots numerous, green; basin deep, abrupt, regular; eye medium, closed; cavity medium, regular, green; stem long, slender; core medium, oval, closed; seeds numerous, angular, pointed, pale; flesh yellow, tender, fine-grained, juicy, subacid, aromatic.

McIntosh's Red is a new good variety.

McLellan. Very good, table, Dec. to March. Medium size or above, roundish, regular, fair, yellow, mostly striped, marbled and splashed with red; stem short; cavity deep; calyx nearly closed; basin moderate, slightly uneven; flesh white, very tender, juicy, with a fine vinous flavor, almost sugary. Tree handsome and good otherwise. Not much raised in the West.

Maiden's Blush. Very good, table, cooking and market, Aug. to Oct. Medium size to large, regular, flat, smooth, polished, pale waxen yellow blushed with bright carmine, and is a very handsome apple; dots minute; basin shallow, regular or wavy; eye small, closed; cavity wide, wavy; stem medium to short; core closed; seeds numerous, brown; flesh white, crisp, fine-grained, juicy, acid, aromatic. In drying it retains a very light color. Tree has all the good qualities.

Melon, *Watermelon*. Very good, table, cooking and market, Nov. to March. Large, oblate, somewhat conical, angular, smooth, waxen yellow, nearly covered with marbled and mixed scarlet, striped distinctly with darker shade; dots minute; basin wide; eye open; cavity deep, acute, wavy, green and brown; core heart-shaped, wide, partially open; seeds numerous, angular; flesh yellow, fine grained, tender, juicy, subacid, aromatic, rich. Tree round-headed, spreading, vigorous.

Michigan Golden. This is treated by Dr. Warder as a distinct variety from the Lowell, although his description is about the same. In quality he gives it as nearly best, and extends its season for use to November.

Monmouth Pippin, *Red Cheek*. Very good, cooking and market, Dec. to March. Rather large, handsome, roundish or flattened, regular, smooth, greenish yellow, blushed and marbled; dots minute, green; basin shallow, regular; eye large, closed; cavity wide, regular or wavy, brown; stem short, thick; core medium, closed; seeds numerous, pointed, brown; flesh white, crisp, fine-grained, juicy, acid. Tree of moderate, upright growth; young shoots dark olive.

Milam. Good as dessert, Dec. to March. Small, smooth, yellow, covered with marbled-red indistinct stripes; dots small, grey, scattered,

prominent; basin narrow, wavy, leather-cracked; cavity acute, brown; stem long; core ovate, closed; seeds numerous, some imperfect; flesh white, tender, crisp, juicy, mild subacid or sweet; agreeable and refreshing. Tree round-headed, twiggy; foliage rather dark; shoots reddish; annually productive and an early bearer.

Minkler, *Brandywine*. Good, market and cooking, Jan. to May. Medium to large, globular, smooth, greenish yellow, covered with mixed red and stripes of dark, dull red; dots scattered, minute, yellow; basin wide; cavity acute, brown; core large, closed; seeds numerous, long, pointed; flesh yellow or greenish yellow, fine-grained, breaking, juicy, subacid. Tree thrifty, spreading; branches strong. The Brandywine found at Quincy, Ill., is probably a distinct apple.

Montebello. Very good, Sept. to Nov. Above medium, oblate, pale yellow, shaded and mottled with light red, striped and splashed with dark rich red over the whole surface, and a few large, light dots; stem very short, small; cavity large, russeted; eye small, nearly closed; basin large, deep, smooth; core small or medium, and very short; flesh quite white, fine, sometimes a little stained next to the skin, very tender, juicy, mild subacid, vinous. Tree upright, hardy, healthy, an early bearer, very productive annually.

Mother. Best, table, Oct. to Jan. Medium size, oblong, regular, smooth, shaded red on yellow, with close, fine stripes of red; dots minute; basin regular or plaited; eye long, small, closed; seeds numerous; flesh yellow, crisp, very fine-grained, juicy, sweet, very rich, vinous, aromatic. Tree rather slender but productive.

Mountain Sweet. Good to very good, table and cooking, Dec. A rival of Broadwell or Lady's Sweeting. Large, beautiful, but too delicate for transportation, oblate, smooth, light yellow; dots minute; basin wide, wavy; eye small, closed; cavity deep, wavy; stem short, slender; core wide, open, dark; seeds numerous, pointed; flesh white, crisp, very tender, fine-grained, juicy, sweet.

Newtown Pippin. See Green and Yellow Newtown Pippin.

Newtown Spitzenburg, *Vandevere*, *Spiced Ox-Eye*, etc. Best, table, cooking and market, Oct. to Feb. Medium size to large, regular, globular-oblate, often lop-sided, scabby and defective on old trees and falls badly, smooth, deep red, mixed and striped, on rich, yellow ground, often overspread with whitish, giving the fruit a grey appearance; dots numerous, minute; fawn color on dark specimens; basin medium, regular; eye small, closed; cavity regular, medium, brown; stem short; core regular, wide, somewhat open; seeds numerous, angular; flesh rich, yellow, very fine-grained, very tender, juicy, rich subacid and saccharine, aromatic, and eminently satisfying. Tree not very large, compact, round head, productive; foliage rather small, curled, showing the white underneath.

Nickajack, *Summerour*, *Jackson Red*, *Big Hili*, *Carolina Spice*, *Cheatan Pippin*, *Red Warrior*, *World's Wonder*, *Missouri Red*, and many other names. Good, market and keeper, Dec. to May. Rather Southern, large, nearly round, not handsome, even but not smooth, mostly covered with brick-dust red, striped indistinctly with dark red, some stripes very distinct; dots scattered, yellow; basin shallow, even; eye small, closed; cavity acute, regular, yellow and brown; stem slender; core closed; seeds numerous, large; flesh greenish yellow, crisp, firm, coarse, subacid, not rich. Tree robust, spreading, large, very productive; shoots stout and red.

Northern Spy. Very good to best, Dec. to June. Table, cooking and market. Large, flattened, conical, angular, smooth, yellow, mixed and splashed scarlet or crimson; dots scattered, small; basin abrupt, regular or folded; eye small, closed; cavity wide, regular or wavy brown; stem medium to short; core large, irregular, open; seeds numerous, small, pointed, pale; flesh yellowish, white, crisp, granular, juicy, acid, aromatic, rich, with the spiciness of a Spitzenburg. Tree vigorous, large, upright, and when older, spreading and very productive; needs much trimming; shoots reddish; leaves, healthy, large, dark.

Ohio Nonpareil, *Myer's Nonpareil*, *Western Beauty*. Very good to best, table and market, Sept. to Dec. Large to very large, regular, oblate, smooth, yellow, covered with bright red, very handsome; dots scattered, grey; basin wide, regular; eye large, closed; cavity deep, regular; stem short, small; core somewhat open; seeds numerous; flesh yellowish, tender, fine-grained, juicy, subacid, rich. Tree healthy, etc., limbs straight, stout, compact.

Peach Pond Sweet. Very good, table, cooking and market, Sept. to Nov. Small to medium, round, oblate, five-angled, slightly conical, smooth, pale yellow, lightly covered with mixed and striped red, beautifully splashed crimson; basin narrow or folded; eye small, closed; cavity deep, acute, brown; stem medium to long, green, sometimes knobby; core regular, heart-shaped, closed; seeds small, short; flesh yellow, tender, fine-grained, juicy, very sweet. Tree spreading; shoots dull, grayish brown.

Peck's Pleasant. Very good, to best, table, cooking and market, Nov. to March. Large, flattened, globular, somewhat angular, sometimes having a shallow furrow on one side, smooth, yellow or orange, sometimes faintly blushed; dots grey with white basis; basin rather shallow and folded; eye small and open; cavity wide but often lipped brown; stem short, very thick and knobby;

core large, closed; seeds numerous, angular; flesh yellow, tender, crisp, fine-grained, subacid, somewhat aromatic. Tree spreading moderately, vigorous, and a regular bearer.

Penock, Red Ox, Large or Big Romanite. Poor, Nov. to March. Very large, form variable, but generally roundish; often unequal and lopsided, greenish yellow, covered with mixed and striped red; dots large, irregular and grey; basin wide, deep, uneven; eye open; cavity wide, deep; stem short; seeds numerous, angular; flesh yellow, breaking, coarse grain, subacid; very much disposed to bitter rot. Tree large, spreading, very productive, bearing annually.

Perry Russet. Very good, table and cooking, Nov. to Jan. Medium to large, oblate, regular, smooth, yellow, covered with fine russet; dots minute, scattered; basin medium, wavy; eye large, closed; cavity regular or wavy brown; stem medium; core small, closed; seeds few; flesh yellow, fine-grained, juicy, acid, rich. Tree a moderate, upright, spreading grower, hardy, an early and abundant bearer; young shoots light brownish red.

Pomme Grise, Gray Apple. Good to best, for dessert and market, Dec. to March. Small, roundish, oblate, regular, even, not quite smooth, yellow, overspread with fine russet, rarely blushed; basin wide, sometimes abrupt; eye very small, closed; cavity wide; stem short or medium; core heart-shaped, full, regular, closed; seeds plump, angular; flesh firm, yellow, crisp, fine-grained, juicy, subacid, rich, aromatic, delicious. Tree good; shoots slender.

Primate, Rough and Ready, Sour Harvest, July Apple, etc. Very good to best, table, Aug. to Oct. Fair size, globular, angular, irregular, smooth, greenish yellow, becoming almost white, sometimes faintly blushed; basin abrupt, folded; eye small, long, closed; cavity acute, wavy green; stem medium to long, thick; core closed; seeds numerous, angular, long, dark; flesh greenish white, very tender, fine-grained, mild subacid, agreeable. Tree stocky and productive; shoots stout, short, light olive; buds prominent; foliage pale green.

Porter. Very good to best, table and market, Aug. to Oct. Rather large, oblong, somewhat conic, often truncated, smooth, yellow, often faintly blushed; dots few, sunken; basin abrupt, folded; eye large, closed; cavity acute, wavy brown; core closed; seeds numerous; flesh yellowish white, crisp, tender, juicy, acid. An Eastern apple.

Pewaukee. Good, Jan. to May. Medium to large, roundish, oblate, bright yellow, striped, splashed and mottled with light and dark red over most of the surface, covered with a thin greyish bloom; dots both large and small, numerous; stem short, small; cavity small; eye closed; basin slightly corrugated; flesh white, crisp, a little coarse, half tender, juicy, subacid, slightly aromatic; core small. Tree strong, upright, spreading, an annual bearer, and Wisconsin is its home.

Pryor's Red, Big Hill. Very good, or best, table, cooking and market, South and Southwest, Dec. to Mar. Large, globular, oblate, often unequal, greenish or dull, red striped, russeted; dots numerous, large, grey; basin shallow, regular or plaited, leather-cracked; eye small, closed; cavity shallow, acute, often lipped; core regular, closed; seeds numerous, angular, pointed; flesh yellow, tender, melting, fine-grained, juicy, subacid, rich. Tree large, twiggy, productive when old; shoots slender, reddish, olive, speckled; foliage scattering, folded, greyish green, subject to blight.

Plumb's Cider. Sept to Jan. Medium size, roundish, slightly conic, greenish yellow, shaded and rather obscurely striped and splashed with dull red; some light dots; stem short, small; cavity small; eye small, closed; basin small, corrugated; flesh whitish, half fine, tender, juicy, mild subacid; core small. The tree is round-headed, an early bearer, and very productive alternate years. It is one of the most profitable apples in Wisconsin.

Quince, or *Cole's Quince.* Very good, Oct. to Dec. Medium to large, brownish, oblate, yellow, rarely with a blush, somewhat broadly ribbed; stem short; cavity open, deep; eye closed; basin large, deep, uneven; flesh yellowish white, crisp, tender, a little coarse, with a brisk, pleasant subacid, quince aroma; core large. Young wood, a clear, rich reddish brown, with short, abrupt, prominent buds.

Ramsdell's Sweet, Ramsdell's Red, Red Pumpkin Sweet, English Sweet, etc. Very good, cooking and for stock, Sept. to Feb. Medium to large, oblong, regular truncated, smooth, yellow, ground hidden by bright or dark red, mixed and striped; dots numerous, fawn-colored, and covered with a bluish bloom; basin deep, abrupt, wavy; eye small, closed; cavity deep, wavy; stem medium to long, often red; core large, closed; seeds large; flesh yellow, crisp, juicy, very sweet and rich. Tree upright, many branches, an early bearer; shoots slender, reddish; foliage light green.

Rambo, Romanite, Bread and Cheese, Seek-no-further, etc. Best, dessert, cooking and market, Oct. to Dec. Small to medium, regular, oblate, sometimes unequal when overgrown; large specimens appear truncate, striped and splashed, scarlet on greenish yellow, in some the stripes coalesce; dots numerous, small, prominent, rich bloom; basin wide, abrupt, regular or plaited, sometimes quite shallow; eye small, closed; cavity wide, always green; core closed; seeds numerous, large, angular; flesh greenish white, tender, crisp, granular, juicy, subacid, aromatic, vinous. Tree upright,

thrifty, productive; shoots dark; foliage large, light green.

Rawle's Janet, Missouri Jannetting, Red Never-Fail, Rock Rimmon, etc. Good to very good, table, market, keeper and cider, Southwest, Feb. to June. Medium size, flattened, conic, regular, smooth, mixed and striped crimson on yellow and green; dots many, small; eye small, closed; cavity deep and brown; stem long, curved; core heart-shaped, closed; seeds many; flesh yellowish, crisp, fine-grained, juicy, subacid, vinous, refreshing. Tree thrifty, not large, spreading; twigs brownish; foliage rather whitish; blossoms late. Grows and matures in Missouri far better than anywhere else.

Red Astrachan. First-rate, market and table, July and Aug. Medium to large, regular, oblate, smooth, mottled, marbled and striped crimson on greenish yellow; dots minute, with heavy bloom; basin regular; eye small, closed; cavity shallow; stem long, yellow; core closed; seeds angular, small, dark; flesh yellow, crisp, juicy, sour, not rich. Tree vigorous and productive; shoots reddish brown; foliage large, rich green.

Red Canada, Steele's Red. Best table and market, Dec. to May. Medium size, globular, conic, indistinctly angular, smooth, yellow, covered with mixed and striped bright red; dots numerous, grey, indented, elongated near the stem; basin shallow, folded; eye small, closed; cavity wide, acute, wavy; stem long, inclined; core large, closed; seeds imperfect; flesh yellowish white, crisp, tender, fine-grained, juicy, subacid, aromatic, delicious. Tree slender, twiggy, but healthy and productive; young wood brownish olive.

Red Queening, Red Queen, Crimson Queening, etc. Good in the West, Dec. to March. Medium size, conical, mostly covered with deep crimson; flesh white, with a red tinge under the skin; tender, juicy, sweet, aromatic.

Rhode Island Greening. Almost best, cooking and market, Oct. to March. Large, globular, sometimes flattish, smooth in the North, somewhat rough and often quite russeted in the South, a dull green becoming yellow at maturity; dots grey, irregular, numerous; basin somewhat russeted; eye small to medium, closed; cavity wide; stem medium to long, curved, often reddish; flesh very yellow, crisp, tender, juicy, rich, acid; seeds numerous, angular, dark. Tree very vigorous, crooked, spreading, productive; shoots stout, dark; foliage dark.

Ribston Pippin. An extra good apple in England; good in Maine and Canada. Cooking and market, Nov. to Feb. Medium to large, round, truncated, rough, splashed and mixed dull on yellow; prominent russet dots, small but numerous; basin abrupt, russeted; eye small, closed; cavity acute, wide, brown; stem slender; core closed; seeds numerous, angular, imperfect; flesh yellow, crisp, firm, juicy, acid, rich, aromatic.

Rice's Sweet is a good apple for the West.

Roman Stem. Good to very good, dessert, Nov. to March. Medium size, globular, smooth, yellow, often blushed; dots minute, reddish or dark; basin shallow, wavy, russet; eye small, closed; cavity acute, lipped; stem long; core large, hollow, heart-shaped; seeds numerous; flesh yellowish white, fine-grained, juicy, mild subacid, rich. Tree productive, spreading irregular; moderately vigorous.

Rome Beauty, Gillet's Seedling. Good, Oct. to Feb. Market, large, regular, fair, handsome, roundish, oblate, sometimes rather conical, smooth, pale yellow, striped, mixed, bright red; dots minute, indented; basin wide, deep; eye very small; cavity wide, wavy, green; stem long, slender; core wide, closed; seeds numerous, long, pointed; flesh yellow, breaking, coarse grained, subacid, not rich. Tree hardy, round-headed, very productive; shoots slender or red; foliage healthy; blossoms late.

Roxbury Russet, Boston, Putnam, etc., *Russet.* Good to very good, Nov. to June. Table and market. Medium size, sometimes large, roundish, a little flattened, dull green, but when ripe covered with brownish yellow, russet, sometimes with a faint blush on one side; stem slender, curved; cavity pointed; basin regular, or wavy, green, often folded; core closed; seeds numerous, angular, imperfect; flesh greenish yellow, breaking, granular, often coarse, juicy, decidedly acid. Tree robust, spreading; shoots stout, straggling, dark; foliage greyish-green.

Salome. Best, dessert and cooking, in the spring. Uniform, large, fair size, and cling tightly to the tree; flesh juicy, a peculiar subacid, slightly spicy flavor; color yellow, nearly overspread with red. The tree is an early and abundant bearer, producing annually; leaves very thick and stout. Originated by E. C. Hatheway, of Ottawa, Ill.

Seek-no-Further. The apple which, by this name, flourishes in the Northwestern States, is the Westfield Seek-no-Further; which see.

Smith's Cider, Smith's, Pennsylvania Cider. Good for cooking and cider Dec. to Mar. Medium to large, round, flat to elongated, sometimes lopsided, smooth, pale yellow covered with mixed light red, splashed indistinctly with bright carmine, beautiful; dots indistinct, rather large, light grey; basin shallow, often plaited; cavity acute, brown; stem variable; core wide, pear-shaped, open; seeds numerous, pointed; flesh white, breaking, juicy, acid, aromatic, peculiar, not rich. Tree vigorous, etc., and an early bearer; limbs straggling; shoots slender, light olive; foliage large, light green.

Sops of Wine. Good for dessert, Aug. and Sept. Small to medium, round, slightly conic, regular, smooth, mixed red, shaded dark red

throughout; dots small, yellow; basin shallow, plaited; cavity somewhat wavy; stem long, red; core distinctly marked with a red line, wide, oval, closed; seeds numerous, brown; flesh yellow, fine-grained, tender, juicy, acid, agreeable. Tree spreading, productive, upright.

Stanard, Stanard's Seedling. Good, market and table, Nov. to Mar. Large, roundish, ribbed, angular, smooth, yellowish green, somewhat red, mixed and striped indistinctly; dots numerous, minute, white; basin folded; eye large, closed; cavity wide, acute, wavy, green; core small, closed; seeds numerous, brown, angular; flesh yellow, breaking, rather coarse, tender, acid, rich. Tree spreading, generally crooked; buds large. Becoming a popular apple in the West.

St. Lawrence. Good to very good, Sept. and Oct. Large, oblate, yellowish, striped and splashed carmine; cavity large; basin small, deep; flesh white, lightly stained, crisp, juicy, tender, vinous. Tree vigorous, upright, productive; young shoots smooth.

Striped Winter Pearmain, Large Striped Winter Pearmain, Striped Sweet Pippin. Very good, market, cooking, table, Oct. to Feb. Large, round, flattened, regular, fair, handsome, smooth, mixed, splashed and striped pale purplish red on yellow; dots minute, indented, grey, so that the fruit has a general grey appearance; basin regular, sometimes cracked; eye small, closed; cavity wide, wavy brown; stem various; core open; seeds numerous, large, angular, some imperfect; flesh yellow, breaking, coarse-grained, juicy, subacid. Tree spreading, thrifty, productive; shoots rather slender, dark; foliage dark green.

Summer Pippin, Sour Bough, Large Golden Pippin, etc. Good, cooking and market, Aug. and Sept. Medium to large, variable in form, pale waxen yellow shaded with a delicate crimson blush and sprinkled with green and greyish dots; stem variable; cavity deep, abrupt; basin deep, abrupt, folded; eye closed; flesh white, tender, moderately juicy, subacid, refreshing. Tree has a beautiful head and is a good bearer.

Summer Queen. First-rate, cooking and market, July to Sept. Medium-sized, round, conic, angular, yellow covered with mixed red, striped, splashed scarlet; dots minute, yellow; basin none or very shallow, folded or plaited; eye medium, closed; cavity wide, brown; stem long, slender; core open; seeds numerous; flesh firm, yellow, breaking, acid, aromatic. Tree large, spreading, productive and vigorous.

Summer Rose. Very good or best, June to Aug.; dessert, cooking. Small, roundish, flattened, polished, very pale yellow striped and splashed distinctly with bright red and carmine; basin abrupt, wide; cavity regular; core large, closed; seeds numerous, short; flesh white, crisp, fine-grained, juicy, subacid, not rich, but agreeable; ripens gradually. Tree spreading, productive, and early bearer; shoots stout; foliage large, with bluish mealy luster.

Swaar. Very good to best, Dec. to Mar.; dessert and cooking. Large, variable form but generally roundish, somewhat flattened on the sides as well as vertically; not smooth; greenish yellow bronzed, becoming a dead golden yellow when ripe; dots large, numerous; basin medium, wide; eye small, not long, closed; cavity wide, regular or wavy green; stem long, curved, stout; core heart-shaped, closed; seeds numerous, angular, pale; flesh very heavy (whence its name, Swaar, which is Dutch for heavy), yellow, fine-grained, very mild subacid or sweet, very rich. Tree spreading, vigorous and productive; shoots stout, dark; foliage large, curled.

Sweet June. See High-top Sweet.

Sweet Romanite. Good to very good, baking, cider, table and stock, Dec. to Apr. Medium size, round, sometimes flattened, smooth, greenish yellow, blushed, mixed bright red and dull red, stripes indistinct; cavity deep, wavy, brown; stem medium to long, green; seeds numerous, angular; flesh yellow, fine-grained, breaking, juicy, very sweet; core small. Tree strong, upright, a moderate bearer.

Tetofsky, Tetofski. Good, cooking and market, June to July. Small to medium, round, flattened, somewhat conic, angular, smooth, yellow striped, splashed carmine, white bloom; basin shallow, folded; eye large, closed; cavity wide, wavy or deep, acute; stem short, yellow; core large, closed; seeds numerous, brown; flesh yellowish white, breaking, fine-grained, juicy, acid. Tree upright, hardy and productive; leaves broad, pale or light green.

Tewkesbury Winter Blush. Good, table, market, and keeping, from Jan. to July. Has more juice and flavor than any other long-keeping variety. Small, regular, flat, smooth, yellow blushed; flesh yellow, breaking, juicy, well-flavored. Tree has all the good qualities.

Trenton Early. Very good, dessert and cooking, Aug. and Sept. Large, conical, angular, smooth, very pale yellow or white; dots rare, minute; basin narrow, folded; eye small, closed; cavity wide, regular, brown; core large, rather open; seeds numerous, angular; flesh white, very tender, juicy, subacid, pleasant. Tree an abundant bearer, hardy, etc.

Talman's Sweet, Tallman's Sweet, or Sweeting, or Tolman's Sweet, etc. Good, market and cooking and stock, Nov. to Apr. Medium to large, nearly round, somewhat flattened, smooth, yellow; dots minute, dark; frequently a distinct line on one side from stem to eye; basin wide, leather-cracked; eye small, closed; cavity wide; stem

DUCHESS OF OLDENBURG.

BEN DAVIS.

NORTHERN SPY.

long; core heart-shaped, closed; seeds numerous, dark; flesh yellow, breaking, firm, very sweet, rich. Tree upright, spreading, hardy and productive.

Triumph. Good, dessert and baking, in spring. Uniformly above medium size, regular, smooth, pale yellow, mostly covered with rather a dull red; flesh rich, subacid. Tree a seedling originated by J. W. Ridings, of Grundy county, Illinois.

Twenty Ounce, *Twenty Ounce Pippin*, *Cayuga Red Streak*, etc. Good, cooking and market, Oct. to Jan. Large, roundish, flat, greenish, more or less mottled and striped dull red; basin wide; eye open; cavity wide, green; stem short, thick; core large, closed; seeds numerous, large, angular; flesh yellowish white, breaking, acid, with a peculiar aroma not agreeable. Tree has a compact, neat head, bears regular crops, and the fruit is fair, handsome and showy.

Utter is a popular apple in some parts of the Northwest, the tree being hardy and a regular bearer. The fruit, which is best in early winter, is medium-sized to large, oblate, lemon-yellow ground, mottled, shaded and striped with light red; small russet dots; stem short and slender; basin open, furrowed; flesh white, tender, juicy, mild, pleasant subacid.

Wagener. Good, market, dessert and cooking, Nov. to Feb. Large, oblate, five-angled, very smooth, yellow, well covered with mixed bright red stripes not distinct; dots scattered, yellow; basin wide, abrupt; cavity brown; stem green; core heart-shaped, closed, wide; seeds numerous, large, angular; flesh yellowish white, tender, fine-grained, juicy, mild subacid. Tree a very early bearer, productive, etc., requires thinning.

Walbridge. See Edgar Redstreak.

Warfield. Good, Aug. to Nov., cooking. Medium size, roundish, oblate, light waxen-yellow, with a blush in the sun, moderately sprinkled with grey dots; stem slender; cavity slightly russeted; eye large, open; flesh whitish, moderately juicy, mild subacid; core small. Tree hardy, an early and abundant bearer. Originated in Muscatine, Iowa, and introduced by Suel Foster, of that place.

Wealthy. Very good, Dec. to Feb. Medium, oblate, whitish-yellow ground, shaded with deep crimson in the sun, obscure broken stripes, mottlings in the shade, sometimes entirely covered with crimson; many light dots; stem short to medium, slender; cavity green russet; basin deep, abrupt, uneven; flesh white, fine-grained, stained with red, tender, juicy, lively, vinous, subacid; core small; Tree hardy, vigorous, etc. Originated only about 20 years ago.

Westfield Seek-no-further, or simply *Seek-no-further.* Good to best, table and market, Oct. to Feb. Medium size, roundish, conic, smooth, dull red mixed and striped on yellow, in the North clear bright red; dots scattered, large, yellow; leather-cracked and russeted about the apex; basin shallow, leather-cracked; eye closed or open; cavity pointed, brown; stem long; core closed; seeds numerous, small, pointed; flesh yellowish white, tender, breaking, very mild subacid, aromatic, satisfying, not high-flavored or spicy. Tree vigorous, etc.

White, or *Canada Pippin.* Good, cooking and market, Dec. to March. Large, variable in form, angular, sometimes lopsided, generally fair and free from scab, smooth, green or greenish white to pale yellow when ripe; toward the base it is often marked, when unripe, with indistinct wavy stripes of white; the inter-spaces are sometimes colored by exposure and assume a dark or purplish hue, making the fruit appear to be striped; dots minute, and surrounded by green bases, which are most distinct just before the fruit is perfectly ripe; basin deep, abrupt, wavy or folded; eye small, closed; cavity wide, deep, wavy, brown and green; stem short, sometimes thick; core small, pear-shaped, closed; seeds numerous, angular, pale brown; flesh white, or yellowish white, breaking, granular, juicy, acid, not spicy; rather poor keeper. Tree remarkably thrifty; shoots dark, downy, bearing large leaves which are very downy beneath and deep green above.

Williams' Favorite, *Early* or *Red.* Good, market, July and Aug. Small, round, smooth, dark purplish red, indistinctly striped; dots none; basin abrupt, folded; cavity wide; stem long, slender; core large, closed; seeds pointed, brown; flesh whitish yellow, streaked red, breaking, not juicy, subacid, peculiar. Downing seems to describe a different apple under this name, saying that it is large and handsome and good for dessert, and that the tree is an abundant bearer.

White Winter Pearmain. Good to best, dessert, cooking, market, Dec. to March. Medium size to large, handsome when fair, but often scabby on rich limestone soils and on old trees, conical, sometimes obscurely angular, smooth, yellow, often bronzy; dots scattered, small, dark; basin abrupt, regular or shallow and folded; eye medium, closed; cavity acute, wavy, brown; stem medium to long, often knobby and clubbed; core closed; seeds few, pale or yellow; flesh yellow, fine-grained, tender, crisp, juicy, mild subacid, very rich. Tree spreading, productive, the bark often marked by a kind of canker or crack; foliage large, rather light green.

Willis Sweet. Good for all purposes, Aug. and Sept. Medium size, round, somewhat angular, striped red, very sweet and rich; flesh whitish, juicy, tender; core large.

Willow Twig, *Willow*, *James River.* Good, market and keeper, Dec. to April. Globular, trun-

cated, somewhat oblong, medium size, light yellow, shaded and marbled with dull red, and sprinkled with numerous russet dots; basin wide, abrupt, plaited; stem long, slender, inclined; core round, closed; seeds numerous, brown; flesh greenish yellow, breaking, juicy, acid. Tree very vigorous, productive, etc., twiggy, thorny while young; shoots slender, olive brown.

Wine, Hay's Winter, Pennsylvania Red-streak. Good, cooking and market, Oct. to March. Large, globular-oblate, flattened or truncate, regular, sometimes unequal and lop-sided, smooth, yellow, more or less covered with broken stripes of red, splashed with crimson; dots scattered, large, grey; basin shallow, wide, abrupt; cavity acute, brown; flesh yellow, firm, breaking, juicy, acid, rich. Tree very large and handsome, spreading and very open head; leaves small, curled, mealy.

Winesap. Very good, cider, cooking, market. Medium size, conical, often obscurely angular or slightly ribbed, smooth, bright or dark red, mixed and obscurely striped on yellow, which is mostly covered, often veined russet; dots few, minute, indented; basin narrow, shallow, plaited; cavity wide, reddish brown; core somewhat open; seeds large, rather light; flesh firm, yellow, rich, acid. Tree vigorous, etc., an early bearer; branches open, straggling; foliage curled, bluish-mealy, sparse.

Winter Sweet Paradise. Very good, dessert, Nov. to March. Rather large, roundish-oblate, dull green when picked, with a brownish blush, becoming a little paler; stem short, often russeted; basin deep, slightly folded; flesh white, fine-grained, juicy, sweet, sprightly; core small. Tree hardy, etc., but not an early bearer; young shoots reddish grey.

Worthen Winter Sweet. This is a new apple, introduced by A. H. Worthen, Jr., near Warsaw, Ill., and bids for the highest public favor. The fruit has a very delicate color, and is beautiful. It is above the average size, of fine flavor, yellow, and keeps well.

Wythe. Good, Jan. to March. Medium size, oblate, slightly conic, nearly regular, white, shaded, striped and splashed over more than half the surface with bright red and a few light and grey dots; stem short, small; cavity large, deep; basin slightly plaited; flesh whitish, fine, tender, juicy, sprightly, subacid, slightly aromatic; core medium. Tree has round head, blooms rather late, bears good crops annually, of fruit of uniform size, which keeps well. This tree originated at Wythe, Ill., and is hardy and vigorous.

Yellow Bellflower, Belle Fleur, Lady Washington. Very good to best, dessert, cooking and market, Dec. to April. Large to very large, ovate, oblong, angular, ribbed, smooth, rich yellow, sometimes blushed; dots scattered, grey; basin plaited; cavity deep, wavy; stem long, curved; core large, oval, open; seeds dark, large, angular, imperfect; flesh yellow, breaking, fine-grained, juicy, acid to subacid, aromatic, very rich and satisfying. Tree vigorous, etc., spreading, drooping; twigs slender, brown; foliage abundant, long, wavy; blossoms very large and not protected by the leaves.

Yellow Newtown Pippin, Yellow Newtown. Best, dessert, cooking, market and cider, Feb. to May. Large, round, cylindrical, truncated, lop-sided, ribbed, sometimes even conic, smooth, yellowish green, sometimes bronzy, becoming yellow when ripe; marked with grey stripes near the base while green; dots minute, scattered, whitish bases; calyx open; basin large, folded, ribbed or plaited; cavity deep, brown; stem medium or short; core oval, closed; flesh yellow, firm, breaking, juicy, not crisp, acid, aromatic, rich, very agreeable. Tree of slow growth, not an early bearer, but large, spreading and productive.

SIBERIAN APPLE, called also Siberian Crab-apples, or simply "Crabs." This is a beautiful fruit and comparatively easy to raise, the principles of propagation and culture being the same as for the standard apple above treated, but it is more hardy. Some varieties are unequaled for preservation in different styles for dessert, and some are excellent for eating uncooked. They have the fine aroma of the wild crab, without the "crab"-bedness, and nothing can take their place. Some Siberians, under favorable circumstances, grow to the average size of standard apples.

VARIETIES. *Brier's Sweet* is a valuable Siberian apple, well adapted to Northern Illinois and Wisconsin; fruit as large as the Transcendent; shape like the Bailey Sweet; pale yellow, beautifully penciled and splashed with carmine; flesh yellowish, crisp, juicy, very sweet and rich. Tree vigorous and productive. This variety originated with B. B. Brier, of Baraboo, Wisconsin, and was the result of a fertilization of the Siberian crab with the Bailey apple.

Fay's Joe is a good crab-apple for the Northwest.

Hyslop. Good for cooking and for cider. Large, produced in clusters, roundish ovate, dark, rich red, covered with a thick blue bloom; stem long, slender; flesh yellowish, subacid. Tree hardy, of strong growth, and rather spreading; young wood light colored and a little downy.

Lake Winter. One of the best in Wisconsin. Size medium to large, pale yellow, smooth, mostly covered with bright blush or stripes; cavity small; calyx closed in a shallow basin; core and seeds small; flesh fine-grained, firm, juicy, subacid, becoming nearly sweet in spring, entirely free from the crab taste; excellent for cooking and eating, from October to March. Tree a beautiful grower.

Milton. Also one of the best for the Northwest, but on rich lands has an irregular growth and tendency to blight.

Soulard. Very good, Oct. to Nov. Medium to large, oblate, obscurely ribbed, whitish, shaded, striped and splashed with light and dark bright red over most of the surface, with a few light and brown dots; stem small; cavity quite large, slight russet; basin corrugated.

Transcendent. This is one of the best of early autumn varieties. Fruit medium to large, roundish oblong, slightly but regularly ribbed, golden yellow, with a rich crimson-red cheek in the sun, covered with a delicate white bloom; stem long and slender, set in a deep cavity; eye closed; flesh creamy yellow, crisp, subacid, a little astringent until mellow, when it is pleasant and agreeable.

Whitney's No. 20 is a seedling raised and disseminated by A. R. Whitney, of Franklin Grove, Ill. The tree is symmetrical, and the fruit fully up to the Transcendent in size. For jellies the native crab is considered the best.

To GRIND apples for cider and vinegar making on a large scale, there is manufactured a horse-power machine, represented by the annexed cut, which, with either one or two horses, does the work more thoroughly than any other machine we have examined. Many farmers lose about a quarter of the apple-juice, that would be saved by more perfect grinding. The price of this machine is only $25. Of course it can be run by any horse or steam power a man may have on his premises.

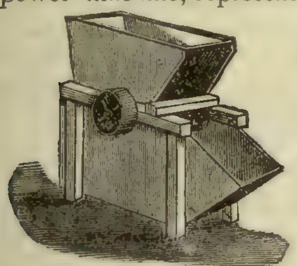


FIG. 20. *Apple Grater.*

Apples, to CAN and DRY: see Canning and Drying.

Apple Pomace, ground apples from which the juice has been expressed, generally by a cider-mill. The pomace of ripe apples, after the cider is extracted, is valuable for almost any kind of jam. It is not as desirable for milch cows as for other kinds of stock, as it tends to make fat rather than milk. After cattle become accustomed to it, two pecks a day to each animal should be given. The same amount given to a horse, if he is not worked too hard, will fatten him. Pigs will readily eat it, and it appears to do them good. It is also good for poultry. If boiled and mixed with meal, it is readily eaten, and is quite as good if not better than potatoes. If spread in the hen-yard, the hens will pick out all of the seeds, which are really the most valuable portion of it. Sheep are very fond of it. In commencing to feed to any animal, only small quantities should be given at first, gradually increasing to the amount believed to be sufficient. Pomace spread several inches deep on a poor, gravelly hill, will bring in a good crop of clover the second year. And finally, when dried, it makes a hot fire. It is often used in steam cider-mills for fuel under the boilers. Whatever is intended for feeding purposes should not be left out in the sun and rain, to sour and decay, but should be housed and kept as sweet as possible. In hot weather it is very difficult to keep it, but when cool weather comes it can be kept for some weeks without fermenting enough to injure it. During warm weather it should be fed out directly from the press, unless it is spread and dried. Every farmer who carries his apples to mill to grind for cider, should secure the privilege of carrying home, as wanted, as much pomace as his apples make, or as much as he has stock to consume; for the real value of the pomace is much more than the cider, if the apples are ripe.

Apple Butter, a sauce made of apples stewed down in cider. To make it, fill a preserving pan with peeled, quartered and cored apples; add cloves, allspice and cinnamon,—not too much; cover with good cider and boil slowly, mashing with a wooden spoon, until the whole becomes a dark brown jam, with no more juice than suffices to keep it soft and buttery.

Apple Jelly: see Jellies.

Apples, TO PICKLE. First, wipe the skins smoothly, trim, and force the core out with a corer; put them in a deep dish, and steam them a little (not very soft); at the same time have ready the pickle, of which allow to one quart of good vinegar a cup of brown sugar, a tablespoonful of ground cinnamon, one teaspoonful of cloves (more if liked); simmer about five minutes, and pour over the fruit, hot. They may need scalding. For sweet apples, to eight pounds of fruit take three pounds of sugar and one quart of vinegar and one pound of raisins. This makes splendid sauce with either dried or green apples.

Apples, TO BAKE. Most apples are good for baking, the acid sorts disintegrating into a fine pulp and broken skin, and the sweet shrinking down under a more leathery skin, forming a fig or raisin-like mass, with more or less of the juice expressed and evaporated down into a kind of molasses. Milk and cream can be used at the same meal with sweet apples, either raw or cooked, but with the acid apples milk coagulates or sours in such a way as to disagree with delicate stomachs: indeed, it is not perfectly healthful for any stomach. Baking is the most simple process of cooking apples, nothing special being required except to put in the pan just enough water to prevent burning. Acid apples should be watched and taken

from the oven as soon as done (soft to the core), but sweet apples can remain in the oven an indefinite length of time, if the heat be not great enough to burn them. A very easily prepared as well as palatable pudding is made by covering a pie-plate with quarters of apples, then over this a crust of biscuit dough; bake and eat with sweetened cream or pudding sauce.

Some apples are better BOILED than baked. A very excellent and ornamental dish can be prepared in this way: Pare and core, without breaking or splitting open, some small-sized, tender and juicy tart apples. Boil them very gently, with one lemon or one orange for every six apples, till a straw will pass clear through them easily. Make sirup, while the apples are cooking, of half a pound of pure white sugar for each pound of fruit. When the sirup is ready, take the apples up, unbroken, with the lemons or oranges, and put into the sirup. Boil gently till the apples look clear. Again take up the fruit carefully, unbroken, and place close together in a dish. Then put an ounce or more of clarified isinglass to the sirup, and let it boil up. Lay a slice of lemon or orange on each apple, and pour the sirup over them. This is a pretty dish and also very good.

To FRY apples, take nice, tart specimens, slice the round way of apple, in rather thick slices, then roll them in flour and sugar mixed together; have a pan ready with melted butter, lay your apples in, cover tight, fry to a nice brown; be careful and not mash them up, and do not be stingy with your butter. Another method: Take juicy, thin-skinned, and not very sour apples. Slice them, leaving the skin on and put them to fry in some suitable dish in which you have a little melted butter. Add a very little water as often as proves necessary to keep them from scorching. Stir them quite often and when nearly done add a little salt and a spoonful of sugar, if you choose.

For other modes of serving apples, see **Fritters**, Marmalade, Sauces, Brandy and Wine.

Apricot (a′pri-cot). This is a very handsome and delicious dessert fruit for preserving in sugar or brandy, for jellies or pastries, for drying for winter use, and in some countries good liquor is made from it. The fruit ripens between the cherry and plum seasons. The propagation is by budding on plum stock in July. It is a favorite tree in the older countries for training on walls or espaliers, and a western or northern exposure is the most favorable. The pruning and general management of its cultivation are about the same as of the peach: especially its limbs should be shortened in. The apricot is not subject to diseases, but the curculio works on it a great deal, for the treatment of which see under Plum.

VARIETIES. *Breda.* Small, pale red in the shade, reddish purple in the sun; flesh orange color, juicy, rich, with a pleasant flavor; kernel sweet; ripens the last of July and first of August.

Early Golden. Dubois' Early Golden. Small, roundish oval, pale orange; flesh yellow, moderately rich and sweet. Tree vigorous with long slender branches; middle of July.

Large Early, Gros, Precoce, St. Jean. Large, orange, with a red cheek, sweet and rich; parts readily from the stone. Tree vigorous and productive, ripening its fruit about the first of August.

Moorpark, Anson's Dunmore, etc. One of the largest and finest apricots; yellow, with a red cheek; flesh orange, sweet, juicy and rich; parts from the stone; kernel bitter. Tree very productive, ripening the fruit early in August.

Purple or *Black.* Small, pale red, purple in the sun; flesh yellow, juicy, and pleasant. Tree has slender, dark shoots, and small, oval, glossy foliage; tree hardy as a plum; fruit ripens in August.

Aquarium (a-qua′ri-um), a glass tank of water for keeping live fish on exhibition. Goldfish, sticklebacks and minnows are among the easiest kept in fresh-water aquaria. The water must be pure and constantly renewed, having in it no organic decaying substance. Growing plants and healthy mollusks, as periwinkles, are indispensable. With all these, the favorite food of the fish should be given regularly. Success, however, in keeping an aquarium depends upon a skillful knowledge of details too numerous to describe here.

Arbitration, the settlement of controversies by referring the question in dispute to other parties and without recourse to law. The custom is, each party chooses a person, and these two choose a third, called an "umpire," who decides points upon which the arbiters disagree. This method of settling difficulties is simple, honorable and inexpensive, and has been urged by all moralists from time immemorial. From the fact that it is so little resorted to we infer that in most cases of litigation vengeance is the thing sought for rather than indemnity. It is well known, too, that most parties to a difficulty do not wish to have the trouble of securing arbitration, unless the decision is promptly executed by the one found in the wrong. Law is a means employed to *enforce* the fulfilling of contracts, which arbitration generally fails to do. Again, we know it is difficult for the parties in a controversy to procure the services of neighbors as arbiters, and it seems at first, in each case, that to obtain arbiters from a distance would cost more than a lawsuit. Furthermore, a lawsuit may be an "amicable" one, and of the nature of an arbitration. But with all these considerations, every one in his sober moments recommends arbitration, in cases where it will apply. The "grange" encourages it, the Bible commands it, and every code provides for it.

Arboriculture, the culture of forest trees: See Forestry.

Arboretum (ar-bo-re′-tum), a place in a park, nursery, etc,, in which a collection of classified trees are cultivated.

Architecture: See Residence, Barn, Ice-House, Dairy, Privy, etc.

Area (a′-re-a), extent of surface. To measure areas, see Measurements.

Argand Lamp, one that has a cylindrical wick and a tall, narrow chimney, This form gives a little better light than any other.

Army Worm: See under Wheat.

Arrow-Root, starchy food from the roots of several plants of tropical America. The Jamaica and Bermuda brands are the best in market. It constitutes a favorite diet for invalids, and is prepared as follows: Wet a teaspoonful of the root in a little cold water, with half a teaspoonful of salt; pour on it half a pint of boiling water, stirring it very fast; then set it where it will just boil up for a minute; sweeten it, and add milk, if allowed. For a drink make it very thin and add lemon juice and sugar: See also Blanc Mange, Gruel and Jelly.

Arsenic (ar′-se-nic) and its preparations, as Paris green, ratsbane, Fowler's solution, etc., when taken in improper doses, produce pain and heat in the stomach, vomiting, burning dryness in the throat, and great thirst. The matter thrown up is generally colored green, yellow or brownish, and sometimes it is bloody. Diarrhœa or dysentery ensues, pulse becomes small, rapid and irregular. The breathing becomes much oppressed, and cramps and convulsions often precede death. Remedy: Give promptly a warm-water emetic, or use stomach-pumps, or do both; then give hydrate of peroxide of iron, recently prepared, in quantity about thirty times greater than the poison which has been swallowed. In the absence of this hydrate, or while it is being prepared, give large drafts of new milk and raw eggs, or lime-water and oil, or melted oil, or magnesia or chalk in a large quantity of water, or even flour and water. The iron antidote can be in the form of a perchloride of iron dissolved with carbonate of soda, both of which are obtainable at the drug stores.

Artesian Well: See Well. Artesian water is not necessarily pure water; indeed it is generally mineral.

Artichoke, Globe. Of this plant, the undeveloped flower-cluster, which resembles a huge thistle-head, is the part eaten, being served with drawn butter. The plants are propagated first by seeds, sown in a hot-bed in March, and planted out at distances of two to three feet. To protect it through the winter, draw the leaves together and earth up around them, and cover the tops with litter. The time to cut the heads for use is immediately before the appearance of the blossom, just when the center of the head begins to open. It is not a very substantial article of diet.

Artichoke, Jerusalem. This is a plant of the sunflower family, bearing tubers on its roots, like potatoes on their subterranean stems, like which it is also cultivated. It is a poor article of diet for man, but good for hogs. Sometimes it is pickled, or cut up in vinegar and used as cucumber, or even boiled for eating by those who may like a sweetish, watery potato. It is as easy to raise as any common weed.

Asafetida, the dried resinous juice of the root of an Asiatic plant. Its effects on the system are stimulant, anti-spasmodic, expectorant and feebly laxative, and is much used in cases of hysteria, hypochondria, convulsions of various kinds, spasms of the stomach or bowels unconnected with inflammation, and in numerous other nervous disorders of a merely functional character, in whooping-cough, asthma, catarrh, croup, measles, etc. Medium dose, ten grains.

Ash, a valuable forest tree: See Forestry.

Ashery, a place where ashes are deposited; also, a place where potash is made. The cellar is a good place to deposit ashes. In putting wood ashes into barrels or boxes, remember that live coals from some kinds of wood, as the black-jack oak, will sometimes remain alive for weeks, when buried in ashes, and may set things afire.

Ashes. It is impossible to tell with any degree of certainty what the effects of a given manure will be on a given soil or crop. The kind of soil or its mechanical construction, the climate, season, mode of cultivation, and the value of the manure, all may have an influence in determining the result. The chief value of wood ashes consists in supplying the soil with mineral constituents, and in their action as solvents upon other insoluble salts already in the soil; also by neutralizing acids, and improving the mechanical condition of the soil. Barnyard manure is chiefly composed of water and organic matter, as woody fiber, starch, gum, sugar, gluten and albumen in vegetables, and in animals the flesh, milk, butter, cheese, etc. The character and fertility of the soil depend very greatly on the nature and quantity of the organic matter it contains; yet while inorganic matter forms by far the smaller portion, this portion is absolutely essential to the production of useful plants. No seed can be produced without it; and the absence of a single element may render the soil unfertile or entirely barren. Competent authorities have estimated the

annual exhaustion of salts by crops of grain, roots and grass at from 180 to 260 pounds per acre; and as ashes (of plants) consist of these elements, they furnish one of the most needful manures for the soil.

While ashes are beneficial to almost every soil, they are much more so to those that are sandy and gravelly than on clay, because the latter, being formed mainly from granite rocks, naturally contain potash.

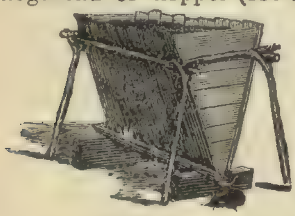
In applying ashes to the soil they should be hauled out and spread over the ground previous to plowing. It has been the custom with some farmers, and may be yet, to apply them to corn on the surface, for the double purpose of obtaining the benefit of their fertilizing properties, and as a protection against grub worms. But that method is open to the objection that the plant can thus receive no benefit save from the small amount that is soluble and carried into the soil by rain. If they are incorporated into the earth previous to planting the corn, the roots of the plant and chemical action will evolve other elements which become assimilable and enhance the growth of the plant.

Ashes that have lain out of doors for some time may have parted with some of their useful properties, but they are still beneficial. They will not act as rapidly, probably, as when fresh, but their effects will hardly fail of being beneficial. Light soils do not require as heavy an application of ashes as rich clays. On the former, from fifteen to twenty bushels per acre is not too much; and double the quantily may be applied to the latter. Horace Greeley said he would apply a thousand bushels to the acre if he could get them.

Coal ashes are of no use to a sandy, loamy, or gravelly soil, but in a hard or stiff clay they serve to loosen up the soil, that it may be better aerated and saturated with manure.

Wood ashes, when carried fresh out of the house, should never be deposited in barrels or boxes near any building. Certain kinds of live coals, especially those from the black oaks, are decidedly tenacious of igniting power, and often surprise the most suspecting in setting buildings afire.

Ashes, to Leach. Put them in a large box, hogshead or hopper (see engraving), with straw or fine brush, or both, lining the receptacle all around and underneath the ashes. Place the box or hogshead on an elevated and inclined platform, so arranged as to collect all the lye into one vessel, which should be of iron; pour in enough water to fully saturate the ashes, but without starting the drain, and let them soak a day or two; then add water regularly and keep the drain going until the strength of the ashes is sufficiently exhausted.



Ash-hopper.

Asp, or **Aspen**, a well-known small tree, called also "quaking asp," and "poplar," characterized by its trembling leaves and light, white, soft wood, which readily decays.

Asparagus. This is the most healthful and palatable "greens" which the market affords, and, being early, is most welcome. As only the green portion of the sprouts is tender enough to eat, asparagus should be raised in the sun, and in an unmulched bed. Sow the seed in a bed late in the fall or in early spring, as soon as the ground can be worked. Sow in drills one foot apart, covering the seed about one inch deep. Thin the plants when up to three inches in the row. When one or two years old, remove the roots to a permanent bed, which should be of deep, rich, mellow soil, not too wet and cold. Here the old method is to trench the ground about two feet deep, filling up with well-rotted manure, "seasoned" with a little salt. Set the roots six to eight inches apart. The new method is to set them two or three feet apart, in soil prepared as for corn or potatoes, without deep trenching. Set them so the crown will be three or four inches below the surface of the ground. With the "field" method, in autumn they are to be plowed right over the crowns, as represented by Fig. 1, good stable manure filled in, and then the plants are covered with the plow, as shown in Fig. 2. The old method is to put the manure over the unplowed bed in the autumn and fork it in in the spring, taking great care not to injure the roots. Do not let the seed ripen, as that exhausts the roots too much for the production of large sprouts. Be patient, and the second or third year after transplanting there will be an abundance of shoots to cut. In cutting, be careful to avoid injuring the new shoots, and cover the cut stubs with soil. Cease cutting for the season as soon as the earliest peas are ripe. When the asparagus beetle

Fig. 1.—*Asparagus Roots, Uncovered.*

Fig. 2.—*Asparagus Roots, Covered.*

is troublesome, let young chickens upon them by cooping up the mother on the beds.

VARIETIES. The standard variety is Conover's Colossal; but a new variety, called the Defiance, promises to supersede it. Other varieties are Van Sicklen's Colossal, Grayson's Giant, Largest Ulm, Lesher's Mammoth, and the New Giant. The latter has purple sprouts.

ASPARAGUS, TO COOK. This vegetable should be dressed as soon as possible after cutting, although it may be kept a day or two by putting the cut ends in water. Throw away all the hard and stringy portions (the whitest parts), tie the selected parts into small bunches, and boil them in a very little water about 20 minutes, adding a very little salt. The tougher portions can be boiled separately, a longer time. Take off the strings, put in a covered dish and pour drawn butter over it. Keep the heads all one way. A little saleratus will preserve its green color. Often served on buttered toast. The asparagus water can be made into a soup or gravy by thickening with flour or sweet cream.

ASPARAGUS OMELET is made by chopping very fine some of the vegetable which has been steamed until tender, and mixing it with the yolks of five and the whites of three well-beaten eggs and two tablespoonfuls of sweet cream. Fry, and serve hot.

Asphalt, mineral pitch, or compact native bitumen. Asphalt composition for walks may be made thus: Take 2 parts very dry lime rubbish and 1 part coal ashes, also very dry, and both sifted fine. In a dry place and on a dry day, mix them, and leave a hole in the middle of the heap; into this pour boiling-hot coal tar; mix, and when stiff as mortar lay it down 3 inches deep for the walk, on dry ground beaten smooth. Sprinkle over it coarse sand. When cold pass a light roller over it, and in a few days the walk will be solid and waterproof.

Asphyxia (as-fix'i-a), apparent death from suffocation. "Asphyxiated," to be in a state of asphyxia.

Ass. This animal, although the butt of popular humor and the target for arrows of scorn and invective, has not a bad temper when properly treated, and his usefulness is beyond question. The wild ass abounds both in Asia and Africa, and in some localities attains a large size. Bell noticed a wild animal of this species which he believed to be the origin of the domestic ass. It was of silver-gray color, with a broad, coffee-colored stripe. The domestic varieties of Western Asia are of a superior character. Some from Gozo Island, in the Mediterranean, attained the height of 14 hands. Three or four domestic breeds of Syria are treated with great care, and ladies are accustomed to ride on them. A domestic kind in India are not much larger than good-sized dogs. But the best is the Arabian ass, which is the finest in the world. They carry the head elevated, have fine and well-formed legs, which they throw out gracefully in walking or galloping. An improved and costly domestic breed, used principally in Kentucky and the Western States, for the production of strong, active and high-priced mules, is the Maltese variety. The best member of this breed stands 15 hands high. It is the practice to cross them with the Spanish and Southern French breeds. The first Maltese ass brought to this country was presented to Washington by Lafayette in 1787.

The ass, when properly trained, is docile, sagacious and susceptible of strong attachment to his master. Even under injudicious training he long resists the effects of unkindness, and bears brutal treatment with firmness and courage. As a feeder the ass is the most economical in domestic use. He will maintain himself on much less than would be necessary for the horse; and as to quality, when nothing better is at hand, he will subsist on thistles, weeds, briars, or any other vegetation that he can obtain. But the ass is very particular about what he drinks; he will taste of nothing but the purest water. He requires but little care, and is seldom sick. After a hard day's journey he will lie down on a hard road, and rise in the morning refreshed and good-humored. He matures early, and can be trained or lightly worked at two years of age. The female breeds at three years old, and will give milk often for years after the foal has been taken from her. This trait is often taken advantage of by keepers, by continuing the impression that the foal is present. This is done by preserving the skin of the foal, and occasionally throwing it over another foal, and allowing the mother to smell of it. The milk of the female is very nutritious and is used by sick people. The skin of both jack and jenny is equally hard and elastic, and is used for parchment, drum-heads and other special purposes. Jacks in this country are mostly used for breeding to mares for the production of mules. For the reason that the jack controls the quality of the mule much more than the mother, care should be taken to select the best jacks. Good specimens, however, are difficult to find, the best being found in Kentucky. For further facts in relation to breeding from jacks see articles on the Horse and Mule.

Assimilation, of food, the conversion of nutriment into living tissue. No article of food, however "nutritious," is of any value unless it is not only "digested," but "assimilated." Many persons eat much and yet are lean and weak, because some morbid condition of the system prevents the vital conversion of the chyme, or extracted nutriment, into real muscle, bone, etc.

Assets, cash or property belonging to persons or corporations which possesses a definite value.

Assurance, often used in the sense of Insurance, which see.

Asthma, a distressing affection that generally attacks persons in the night time, soon after retiring. The first symptom is a want of breath and a tightness across the chest. The respiration is laborious, and accompanied with a wheezing noise, that can be heard over the whole house. The disease is often accompanied with a want of breath that gives the lips and face a purple color, as if the patient was strangled; it rarely, if ever, proves fatal. Treatment—*Regular:* The best remedy is to produce vomiting. A teaspoonful of powdered alum in molasses is an effectual emetic; sirup of squills, in teaspoonful doses every half hour, will generally procure relief. Goose oil is very good to relieve the wheezing; smoking tobacco alleviates the complaint, but never cures it. Hive sirup (Cox's) is of great value; take a teaspoonful every two hours until the breathing is relieved. In the moist asthma, such things as promote expectoration must be used. In the dry asthma, anti-spasmodics and bracing medicines are most proper. The patient may take a teaspoonful of paregoric, twice a day or so, or a teaspoonful of Peruvian bark in powder, in a wineglass of milk, before eating, once a day. *Homeopathic:* Of 10 pellets of aconite in a tumblerful of water, take a tablespoonful every half hour during the attack; or of arsenic, ipecacuanha or veratum in the same way; or of nux vomica, 1 drop every 6 hours. *Eclectic* and *Botanical:* To promote expectoration, and to relieve tightness, give every 15 or 20 minutes a teaspoonful of the decoction of lobelia. To vomit, give half or two-thirds of a wineglassful, which may be repeated, if it does not operate in thirty minutes or so, drinking plentifully, during the operation, of some warming tea, pennyroyal, etc. *Hygienic:* Hot compresses to the throat and chest and sips of hot water until expectoration takes place or the distressing symptoms subside; tonic rubbing of the same parts in the morning before breakfast, with warm hands dipped in cold water; omit the third meal of the day, or at least let it be mostly of fluid food; and never let the body be chilled, or the feet get cold. Live out of doors as much as possible.

Astringent (as-trin'gent), a drug that causes organic contraction, as illustrated by the change of hide into leather. In medicine the leading astringents are tannic acid, gallic acid, galls, oak bark, catechu, kino, logwood, geranium, blackberry root, uva-ursi, creosote, alum, lead, copper, zinc, permanganate of potassa, chlorinated soda, etc. Some practitioners use cold water and ice as substitutes for astringents, externally applied. Among articles of food the most astringent are blackberries, raspberries, pie-plant or rhubarb, acorns, etc., and among the drinks tea takes the lead.

Atrophy (at'ro-fy), a wasting away from defect of nourishment. See Assimilation, Leanness and Marasmus.

Attorney, a person appointed by another to act in his stead, in legal proceedings. A "power of attorney" is the writing giving such authority.

Auction, public sale to the highest or lowest responsible bidder. The auctioneer is the crier, who makes the sale. He is bound by instructions. If price is limited he cannot sell below that price. If the owner does not wish an article sold below a certain price, that price must be announced before the article is cried; it is called the "owner's bid," and there can be but one such bid on any given article. Nothing can be honorably reserved which has been advertised to be sold. The auctioneer cannot buy at his own sale, nor can he bind an administrator or executors by warranty. Printed terms of sale cannot be varied by parol statements of auctioneer. Only the owner in person or some person specially authorized can do so. When real estate is sold, contract must be in writing, and the terms and sale made by the auctioneer must be signed by the person selling. When personal property is sold a delivery is sufficient; but in sales of personal property the thing sold must be present and delivered in whole or in part. If the purchaser does not comply with the terms of sale, the seller may tender the property and sue for the price; or the property may, after tender and refusal to pay, be again sold at auction, and the purchaser at first sale be compelled to pay the difference, if any, between the first and second sales. Generally the auctioneer is considered the agent of both parties, and entries and signatures by him as such are sufficient to bind the parties. Unless he discloses the name of the owner he will be considered owner. The purchaser is not required to accept property when the auctioneer refuses to give the owner's name, or when the title is found to be defective. An auctioneer is liable only for gross negligence or ignorance. But if he exceeds his instructions he is personally liable to any party injured. Fraud used by him to effect a sale renders the sale void.

Award, the decision of arbitrators in a disputed transaction.

Awn, the bristle or beard of wheat, oats, barley and the grasses.

Ax. As to the quality of an ax, very little is left to the judgment of the purchaser, as he generally finds it safe to trust the hardware merchant. But more attention should be given to the care of this

most useful of all farm implements than is usually bestowed upon it. Labor and vexation are in a great degree prevented, instead of being multiplied; by keeping at least one ax on the premises in good order, and in some regular place where one can lay his hands on it immediately in case of emergencies. An ax, however, will never be kept sharp unless there is also at hand a good grindstone, kept in order. Many persons give themselvs much unnecessary trouble by a reckless use of the ax—striking it into nails, stones, and other hard substances in wood or in the ground. One careless stroke often makes hours of trouble in repairing a gap in the edge of the tool, or in endeavoring to use the ax with the gap in it. While a thick-edged ax throws chips well, a thin-edged one is far preferable for rapid chopping. The older axes, which are kept for rougher purposes, as cutting things in the ground, driving stakes, spikes, etc., may be permitted to retain a thick edge. It never pays to try to do much cutting of clear timber with a thick-edged ax.

Every farmer should know how to make an ax-handle and put in one. Those sold at the stores are generally turned, and are therefore very easy to split. The best method is to take a piece of the white part, or sap, of any kind of hickory, cut it nearly into shape while green, and then let it thoroughly season, when it can be finished with a drawing-knife on a shaving-horse, and scraped with the edges of broken glass. To finish the handle when the wood is green will result in failure, as seasoning will crack and split it all over. Take the handle of some ax that suits you for a pattern, from which an outline can be drawn on the timber to be used.

To get an old handle out of an ax-poll, the usual process in the country is to drive the poll into moist earth up to the eye, and burn out the wood with a little fire of chips and litter; or, as some do, by burning out the old handle with such a fire, while keeping a wet cloth on the edge, without driving into the ground. Heating the edge will soften it, unless it is case-hardened by a process which requires a little more skill than most persons have.

The only proper way to fasten a new handle into an ax-head is to drive the handle through until the rough end project a half inch or more, split that end in the middle from edge to edge and not from side to side, and drive in tightly a long, thin, neatly-made wedge of hard wood; then saw off the surplus to just within one-eighth of an inch from the ax-head.

Axis, the central line of a body around which it revolves, as from pole to pole of the earth, and form journal to journal of a wheel.

Axle-Tree and Axle-Grease: See Wagon.

B

BABBITT Metal, a soft alloy of copper, zinc and tin, used for the bearings of journals, etc., to diminish the friction. It takes its name from the inventor. It may also be made of copper, tin and antimony, in the proportion of one-twelfth each of copper and antimony, and ten-twelfths of tin. A metal said to be cheaper than Babbitt metal, at 12 cents a pound, is the following: Six pounds of lead and one of antimony. Melt the antimony and then add the lead. Old type from printing-offices is often used for journal boxes, sometimes doctored up a little with alloys, as the case demands.

Back. For a weak back, bathe the part frequently with alcohol and beef's gall, or with neat's-foot oil in which berries of the red cedar have been boiled by gentle simmering. For a sprain in the muscles of the back, rub on, before a hot fire, an ointment made of Canada turpentine ½ ounce, soap liniment six ounces, and laudanum one drachm. For a "sprain" more internal, or "stitch," take absolute rest; take night and morning 15 or 20 drops of the balsam of copaiba. If the part is inflamed, apply cold-water cloths. Keep the bowels open by gentle aperients. *Hyg.:* Horizontal position constantly, warm compresses 15 to 30 minutes twice a day, and hand-rubbing twice a day.

PAIN. A pain in the back may be a symptom of any one of a great number of diseases, and the application of hot cloths and friction to the part is the only safe thing to do until a physician is consulted, how oft soever the doctor himself may mistake the case. There may be some disease of the kidneys, liver, urinary or uterine system, of a serious nature, with which it would not do to experiment or "tamper." When it is known that the trouble is in the muscles of the back, every one has his favorite liniment. Sitting in cold chairs, riding across a very cold wind for several hours, and severe lifting with a side or twisting draft, are all dangerous to the back. Often one exposes his back to rheumatic and kindred affections when asleep, by turning over in such a manner as to leave the sweating surface uncovered; or the night dress (shirt or gown) may be one of that objectionable kind which is open in the back and difficult to be kept buttoned close.

Back-furrow, to throw the earth from two plow furrows together, or toward the central line of the plowed land.

Backing, the backward motion of a draft-horse, by command of his driver. To teach a horse to practice this motion with promptitude and steadiness is an important part of his training. But backing also means the restive or vicious backward motion of a horse, in circumstances where he ought to move forward. Some horses practice this trick only in starting, and others practice it on almost any sort of occasion; some acquire it by some act or process of bad breaking, such as painful adjustment of the collar, pulling up hill, or sudden starting, and some appear to practice it from laziness, caprice or bad temper. Some may readily be cured of it by adroit management, gentle whipping, or the placing of strong obstacles in the way of backing, and others can scarcely or but temporarily be cured by such strong remedies as assigning them the middle place of an agricultural team of three or the near-wheeled place of a stage-coach yoke of four, where they will be dragged along by their companions till they find a forward draught much easier than a backing resistance. Backing in this second sense is also called *gibbing*. But backing in the third sense means the backing or first motion of a colt, or teaching him to receive and endure a rider. No person ought to attempt this who has not a considerable knowledge of the disposition and tricks of young horses, and some experimental acquaintance with the methods of controlling them.

Bacon, hog's flesh pickled and dried, usually by smoking. The most common way of converting pork into bacon is first to salt it thoroughly, usually by pickling. In England they have a long process of rubbing on the salt and letting it become absorbed, and repeating the application several times. Bacon can be smoked in a barrel or hogshead, nails being driven in the staves inside, on which to hang the pieces of meat, or poles put through holes in the staves near the top, by which the meat can be suspended. The meat should be cut in pieces, not too large for convenience and thorough curing. Smoke should be made with corn-cobs or clean, sweet woods. The fire should never be allowed to spring into a blaze; and if, perchance, it does, it should be extinguished as soon

as possible; for the heat in the barrel or smoke-house will start the fat and damage the meat. The smoking should be done steadily and gradually, so that the curing will be perfect. Most good farmers have a smoke-house, with all necessary conveniences for smoking bacon and other meats. In the South, where it is difficult to preserve meats fresh, bacon is an important article of diet, the smoke-house being always supplied with the Southern staple meat.

Breakfast bacon is made by taking one-half the side of the belly, and curing it in sweet pickle the same as hams. The remaining half may be cured in dry salt, and, when smoked, will be choice bacon; or it may be cut in pieces five or six inches square, and cured in regular mess-pork pickle, making the best of family mess pork.

The Kentucky method is as follows: Leave the meat in a strong brine for seven or eight weeks, then wash in lukewarm water and dry. When dry roll it in a mixture of equal parts of pepper and saltpeter, rubbing it thoroughly with the hand. Hang it in the smoke-house under a slow fire, only partially smoking it. In the spring, before the flies come, paint the meat with New Orleans molasses; then smoke thoroughly. For further information about smoking pork see "Hams."

A method of making bacon without the tedious process of smoking is this: As soon as the meat is salted to your taste, which will generally be in about five weeks, take it out, and, if any of it has been covered with brine, let it drain a little. Then take good black pepper, finely ground, and dust on the flesh side, and on the hock end, as much as will stick; then hang it up in a good, clean, dry, airy place; if all this is done as it should be, you will have no farther trouble with it, for by fly time in the spring your bacon is so well cured or dried on the outside that flies or bugs will not disturb it.

If bacon is carefully put up, according to the above directions, the bacon beetle will not infest it; otherwise, there is no good remedy against the pest.

Bacon, to Cook. Frying is the simplest and most usual method of preparing bacon for the table, but is too often overdone. Five to ten minutes of frying heat is sufficient. Very few persons boil this article, but when it is determined upon the following advice is given: If very salt, soak it in soft water two hours before cooking. Put it into a saucepan with plenty of water and let it boil gently. If a fine piece of gammon bacon, it may, when done, have the skin, as in hams, stripped off, and have finely-powdered bread-raspings strewed over it. For a piece of two or three pounds, boil an hour and a half. To steam bacon, scrape the outer rind or skin well, wash the bacon, put it in a steamer over a pot of boiling water, and steam it at the rate of 20 minutes to the pound. Serve it with veal or fowls, or by itself with greens. In steaming bacon no waste then takes place as to quantity, and the flavor is quite preserved, while the bacon is much more tender, as it cannot well be spoiled by too quick boiling.

Bacon with Carrots. Melt in a stewpan three ounces of butter, and mix with it one ounce of flour; stir for five minutes. Now add a gill of boiling stock or water, stirring with a wooden spoon. Add half a pound of ham or bacon, cut into half-inch dice, with a little pepper (and, perhaps, a little salt, but this will depend on the saltness of the ham or bacon), a bouquet garni, with a clove of garlic, or a large onion instead of the garlic. Cut into slices, about the thickness of a penny, six large carrots and put them in the stewpan. Let the contents boil till the carrots are tender. Remove the onion and bouquet garni and serve. Constant attention is necessary after adding the sliced carrots.

Bagasse (ba-gass'), sugar cane after it is crushed. When dry it is good for fuel.

Bag Holder. A ring or half ring of wood or metal for holding bags while being filled. A good convenience.

Bag Truck. No grain-raiser likes to do without a bag truck. Such a convenience more than pays for itself every year. It is also often found handy in the removal of heavy boxes and other things.

Baking Powder. As alum, which has a bad effect on the bowels, is much used in the baking powder of the groceries, we give a recipe for making the powder without alum: Take ½ lb. tartaric acid, ¾ lb. pure soda (bi-carbonate) and ¾ lb. potato starch; pulverize and dry them separately; mix them in a dry room, pass the mixture through a sieve, and at once put into packages, pressed hard and covered with tin foil or close-made paper, so as to keep it perfectly dry. One teaspoonful of this is used to each loaf of bread.

Balance. A spring balance is a spiral spring fixed in a graduated case, furnished with a ring handle at one end and a hook at the other, for the purpose of weighing small quantities, say, from one to five or ten pounds. Such a thing is very convenient, but after considerable use it becomes inexact and unreliable. Steelyards and weight scales are better.

Baldness, Preventive of: No. 1. Cologne, 2 ounces; tincture cantharides, 2 drams; oil of rosemary, 10 drops, oil of lavender, 10 drops. Rub well on bald part of head. No. 2. Brandy and onion juice, in equal parts, well rubbed on the bald places, will preserve the hair. Or, take 1 pint of boiling water, pour it upon a dozen large branches of fresh sage, or a large handful of the dried leaves, and cover it tightly for an hour. Put into a bottle 1 ounce of iron filings, nails, or any bits of iron, also a piece of borax as large as a

walnut; turn the sage tea upon it. In two or three days it is ready for use. No. 3. 1 ounce of sugar of lead; 1 ounce of lac-sulphur; mix, and dissolve in 1 quart of rain water; pour off after it settles, then strain; use two or three times a day. This will both preserve and color the hair. *Hygienic:* To prevent baldness, do not wear close hats or caps, and bathe the scalp every day with cold water and rub it vigorously, as you do your face every morning. When a loss of the hair is suffered as the result of a fever, it is recommended to shave the scalp as often as once a month, in addition to the above treatment.

For taking hair or beard out of the skin by a drug: See Depilatory.

Balk (bauk), to refuse to draw (said of a horse when attached to a load); also the act of balking. For treatment, see Horse.

Ball Cock, a wooden ball so suspended in a cistern that when the water rises to the supply cock the ball, carried up by the water, enters and cuts off the supply. It is guided by a perpendicular shaft. Its use is required when it is desired to have an automatic cut-off at that point.

Ball Valve, a valve consisting of a loose ball fitting closely.

Balm, a plant of the mint order, sometimes cultivated for a pleasant medicinal tea, to aid in producing sweats; also the resinous and odoriferous or aromatic sap of certain trees; also any fragrant or valuable ointment.

Balmoral (bal-mor'al), a kind of figured petticoat; also, a kind of boot for ladies, made to lace in front.

Balsam, an older form of the word "balm," and signifying about the same—more particularly, a resin containing more or less of an essential or volatile oil. Among the most celebrated are Copaiba, Tolu, Peru, Canada, etc., used for all sorts of liniments and ointments and many medicines.

Balzarine (bal'za-reen), a light, mixed material of worsted and cotton, for ladies' dresses.

Banana, a tropical fruit which is a first-class article of diet when ripe and fresh; but it is impossible to find such in the markets of the Northern States. In Mexico it is the custom of the natives to fry this fruit and season it very highly with pepper, etc.; but this process deteriorates the dietetical quality.

Bandana, or bandanna, a species of silk or cotton handkerchief, having a uniformly dyed ground, usually of red or blue, with white figures of a circular or lozenge form, made by discharging the color. Also, a similar style in calico printing.

Bandog, a large, fierce kind of dog, kept chained.

Band Wheel, a wheel, in machinery, on which a band or belt runs.

Bandy-Leg, a leg bending inward or outward.

Baneberry, a plant and its fruit, growing in dark woods throughout the United States. The plant grows about a foot and a half high, with a cluster of berries, white or red, extending up above all the leaves. The berries are about the size of currants, and look very tempting. Children sometimes eat them, and become dangerously poisoned. The remedy consists of the usual salt-water emetic, followed by constant movement around the room to prevent a fatal stupor. It is well also to use the stomach pump when practicable, and give injections of tartar emetic. Also, throwing cold water in the face, giving strong coffee to drink, and doses of ammonia or asafetida are recommended.

Bank. Everybody finds the modern banking institution one of great convenience, and he patronizes it whenever he can do so. All the banks in this country are banks of deposit and discount. They lend money and take money for safe keeping, sometimes allowing the depositor interest and sometimes not. A large portion of them add to their business the circulation of bills secured by a deposit in the national treasury of an amount of government bonds more than ten per cent. larger than the amount in circulation. These are national banks and are usually the safer and stronger of the two.

A farmer ought to have as little as possible to do with the discounting and loan-making part of the business. With the deposit portion he is not likely to have too much. Nothing short of impossibility, no mere inconvenience of distance or time, should prevent him or any business man from depositing in bank all moneys for which he has not immediate use. If near a bank's location, it would be prudent to deposit everything except pocket change, for these reasons: 1. Because in any well-established and well-known bank, the deposit is in as nearly absolute safety as anything in this world can be. If stolen, or burned, or lost in any way, the bank and its individual stockholders are liable. 2. In his own keeping, his money, if lost or destroyed by accident, is wholly lost. It is also a constant temptation to robbers. There is no better insurance against the raids of robbers than to have it known that money is never kept in the house or on the person. 3. In a vast majority of cases payment can be more conveniently made by check than by cash. Safety, avoidance of loss by robbery or accident, and convenience, are all in favor of bank deposits; against them nothing but the occasional inconvenience of having to visit the bank.

Since the resumption of specie payments national bank bills have been as good as gold, sometimes better, because more convenient in handling;

and they are equally good in all parts of the country. In most parts of Europe they pass at par as readily as the bills of the Bank of England. There are few situations of a business man's life in which they are not more convenient than specie.

Besides cash, any valuables, as government, municipal or railroad bonds, mortgages, deeds and muniments of title, are safer in the vault of a bank than in any private house, and a good many take such deposits for customers, with the reservation that they will not be responsible for losses. They are called "special deposits." The advantage to the depositor is the greater security against fire, robbery, and other accidents.

That every man knows his own business best is the presumption of law and common sense; but it will do no man harm in his business to know something of the methods of men of brains, experience and success in other kinds of business; therefore the above suggestions are offered.

Bankrupt, a person who, by reason of his inability to meet his obligations, surrenders his property to his creditors, and seeks the relief allowed him by law; also insolvent.

Bantam, a very small variety of fowl, with feathered legs, brought originally from the kingdom of Bantam, in Java.

Barbecue, to dress and roast a large animal whole, which is done by splitting the carcass to the backbone, and roasting it on a gridiron; also, the carcass so treated; also the entertainment at which a barbecued animal is served.

Barberry, or **Berberry**, is a common, prickly shrub, eight to ten feet high, not cultivated very extensively, as the fruit is very small and too sour as an article of diet. The variety called the Common Red is the only kind raised in the West. Its numerous clusters of bright, oval berries are very ornamental in autumn. In very rich soil the tree will grow 12 to 15 feet high, and bear very large fruit. There are varieties in Europe with pale yellow, white and purple fruit. One variety has purple foliage, which is extremely ornamental; and there is a so-called "Sweet" variety from Austria, which is really about as sour as the common. The culture of the barberry is of the easiest kind. A rich, light soil gives the largest fruit. It is easily propagated by seed, layers or suckers. To produce large fruit, keep the shrub free from suckers. Medically, the extract of barberry is tonic, in small doses, and in larger doses cathartic. The fruit makes an agreeable preserve and jelly, and an ornamental pickle for garnishing some dishes. By crossing and culture it is thought that in time a very desirable and palatable dessert fruit could be produced by this now indifferent tree, or more properly shrub.

Barbot, a variety of dog having long, curly hair.

Barege (ba-rage), a gauze-like material for ladies' dresses, vails, etc., of worsted, or silk and worsted.

Barilla, a kind of soda obtained ftom sea plants and used in making soap, glass, etc., and in bleaching.

Bark Lice, which infest the twigs of various fruit and ornamental trees, are easily distinguished. Lady bugs and certain mites are their enemies, but resort must generally be had to brushing, or strong alkaline washes, especially during the latter part of June, and whitewashing the trunk and larger limbs in the fall. A weak solution of kerosene is also good. The willow-louse should be "doctored" the last part of May, and the pine-leaf scale should be thoroughly dosed both in May and in August.

Barley. This is both a winter and a spring grain, like wheat, but in this country is generally sown as a spring crop. It requires a lighter soil than will grow good wheat, and a heavier than will produce tolerable rye or oats; but in all cases it must be one that is well drained. A mellow, rich loam, ranging between light sand and gravel and heavy clay, is best suited to it. It should be sown as soon as the ground is sufficiently dry in the spring, on a grass or clover lay turned over the preceding fall; or it may follow a well-manured and cleanly hoed crop. If sown on a sod it should be lightly plowed in, but not so deep as to disturb it, and afterward harrowed and rolled. The soil should always be well pulverized. Two or three bushels per acre is the usual allowance of seed. Poor or mellow soils, or early sowing, require the least. Barley crops should never follow the other small grains, nor should they succeed each other except on very rich soil. Barnyard manures should not be applied directly to this grain, unless it be a light dressing of compost on different soils, or in moderate quantity after the plants have commenced growing in the spring. When the growth is four or five inches high, rolling will be of service if the ground is dry and not compact.

The harvesting of barley must be done at a very particular time, as it will shrivel if cut too early, and shell if cut too late. The earlier cut the brighter. It may be stacked and taken care of like wheat, but to prevent discoloration and bring the highest price in the market it should be kept dry and not be allowed to heat in the stack or mow. Barley which is plump and shining is best for the brewers. Nor should the grain be threshed out with a common wheat-threshing machine, as the cylinder spikes bruise the germ and prevent it from sprouting in the brewer's vat. "Beater" machines, made expressly for the purpose, are far

preferable. Barley is subject to many disabilities other than the most prevalent one of discoloration of the grain in curing. Those during growth are smut, blight and mildew. That during harvesting and succeeding harvesting is germination in wet weather. Discoloration is produced by dew and damp weather during curing, and from heating in the stack. To obviate this, in the United States, when little danger of rain and dew is feared, the grain is placed in windrows, set in gavels, without binding. Since the introduction of automatic binders, binding is again coming into favor, the shocks being carefully capped if rain is feared, and also at night to prevent the heads taking dew. On the great plains of the West, in the valleys between the Rocky Mountains and the Sierra Nevada, and in California, where there is neither dew nor rain during harvest, the brightest samples of barley are produced. There the grain is harvested, bound and shocked, and either threshed immediately from the shocks or stacked and threshed after sweating, which always takes place in grain or hay when stacked. This sweating usually occupies six weeks or two months, after which grain is usually dry enough for keeping in bulk or during transportation to distant markets.

When grain is infested with cockle, wild mustard or other weeds, they should be extirpated by hand before they are fairly in blossom. If neglected till some time after this, the seed is so well matured as to ripen after pulling, and if then thrown on the ground they will defeat the effort for their removal. When too luxuriant, barley, like rye, may be fed off for a few days, but not too closely. This, however, is seldom necessary.

Both as a green fodder and as a matured grain, barley is a good article of food for all kinds of live stock. Of course, care should be taken not to overfeed a horse with it at first, as it is thus liable to produce purging and weakness. The grain, in various forms, constitutes, also, an excellent article of food for man, although it is seldom prepared for this purpose. "Pot," or hulled barley, is that from which the bran, or skin of the grain, is taken by a mill, and is used in mushes, puddings, etc. Pearl barley is more commonly found on the table.

VARIETIES. The principal varieties of barley are the two and the six rowed, the last being best for hardiness and productiveness, and the first excelling in plumpness and in freedom from smut. As sub-varieties we have the Hudson's Bay, which ripens very early and bears abundantly; the Chevalier and the Providence, both accidental; the Peruvian, Egyptian, Saxonian, Mensury, Probstier, etc.

The uses of barley are various and important. In Europe it forms no inconsiderable part of the food of the inhabitants. The grain yields from 80 to 86 per cent. of flour, which, however, contains but six per cent. of gluten, seven per cent. being saccharine matter, and 79 mucilage or starch. It is inferior in nutriment to wheat and rye, but superior to oats. In this country it is principally used for matting and brewing, and in some cases for distilling, but when ground is more generally appropriated to fattening swine, though sometimes used for other stock.

Barley and rye differ little in their value as food for fattening stock. Corn is the most valuable of all the grains for purely fattening purposes. Rye ranks next in value in this respect, while oats are of the least value for fattening.

An average crop of this cereal is 20 to 25 bushels to the acre, and the weight 40 to 45 pounds to the bushel.

PEARL BARLEY is the small, round kernel which remains after the skin and a considerable portion of the barley have been ground off. For this purpose a distinct species of barley, of pearly whiteness, is chosen. It is steamed, to soften the skin, dried and passed between millstones of a peculiar kind, to take off the husk, all except what lies in the deep furrow of the seed, and which is the cause of the short, dark line to be seen on pearl barley. This is of great value as a delicate article of diet, especially for invalids and those of weak stomachs. If one cannot make way with this article, prepared in some way or other, he cannot digest anything. The two principal methods of preparing it are as follows:

To boil pearl barley it should be continued in the boiling process until it becomes as soft as it can possibly be made, which may require considerably more than an hour. Like the larger kinds, it soon becomes mucilaginous and slippery when in water, and appears to be thoroughly cooked long before it is in reality. Very little or no salt is required; but this, of course, depends more upon the taste of the eater than anything else. Milk is generally admissible. Sometimes it is eaten with sugar. With all this care, however, one is apt to swallow it without sufficient mastication, as it is so slippery with its own mucilage.

But barley porridge is one of the best beverages, or dishes, in the world, for invalids. It is made by first thoroughly boiling the barley, leaving more or less water with it toward the termination of this process, according to the proportion of water and milk which will best agree with the patient; stir in the milk, according to said proportions, and drain off and season to taste.

Barley Water, TO PREPARE. Wash 2 ounces of pearl barley in cold water; parboil it for a short time in half a pint of water, and then boil it, in 4 pints of water, down to 2 pints, and strain. Good beverage for invalids.

Barm, foam from fermenting liquors, which is sometimes used as yeast.

Barn, a building for the stabling of horses and cattle, and the storage of grain and other productions of the earth. Barns vary in location, size, cost and architectural beauty, according to the judgment, means and taste of their builders. They should, however, be something more than four bare walls enclosing a given space. Skill and judgment should be used in planning the barn, so that it will be properly and economically built and add to the general appearance of the premises. The attractiveness of the farm home will depend largely upon the exterior finish of the barn, its relative location as compared with the other buildings, and its surroundings. It is common with many to give no attention whatever to ornamental or picturesque appearance of the barn. Hence the common remark that trees should be planted to hide the repulsive barns. The true rule, on the contrary, is to render every part of the premises neat and attractive. The barn should be a pleasing object; it should convey to the eye of the spectator the impression of comfort and completeness in the farm arrangements. A farm with a dwelling-house alone visible would seem to be only partially furnished. It may, therefore, be well for every farmer who has the means to give to all his outbuildings an attractive exterior and finish; and even those who have small resources may give symmetry and architectural character to a rough building, on the same principle that well-executed rustic work is better than costly and elaborate structures without taste.

The first thing to consider on determining to build a barn is its location. If possible it should be located upon a rise of ground, and where it is easy to keep the premises dry. Unloading wagons can generally be done at the upper side, and hauling out from the lower side. In this situation it is also easy to have a basement which will be dry and warm for the keeping of animals in stormy or cold weather, and which will afford good storage for root crops, pumpkins, etc. The basement should be walled up with stone, and no part of the wood-work of the barn should be in the ground. It should not be so near the house as to appear a part of it, nor so far distant as to be inconvenient.

After the location has been selected, the size must be determined upon. This must be based upon the amount the farmer wishes to store in it; upon the size of his farm; the number of acres of each crop, the kind and number of head of live stock, etc. It is quite impossible to go into every minute detail; but it is far better to canvass the ground thoroughly, and base the size of the building upon calculations carefully made than upon none at all. One error that is very general is the smallness of the barn, as the thousands of sheds, "annex" stables, hay-stacks, etc., which may be seen in all sections of the country, attest.

The size once settled, the construction is next in order. It has been our design to present a sufficient variety of modern and carefully prepared plans and specifications to enable the farmer to erect a barn without going to the expense of having special designs made, and that he may have a large number to select from. By studying the relative merits of the various plans given, much valuable information can be gained, and the farmer will be capable of having a barn erected that will be better suited to his wants and tastes. If it is decided that a basement barn is desirable, the next question to be determined will be, What use shall the basement be put to? Sometimes a portion of the floor above and the basement below are used for stabling purposes, and sometimes no use is made of the basement, except as a place for storage for the manure from the stables. If manure is carted out twice a year, it will not suffer materially by exposure during the time it lies in the yard. If, therefore, a basement barn should be used, the basement should be for stabling and storage of roots, etc., and under ordinary circumstances one should not stable on the floor above. There is no objection, as some think, to keeping stock in the basement of a barn, thorough ventilation being possible and readily secured; and, when necessary, warmth is more certainly assured than it can be where boards alone are the only protection. In cases where a very large amount of stock is kept, it may be necessary to stable above as well as below. When that is done the floor above must, of course, be made water-tight, which can be done by making it double, of narrow plank an inch and a half thick, the joints being laid in white lead.

In the larger portion of our Western country, however, there are no hillsides upon which to construct basement barns; they must, therefore, be built upon a level, in which case all the difference in construction between a barn of this character and one with basement stalls and stalls on the floor above is the absence of the stalls underneath and the double floor of those on the main floor, as above indicated.

Barns should be planned for convenience. They should be so arranged, first, that the hay, straw, etc. may be easily put in them; secondly, so that the fodder may be taken to the stock with but little carrying; thirdly, so that the manure may be taken out without more than once handling, or wheeling a long distance; and, fourthly, so that the capacity of the same may be increased without destroying the convenience of arrangement. Special care should be taken to arrange for saving all the manure—drains and cisterns for liquid manure, and sheds for compost heaps, etc.; mangers and hay-racks so arranged as to save the hay from loss; boxes in which cattle may be fed chopped food, meal, slops, etc. Boxes are even better for hay-feeding than racks, as they save

many small particles of the provender until it is eaten up, much of the hay seed, etc. Sheds may be conveniently arranged on the two sides of the barn-yard, to the south of the main building, in a way to protect the stock against storms and winds from all directions. The floors ought all to be tight enough to prevent anything from going through; clean waste food can be picked up and saved, and the rest can be carefully scraped up and thrown into the manure heap; and the urine of the animals can also be properly conveyed to the drains.

It is a poor practice to drive stock to a distance for watering, if it can be avoided. Good cisterns at the barn will catch the fall rains and often have enough to supply the animals a large portion of the winter. With a pump in them the watering of cattle may be a task of pleasure rather than of dread.

The storing of hay in barn lofts has heretofore caused much extra labor, because the barns were not constructed properly, and until recently no easy mode of lifting hay was generally practiced. At present the many appliances in use (which are referred to under the head of Hay) make this labor comparatively easy. The success of the "railway" pitching apparatus and its great economy suggest the propriety of adapting and constructing barns for its use. A majority of barns throughout the country will admit it with little or no change, requiring only the removal of purlin beams, which are usually not essential to the structure. This mode of filling is particularly adapted to fine horse-barns and carriage houses, and favors a high carriage room and stable, with hay-loft and storage for feed and bedding overhead. Many are now building such barns so as to take all hay, grain and litter into the loft from the outside by the use of the "railway." It is desirable that there be a clear space eight feet in width and ten feet downward from the peak, and doors which shall give an opening in one of the gable ends, eight feet wide and eight feet under the track. To make sure of the latter, there should be no cross beam nearer than ten feet from the peak.

The following are very essential features to be taken into consideration in the erection of a good barn:

1. All barns should have good eave-troughs, connected with spacious underground cisterns. They will protect the walls and furnish domestic animals a large supply of water, or no less than five barrels daily throughout the year, from a roof 35 by 70 feet, if there is an annual rainfall of three feet.

2. A broad, projecting roof, by sheltering the sides of the building, adds to its durability.

3. The basement walls should stand on a broad, deep trench filled with small stone or coarse gravel, to effect drainage; and if thick flagging, projecting some inches beyond the walls on both sides, forms their base over the small stone, rats will not burrow under them (Fig. 1).

4. In building basement walls there should be a space of a foot between their outer face and the bank of earth, the excavation being a foot wider on each side for this purpose, which enables the mason to build a smooth outside, and to avoid the projecting points of stone, which, when the earth freezes in contact with them, dislocates the wall. The outside space is afterward filled with broken stone or gravel, and allows a free drainage into the ditch under the walls, as shown in Fig. 1.

5. Never allow an embankment of earth subject to freezing to press against a basement wall, the successive thrusts of the frost, sooner or later, throwing it over. A vertical stratum of coarse gravel or small stone should be interposed, as already mentioned.

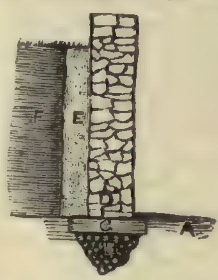


FIG. 1.—*Cellar Wall*—A, *Cellar Bottom:* B, *Drain:* C, *Flagstone:* E, *Gravel Space:* F, *Earth.*

6. The most convenient barns now built have the interior of the main floor entirely free from partitions, so that loads of hay and grain are driven in on any part, and separate narrow bays of any desired width are built up successively. When consumed or threshed these partitions are taken down in succession.

7. Every granary should be graduated on the inside, to show the number of bushels it contains below each graduating mark, enabling the owner to know at a glance how much grain he has on hand (Fig. 2). This graduation may be easily made by multiplying the cubic feet by 45, and dividing by 56.

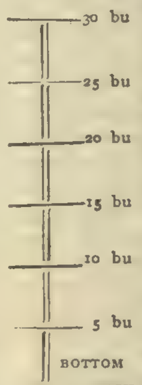


FIG. 2.—*Graduated Granary inside.*

8. Petroleum for inside floors makes them more durable; and for outside woodwork it is better than paint, penetrating into the pores, and giving common wood the character of cedar. Applied to the outside of this a coat of mixed paint (which adheres better to the oiled surface than any other composition) forms, with the oil, a very durable and perfect protection against weather.

9. Cattle yards connected with a barn which consists of a single compact building should be well sheltered with evergreen screens. These form the most pleasing kind of shelter against winter storms, and any one who has seen cattle and sheep reposing comfortably under their broad, green, dense arms, while the snow clouds are sweeping over open fields, could not fail to be struck with their real value. They are the cheap-

est of all barriers against the storm. Trees of Norway spruce planted in a line from three to six feet apart, and growing, as they usually do, two feet yearly, will in a few years form a screen so dense that storms cannot penetrate it. For more ample security of earlier growth, it may be well to plant two rows of the trees, alternating, and not opposite each other.

10. Barns and all out-buildings, whether of high exterior finish or made of rough boards, may be neatly constructed with an architectural or symmetrical exterior.

11. Particular attention should be given to ventilation. The air of the stable is not only deteriorated by the breathing of the animals, but it is further contaminated by emanations from the body, as well as by the noxious ammoniacal vapors arising from the manure. This may be easily perceived on entering the barn in the morning, when not only an offensive, but a pungent, ammoniacal smell is perceived. These vapors are hurtful to the lungs of the horse, and still more particularly to his eyes. The most effectual means of ventilation are large trunks or tubes of boards passing through the ceiling and roof into the open air. The tops of these should be covered in such a way that the heated air can go out, but no rain come in.

STALLS. All good stables are divided into stalls, one for each horse, and these are separated from each other by wooden partitions. If horses are placed together they are apt to do each other mischief, or in some way to incommode one another. In some stables they are separated only by wooden bars, but these are not enough, for one will sometimes rob the other of his food, or do him harm by biting or other annoyance. Good stalls require to be six feet wide in general, and should be eight or nine feet in depth; that is, the partition should be of this length to prevent one horse interfering with another. The height of the partition should be seven feet at the head and five feet at the heels. Ponies will do with stalls five feet wide; large dray horses require six feet six inches. When the stalls are too broad the horses will stand across them; when too narrow they cannot lie down, which is a necessary position for them to repose after being hard worked. It ruins a horse's legs and feet not to allow him to stretch his limbs in the stall. The stall-posts are uprights at the rear of the stall to stay the partition; they should be round or octagonal, not square. Sometimes they rise only a little above the partition, and sometimes they extend to the ceiling, which is firmest. Each side of this post should have a ring for pillar reins, which are used when the horse is required to stand reversed in his stall, as he is occasionally when being cleaned. In some stables there are, besides the stalls, some compartments much wider called boxes, for such horses to be in that are ill, or which require much rest. When horses are worked daily, it is proper to hang the harness of each on pegs in the wall opposite, to lose as little time as possible, keeping in the harness-room that which is used only occasionally.

HAY-RACKS are usually made of wood. The front of the rack usually slopes forward, that the horse may draw the hay more easily from it, and that it be more easily filled. But there are some objections to this form, and dust and the seeds of the hay sometimes fall into the horse's eyes; and on this account some prefer having the bars or spars (as they are called) perpendicular. The spars should be round, two feet and a half high, an inch and a quarter thick, and two inches and a quarter apart. Each rack should have a ring at bottom for securing the horse's head. When tied to the spars he is apt to bend or break them. Some have made the spars turn around on a pivot to facilitate the coming out of the hay. The racks are also sometimes placed in the corner of the stall, forming the quarter of a circle, which gives more room.

The usual mode of filling the hay-racks is from the hay-loft over the stable, by means of an aperture in the ceiling just over the rack. These apertures have been objected to; it has been said that the foul vapors from the stable rise up through them and contaminate the hay, and that the dust and seed of the hay fall down upon head, mane and ears of the horse, and in consequence it is recommended to abolish these apertures and to feed baled hay. We are strongly in favor of baling hay, and thus saving barn-room to a great extent. A press for this purpose is somewhat expensive, but will be much cheaper than a large addition to the barn. A medium-sized hand-press might be obtained for a moderate sum, or several neighbors might buy a power-press in company and use it together, thus reducing the individual cost to a very low figure. With a good press and horse-power four men and two boys will bale, weigh and store from six to ten tons of hay per day. The cost of baling, including ties, will be only about a dollar and a quarter a ton. Straw can also be baled, and thus put into a fraction of the space which it would otherwise occupy. If either hay or straw are to be sold, bailing will greatly facilitate the handling of the materials, and will also admit of their being shipped on the cars.

COW STALLS. We give, in this connection, the plan of a very convenient cow or cattle stall, with

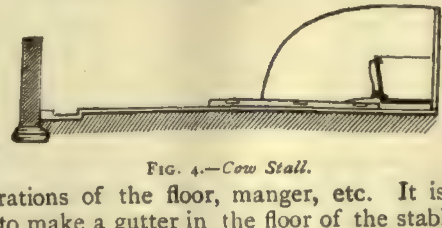


FIG. 4.—*Cow Stall.*

illustrations of the floor, manger, etc. It is common to make a gutter in the floor of the stable, just behind the animals. This does not work well.

The solid droppings will soon impede the flow of the water, and make the gutter filthy and difficult to clean. It is better to grade the floor with a uniform fall to the rear of the stable, where a gutter for the water is to be made (Fig. 4). The solid material never reaches or obstructs it. The floor or platform upon which the cows stand is the important part upon which depends the cleanliness, health and comfort of the animals. To construct it, first lay a brick floor in cement all over the stable, and with a uniform grade from front to rear falling toward the gutter, with an inclination of about three inches in ten feet. Upon this lay out the stalls, with short partitions, but sufficiently high in front to blind the cows from each other. If the stalls be too wide, the cows will stand quartering and defeat your object, which is to make them stand so that their droppings will clear the platform. Then for the wooden platform or floor of the stall, make a simple frame like a sled, and cover it with plank. It should not be heavy. Two-inch plank will serve for the runners. Six inches is as high at the rear end as it should be. The forward end should be enough lower to make the top level when it is put in place on the inclined brick floor.

Fig. 5 shows the platform, and Fig. 6 exhibits it in place. It can obviously be adjusted to any

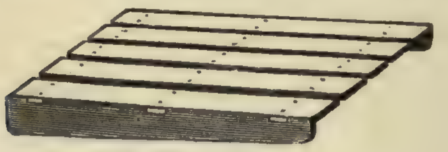


Fig. 5.

length, by drawing it out or sliding it under the manger. One of these must be made for each stall, and fitted loosely between the partitions, so that it will slide freely, and that it may be taken out, if need be, for drying or cleaning. No rat can find harborage in such a floor, and it may be thoroughly washed by dashing water over it, which

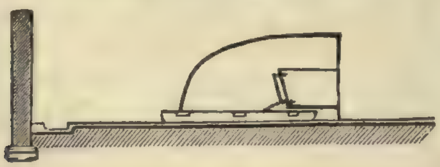


Fig. 6.

finds its way directly to the gutter. It never rots, and scarcely ever needs attention or repairs. And yet with all this adjustment a cow will sometimes crowd forward and deposit excrement upon the platform, or else back out and get soiled by lying down with her body partly on the floor below. The general result, however, is better than that of any other plan.

For securing the cows, use a traveler (Fig. 7) with a short chain and sttap. The traveler is made of half-inch round iron, bent at each end at right angles, and with a thread and nut for securing it

Fig. 7.

to the front of the manger, as shown in Fig. 8, or to a suitable post. A chain or rope eight or ten inches long, with a ring at one end, runs up and down the traveler. The other end is permanently attached to a wide strap, buckled around the cow's neck when she takes her place in the stall. With this she can feed comfortably, lie down, and turn her head. While it gives a little more liberty than is desirable on some accounts, it probably gives no more than her comfort would seem to require.

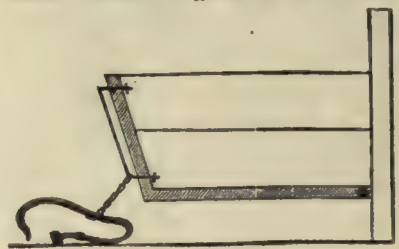


Fig. 8.

The cement floor, to be secure from cracking by frost, should be composed of very clean, sharp sand and the best Rosendale cement.

Fig. 9.—*Perspective of an Oblong Barn.*

Barn Plans. Fig. 9 shows a fine barn, oblong in shape, with lateral wings, inclosing a yard,

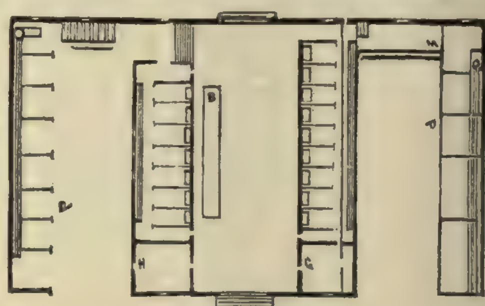


Fig. 10.—*Grand Plan.*

and adapted to a large farm. The foundation is of brick piers. The intermediate spaces can be closed up, forming a convenient pen for sheep,

calves and hogs. The stalls in the main barn are on either side of the center space, which is 20 feet wide, forming a spacious drive-way. Above the floor of this drive-way, suspended from the principal loft, is a platform six feet wide for facilitating the feed of hay. An inclined way from the main floor runs down into one of the wings, as a convenience for washing carriages. Steps lead from the main floor into the hostler's room in the other wing. A harness room, 16 x 17 feet, is provided in the opposite side of the barn; also a granary, 16 feet square. Above the granary is a room for chopping feed. In the wings are cow and sheep pens, with troughs connecting with a pump in the corner of each.

Stalls of cast iron, with feeding boxes, etc., can be used, or wooden stalls can be substituted for much less. A shute leads down from the hay-loft, with an opening in the manger, through which the animal feeds. This is made larger at the bottom than the top, to prevent hay from lodging or becoming packed in the shute. Near the bottom is a door, through which accumulated hay-seed may be removed and saved for planting purposes. The main building is 36 x 46 feet; the wings and yard, 24 feet; the pens, 10 feet long; the drive-way, 20 feet wide. In the ground plan (Fig. 10), B represents the way to the hay, G a grain bin, H harness room, M the man's room, P on the right represents sheep pens, on the left stalls for cows.

For this barn we give the specifications, bill of the quantity of material, and an estimate of cost. We deem this unnecessary for every plan, as any carpenter or builder who is capable of building a good barn can work after the plans given in this work.

Barns should be properly as well as economically constructed, which requires far more forethought and planning than the subject ordinarily receives. A barn once built is not readily moved, or altered in size or shape, and therefore the plan should be well studied before the structure is erected.

Specifications.—The front and rear doors are double, 5 feet wide by 13 feet high each, hung on good, double, wrought-iron hinges. All windows in lower part of stable 2 feet 6 inches by 3 feet 6 inches, of 4 panes to a sash, double windows, both front and rear, in loft 4 lights to a sash, 4 x 3 feet. Door to living room, pine, with three raised panels, with good lock with porcelain knobs, both windows to be 2 x 4 feet, 8 lights to a sash. Stable fittings, stalls, etc., to be portable, with wooden posts, cast-iron troughs and heavy gauze head-board, which cost very little more than the oak stalls. Foundation walls to be 18 inches thick, set 3 feet under ground. One chimney flue of 6 inches in living room.

Bill of Quantity.—Included in the estimate are the following materials:

18 corner and intermediate posts 24 feet long, 8 x 10.
376 feet of sills, 10 x 12 inches, convenient lengths.
254 feet of plates, 6 x 10 inches, convenient lengths.
4 tie-beams, 54 feet long, 10 x 12 inches.
6 principal rafters, 20 feet long, 10 x 10 inches.
3 collar beams, 24 feet long, 10 x 12 inches.
6 struts 12 feet long, 8 x 10 inches.
19 posts, for sheds, 14 feet long, 6 x 6 inches.
19 posts 18 feet long, 6 x 6 inches.
1,000 feet of girts and braces, 6 x 3 inches.
256 feet of purlines, 10 x 12 inches.
80 rafters, 20 feet long, 8 x 2 inches.
80 rafters, 13 feet long, 8 x 2 inches.
600 feet of braces, etc., 6 x 2 inches, in convenient lengths.
160 joists, 13 feet long, 12 x 3 inches.
1,100 feet of girts and plates, 6 x 3 inches.

Estimate of Cost:

Excavation	$25 00
Foundation, brick or stone piers	85 00
Framing, including sills, girts, plates, etc	241 50
Floor joists, including bridges, etc	150 00
Siding or weather-boarding, including battens, etc., 9,800 feet	274 40
Sheathing of roof, 6,100 feet	122 00
Shingling, 61 M, at $4.20	256 20
Flooring (part 2 inches thick), 4,500 feet	180 00
Rafters, including trusses, braces, etc., 6,100 feet	183 00
Windows, including ventilators, etc	120 00
Doors, including hardware, etc.	60 00
Stalls, including fittings, mangers, etc	125 00
Pens, complete	80 00
Grain-bins, steps, ladders, etc	60 00
Painting and glazing	110 00
Sundries	40 00
Total, including labor, etc	$2,112 10

The above will make an excellent barn, one which will be a credit and an ornament to any farm, and will accommodate many head of stock and furnish room for the storage of much grain. Care has been taken to have it properly ventilated, which is an important factor in the construction of barns.

A CURB-ROOF BARN. Fig. 11 represents a curb-roof barn, known also by the terms gambrel or mansard roof, and distinguished by the angle half way up the rafters. It has an important advantage in giving more capacity for a given amount of siding and shingles; and a greater height above the eaves or posts, which presents no difficulty in filling, now that the work of pitching from the wagon load is wholly performed by the horse fork. The cross timbers above the cross beam being entirely omitted (except at the ends or outside), the horse-fork has room to work freely. The main portion is 40 by 56 feet, and it is well adapted to a farm of 100 to 150 acres.

Beginning with the plan, Fig. 12, the construction is briefly explained. The beam between the bay and threshing floor is 12 feet high, and, the girt being left out, the whole floor is accessible for the storage of wagons, farming tools, etc., after the grain is threshed or the hay fed out. Broad, sliding doors open from the outside (on the left) to this floor, and a narrower door at the opposite side. The whole floor is covered with two-inch pine plank, planed and matched. The bay, which is 15 x 40 feet, is represented by A in Fig. 12. The threshing floor, 12 x 40 feet, is indicated by B, and the dotted line between the two shows the beam 12 feet high. C represents the cut-feed and oat room, 12 x 22 feet.

The cellar is under this floor, 40 feet square (occupying all the barn except the horse stables), and 8 feet high in the clear. It consists of an open shed on the side next the cow stable, 10 x 46 feet, with mangers next to the walls. The remaining space, 30 x 40 feet, is inclosed, and has likewise mangers next the wall. The building stands about four feet above the level of the ground in front, and the earth is filled in so as to make an easy ascent. The granary, marked G, affords ample storage for threshed grain.

The horse stable, represented by D, is 16 feet wide, 16 inches below the main floor, and 8 feet

high, and is entered by a sliding door on the left wide enough for two horses to pass. There is room for eight horses. The larger stall for two horses is often convenient for feeding a harnessed team. The others are 4½ x 10 feet in the clear, and the box hay feeders are those now commonly employed, extending upward about 20 feet, with doors at the sides at different heights to throw in the hay. The space over the horse stables is occupied with hay for feeding them, the floor of this bay being about seven feet above the floor of the barn.

The cow sheds and stables, which are shown by E and F, are 22 x 30 feet, having a space overhead for the storage of fodder. The end view of the frame, Fig. 13, needs but little explanation. There are no purline girts, beams or braces (except at the ends) to interfere with the free working of the horse-fork. Although the sills of the horse stable are lower than the others, the plates are on the same level. The ventilator is 5½ feet square and 7 feet high, with blinds. A corn and wagon house is adjacent, 20 by 24 feet, with grain bins overhead, and places for the storage of corn in the ear on each; the wagon passage below; with a hog-pen underneath, in a walled basement seven feet high. The cost of this barn would vary much with the price of materials and with various facilities, from $1,800 to $2,500.

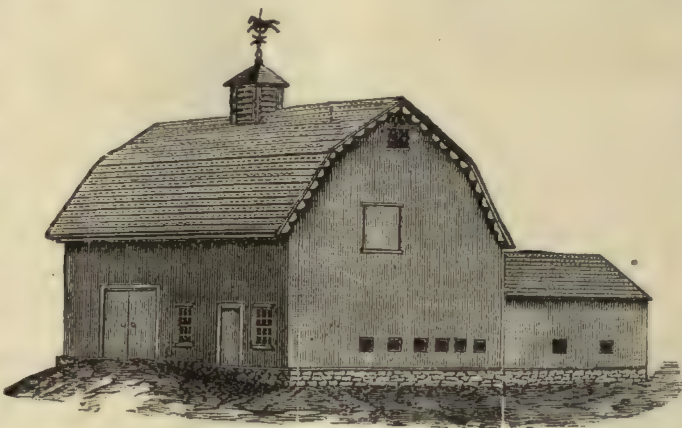


FIG. 11.—*Curved-Roof Barn.*

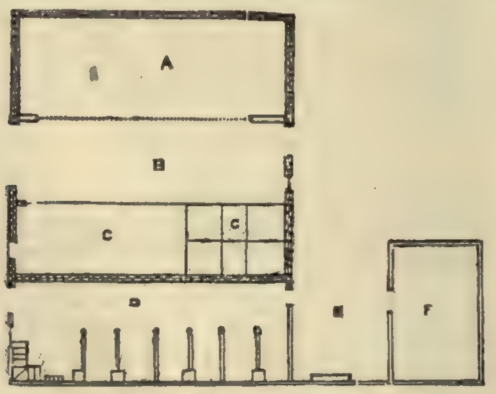


FIG. 12.—*Plan for Fig. 11.*

CARRIAGE AND HORSE BARN. Fig. 14 is a view of a carriage and horse barn, built of wood, with rough vertical and battened boards, but designed with a view to symmetry and ornamental exterior. It is 25 x 35 feet. Fig. 15 represents

FIG. 13.—*End View of Frame.*

the ground plan. The carriage room is 15 x 25 feet, which admits two carriages to stand side by side, with ample room to pass around them, and four can be placed within it without inconvenience. This apartment is separated from the stable by a matched board partition, with a door between them. Pins for harness are put in this partition, obviating the necessity of a separate harness room.

The horse stable is 15 x 25 feet, giving space for four stalls, each 5 feet wide and 15 feet long, which is the shortest length admissible, with free passage around the rear of the horses for leading them out, removing manure, etc. The light being admitted behind them, the animals' eyes are not injured by light, as they would be if their faces were in front of the openings, and the ventilation from without is more perfect. The mangers are only breast high, admitting free circulation of the air between stalls and passage. The arrangement is such that any horse can be taken from the carriage room to the stable, or the reverse, with only a few steps, and all within doors, so that there is no exposure in time of rain or snow storms. A pump at *w*, from the rain-water cistern below, is convenient for watering. The place of the ventilator is shown by the dotted lines at *v*. It reaches down to the floor above, and passes up through the roof. It has a large board valve near the top, which may be opened or closed at pleasure by means of a rod extending down within reach. This ventilator is simply a square board box or tube, two feet or

more square, allowing the immediate escape of all bad odors from the stable, preventing the diseases so common in horses that have to breathe rank exhalations. In the side of this ventilator, in the hay-loft, is one or more large board doors, hung above and swung inward, through which the hay is thrust for the horses below. As soon as the forkful has dropped, the door falls shut, and excludes any possible vapors of the stable from en-

FIG 14.—*Carriage and Horse Barn.*

tering the loft. The stairs at the end of the passage are boarded up, and a door shuts the passage between the stable and the stored hay. Under the higher part of the stairs is a closet for brushes, curry-comb, soap, oils, etc., and *b* is a bin for horse-feed.

FIG. 15.—*Plan for Fig.* 14.

The lower or main story of this barn should be about 9 feet high in the clear. With a good ventilator this is better than 12 feet without a ventilator. With 14 feet posts, there can be a hay-loft over four feet high at the eaves, and with one-third pitch of the roof.

Fig. 16 is a view of a modification of this barn so arranged that it may be made five feet shorter, the dimensions being 25 x 30 feet. Fig. 17 is the plan. The horses' heads are placed toward the outer wall, each stall being lighted by a large single-pane window. In order to exclude the light from the horses' eyes, these windows are set seven or eight feet high; and immediately under them, on the inside, is a narrow plank hood or shelf, entirely covering the light at the animals' heads. The hay is thrown down from above through the square boxes, from which the horses obtain their supply through the side openings at the bottom. A separate harness room is provided. Pins may be placed in the partition in the carriage apartment, in addition, if desired, as described in the preceding design.

The plan of a third design is shown in Fig. 18, the object being to provide for both cattle and horses. The dimensions are like those of the first plan, 25 x 35 feet. There are four horse stalls, each five feet wide, and two cow stalls (C), each four feet, with a post between. The ample width of the passage between them prevents danger of the horses kicking the cows, especially if the more

FIG. 16.—*Another Carriage and Horse Barn.*

quiet animals are placed opposite. The harness room is five by eight feet. A small entrance door is needed at the side, the animals being led out at the end; and a door in the close partition between the stable and carriage house admits ready passage from one to the other. A large box or bin for feed is shown at *b*.

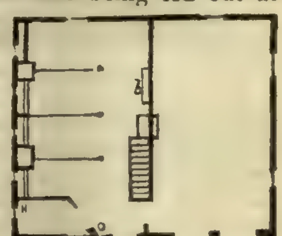


FIG. 17.—*Plan for Fig.* 16.

The cost of such barns will depend greatly on the price of materials and labor where they are erected, and the degree of finish given them. They can be built at from $800 to $1,500. White-oak plank, planed and matched, for the division of the stalls and for the floors, will be better than hemlock or pine, but cost more. Good pine siding will be better, but more expensive than hemlock.

FIG. 18.—*Plan for Fig.* 14.

THREE-STORY BARN. Before the introduction of the horse-fork, some of the best barns in the country were built three stories high, where sloping ground permitted the entrance to the upper story with a loaded wagon. Properly arranged and constructed, they still possess some important advantages, among which is the facility with which grain may be passed from the upper story to the lower during the successive operations of threshing, cleaning and bagging. The basement is 60 feet long, 24 feet wide, and 7 feet high in the clear. The walls contain 70 perches of stone work. The floor above is supported by two rows of pillars, Fig. 19. Those in the outside row are two

by six feet, the inside ones being two feet square. The barn is 48 feet wide. The floor of the cow stable, which is directly over the basement, rests upon joists that are laid upon cross sills, and reach from the ends of the front pillars to the rear ones. The joists rest upon the cross sills as far as the latter reach, and then upon the pillars. The cross sills are ten inches square. There is thus a drop of ten inches in the floor upon which the cows stand, and immediately behind them. This drop, G, Fig. 20, is four feet wide and forms a passage in which the manure collects, and from which it

Fig. 19.—*Three-Story Barn.*

may be pushed through the side of the drop to the basement below. The liquids from the cows drain through this open space upon the manure in the basement. The floor upon which the cows stand, seen at F, is six feet wide. There are nine stalls for cows, F, Fig. 20, each of which is four feet wide. In each stall is a manger and a feed box. The cows are tied by means of ropes around their necks. There is a passage, E, Fig. 20, between the cow stable and the horse stable, C. In the latter there are five single horse stalls, and two closed, loose boxes. Each single stall is five feet wide. When the horse stable is cleaned, a wagon is driven into the shed behind it, B; the manure is thrown into the wagon, and at once hauled wherever it may be needed. The floor of the horse stable is on the ground. The shed B, Fig. 20, is for storing tools and wagons, or housing sheep, and has a door, A, at each end. The stables are eight feet high, and the barn reaches 18 feet above the stables. The plan of the barn floor is shown by Fig. 21; A is the main floor; at B B are the entrance doors, to which a sloping driveway, abutting against the wagon shed, leads. The rear doors, C C, are hung upon rollers. At D is the trap for hay, leading to the feed passage below, and E E E are traps for straw used for bedding, leading into the stables. The granaries are seen at F F, and there are spouts from these leading into the wagon shed so that sacks upon the wagon can be filled from the spouts. The passage to the granaries is at G; it is eight feet wide, and a work bench with tools is kept here. The staircase leading down to the feed passage is seen at H. The trap doors are double and on hinges. The floor is also double, so that no dust can fall through to the floor below, nor any disagreeable vapors arise therefrom. This story is eighteen feet clear, there being a truss roof, which is self-supporting. The roof is shingled with pine shingles, and the whole of the barn is covered with pine weather-boarding, and painted.

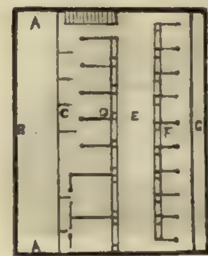


Fig. 20.—*Plan of Stable Floor.*

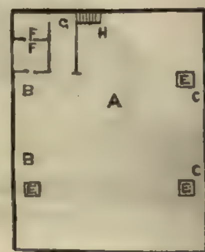


Fig. 21.—*Plan of Barn Floor.*

A Large Horse and Cattle Barn. Fig. 22 represents a very commodious and also an expensive barn. It is 84 feet square and nearly 50 feet in extreme height, not including the cellar. There are 84 stalls provided, as indicated in the ground plan, Fig. 23. There are two rows of horse stalls on one side, and three rows of cattle stalls on the other. The proportions of the interior are as liberal of space as those of the barn itself. The central drive-way or barn floor is 16

Fig. 22.—*Large Horse and Cattle Barn.*

feet wide. The carriage and wagon rooms on each side of the floor are both 20 feet square. Large, loose boxes are for the accommodation of stallions. The various passage-ways between the rows of stalls, and at the rear of them, are four

feet wide, while the horse stalls are nearly six feet, and the stalls for two cows eight feet in width. The two spaces inclosed between dotted lines on the barn floor indicate the position of the hoistways under the skylights for hay. The spaces at

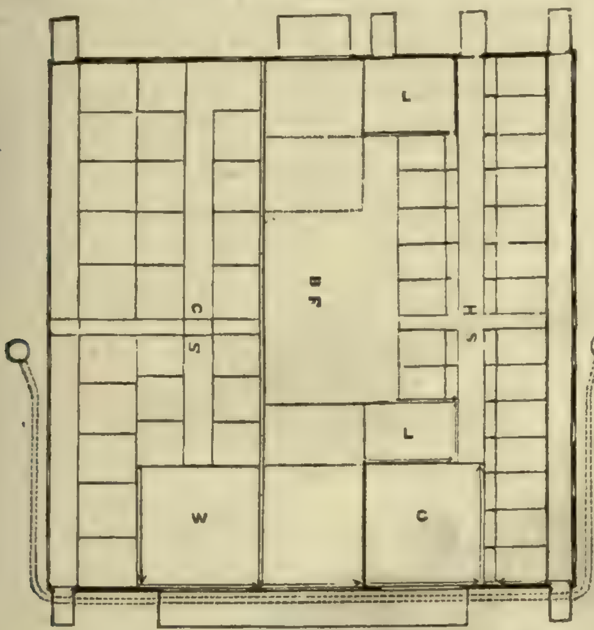


FIG. 23.—*Ground Plan for Fig. 22.*

either end outside these hoisting spaces are floored over above the great doors, and are finished off as granaries for keeping the supply of oats, meal, etc., required for the stock. On each side of the barn is a rain-water cistern, 13 feet 9 inches in diameter and 25 feet deep; these are connected by a pipe, passing underground across the front of the barn. There are seven windows on each side, and six, besides the five sliding doors, in each gable. These, with the three great ventilators, afford unusual provision for pure air. The cattle are fed from the floor above. The passage between the rows of horse stalls is for feeding. The building stands upon 54 stone pillars, and has a tight board floor, any part of which may be easily removed, as occasion may require. With a large corn house 35 feet square, not seen in the engraving, this barn cost $9,000.

In the ground plan, B F represents the main floor or drive-way, 16 x 84; H S, double horse stalls; the space extending the entire length of the barn in front of the stalls, both the horse and cattle stalls, is four feet wide. It is entered by doors at each end; C S represents cattle stalls; C, carriage room, 20 x 20; L, loose boxes, 10 x 16; W, wagon room, 20 x 20.

MODEL BARN. Fig. 25 represents a magnificent barn, commodious in all its proportions, substantially built and of architectural beauty and symmetry. It is perhaps as large and expensive a barn as almost any farmer will desire to build. The main building is 55 x 80 feet. The wings are each 56 feet long; one 31½ feet wide, the other 35 feet. The four leading features of this design are: first, economy of room under a given roof; second, plenty of light; third, plenty of air, and ventilation which would draw off all the deleterious gas as fast as generated; and fourth, convenience to save labor. Saving of manure and many other things were of course included. An important point is the numerous windows, which are hung with pulleys, and may be lowered on warm days in winter and closed on cold days.

The barn is provided with a good stone basement, the plan of which is shown by Fig. 24. This is arranged for hogs, roots and manure. The fixed partitions in the cellar are only two, one inclosing the root cellar, represented by R, and the other outside of that, shutting off a wide cemented passageway, extending from the door at the northeast corner, around two sides of the root cellar, as shown in the basement plan. The divisions marked H are pens for hogs. The remainder of the basement is used for manure.

The main floor (Fig. 26) is entered by several doors. Two double doors open upon a capacious floor in the rear of the horse stalls, which extend through the middle of the main barn. The horse stalls are indicated by H S. A large harness and

FIG. 24.—*Basement Plan for Fig. 25.*

tool room is shown by H R. C R indicates a carriage room. This is situated to the right of the front entrance, and is closed by a sliding door or

partition. There is room on the open part of this floor, behind the horse stalls, and adjacent, to drive in three wagons at a time, and let the horses stand hitched. O X in one of the wings indicates ox stalls. Between these stalls is a ten-foot passage way, through which carts with roots or green feed may be driven, the stairs in the middle being hinged at the ceiling and fastened up. The stalls are seven feet wide and are arranged to tie up two cattle in each. A gutter to conduct off the urine runs along behind each range of stalls, and there are well-secured traps, one in about every 15 feet, through which the manure is dropped to the cellar. The letter C, whenever it occurs in Fig. 26, indicates a trap door of a manure drop.

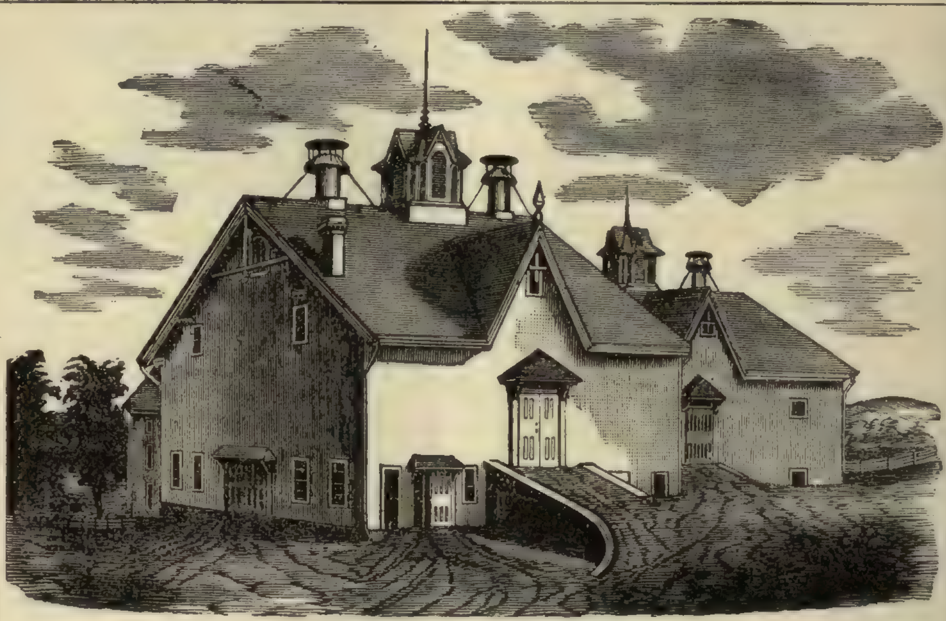


Fig 25.—*Perspective of a Model Barn.*

The cow stalls are in the other wing, and are indicated by the words. To the rear of these are a row of stalls for calves. To the left of these, and shown by L, are two loose rooms, used for lying-in stables for cows. C R indicates a pen for calves, while H B, just across the hallway, is a large horse box. Near the point marked W F. stand the hydrant for flowing water and the trough for mixing feed; and here, too, the shutes for cut feed and grain discharge from the floor above. E R indicates the engine room.

The plan of the hay floor is shown by Fig. 27. Here is where all the grain, hay and straw are stored. Two threshing floors cross the building, and are entered from the high ground on the west by a very easy ascent. The main entrance crosses over an engine room, seen in Fig. 25, and indicated by E R in Fig. 26. This room is built of stone, arched above, and is roomy as well as secure.

By means of a hay-fork and a number of travelers, the hay is taken from the loads and dropped in any part of the immense bays. The forks are worked by one horse, attached to a hoisting machine, of which there are two, placed near the great doors during the haying season.

On this floor are bins for grain and ground feed, as shown by G. These are provided with shutes connecting them with the main floor. There are also hay scales (S) on this floor. This affords the means of being very accurate in many things, in regard to which guess work is ordinarily the rule. The great ventilators, so conspicuous in Fig. 27, pass from the main floor to the roof, and are furnished with doors at different elevations, quite to the top of the mow, thus forming convenient shutes to throw down hay or straw. A long flight of stairs passes from the main floor to the cupola, from which a view may be obtained of the farm and surrounding country. V on this floor indicates ventilating trunks, of which there are four. A points to the stairs to the mow; B, stairs to the cupola; and D, stairs to the main floor.

The basement plan of the above design is given on the preceding page, while the main floor plan, and that of the hay floor, may be found on the following page. The plans very fully explain themselves, and any intelligent carpenter or builder will be able to follow them in the erection of a building. A barn of this kind, only in a modified form,

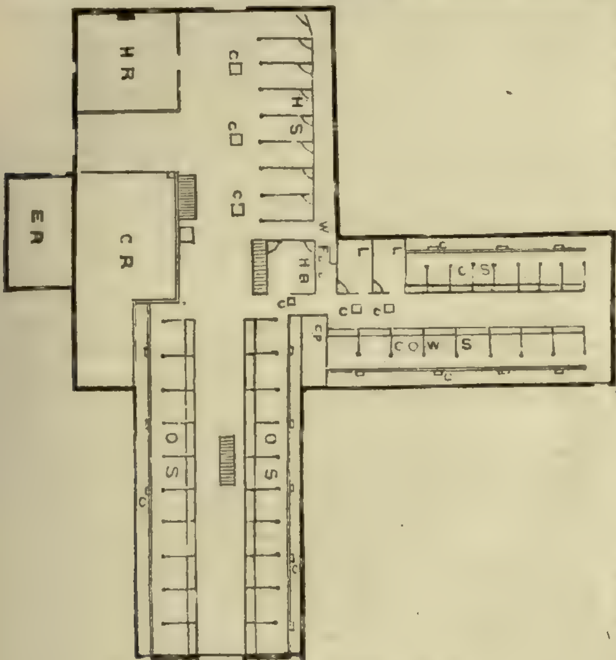


Fig. 26.—*Plan of Main Floor for Fig. 25.*

will be found to meet the wants of large farmers. In these days of railroads and near markets, huge barns are not as essential as formerly, yet many farms demand large buildings.

Fig. 28 represents a very convenient barn for its size and cost. It is 16x22 feet, and 14 feet high, with a wagon-shed across one end. This shed is

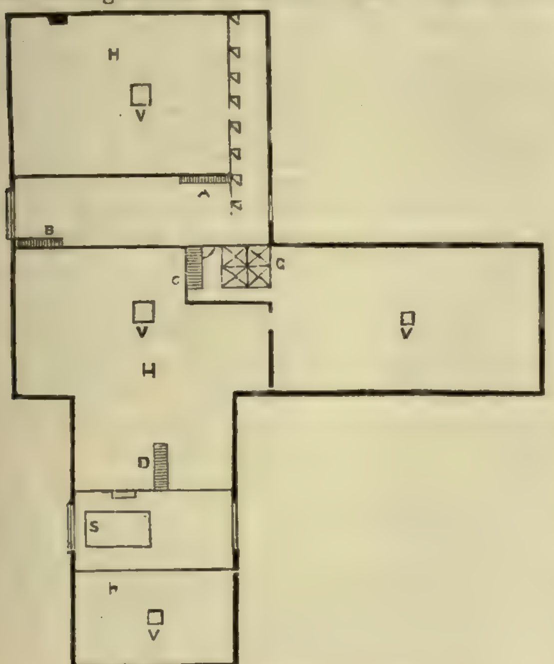


Fig. 27.—*Plan of Hay Floor of Fig. 25.*

8x16 feet, and 7 feet high at the eaves. The first story of the barn is 8½ feet high; it contains a carriage-room, three good stalls with mangers and hay-shutes. There are two windows and double doors in front, and a single door at the back. The oat-bin is under the stairs; the grain is poured in at the top and taken out at the bottom, the lower step being higher and broader than the others, and hinged. The upper floor is of inch matched stuff,

Fig. 28.—*Front Elevation of Barn.*

and the lower one, inch boards doubled, and laid to break joints, making a warmer floor than planks with cracks between them. The siding is of barn boards dressed on one side, and battened with ½-inch by 2-inch battens; the cornice is with one-foot projections. The roof is of 18-inch clear butt pine shingles. Total cost, including foundation and two coats of paint, $175.

Sheep Barn. We give a design of an excellent sheep barn by Figs. 30 and 31. It is 40x90 feet in size. An alley seven feet wide runs lengthwise through the center, as indicated in Fig. 31. This is provided with a floor 2½ feet higher than the pens on either side. At either end of this alley is a sort of step-ladder leading to the hay-loft. The joists over the alley are about 7 feet above it. At one corner of the chamber is a wool-room, and at the other a grain-bin. The breadth given to the alley makes it convenient for feeding, and no hay gets on the sheep. In late spring this barn may be found a convenient place for young calves.

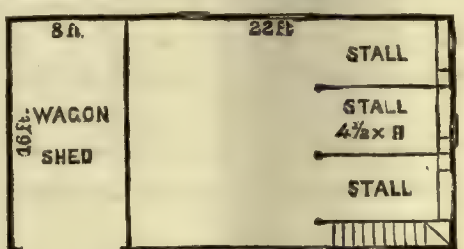


Fig. 29.—*Plan of Floor and Stalls.*

The floor over the pens and alley is all on the same level. Doors are placed on the sides of the building, opening into the loft, through which the hay is pitched. The gates open for the admission of wagon and team. In the ground plan g, g, g, represents the gates in the yards which flank the

pens; d, d, d, doors between pens and yards; w, w, w, windows of pens, and t, t, t, water tanks.

Each pen has a low door entering from the alley, and also a door running into the adjoining pen. The sheep-rack forms the boundary of the pens. Water is supplied to each pen from a pipe

FIG. 30.—*Sheep Barn.*

below ground, and is pumped up by a windmill at some distance from the barn. The water is kept at a uniform level by means of a valve arranged in the reservoir. The back door passing into the yard from each pen is in two parts. The lower door is set in a groove at one edge, and is held to the other with a button. When not in use it is lifted out and set one side. The upper part of

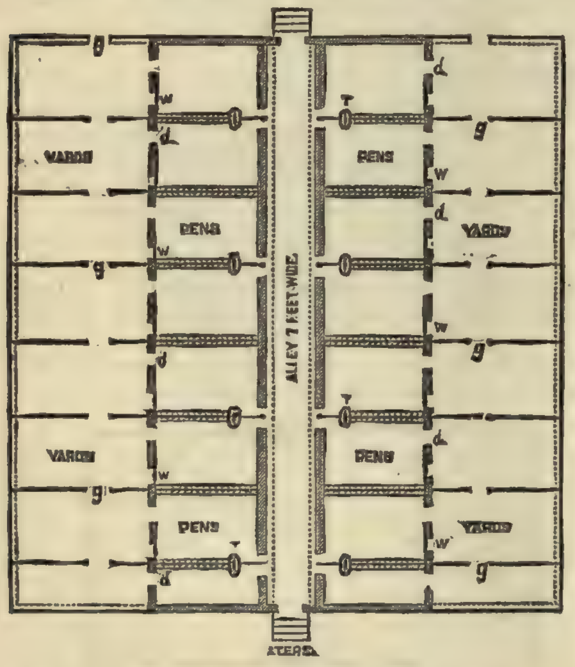


FIG. 31.—*Ground Plan of Sheep Barn, Flanked by Yards.*

the door slides back on rollers above, and is on the outside of the barn. The upper one, when closed, permits a sheep to walk under it; or the lower one may be closed, and the upper open, when occupied by lambs. The pens are 12x16 feet, and the yards outside and adjoining are each 12x25 feet. The pens may be easily varied in width by moving the sheep-rack which divides them. To assist in readily supplying feed from the alley, a slanting board or door inclines toward the alley, and on this the hay or grain is placed on its way to the feeding trough below. These slanting doors are 2½ feet high, and are held in place by long hooks, *b*, at the top. In the summer these doors are set up vertically against the studs, *c* (which form the division between the pens and alley), and are held there by buttons.

Barnacles, instruments used by farriers to put upon the muzzle of a horse when he will not stand quietly. The object of these instruments, and of another called the "twitch," is to produce as much pain in the muzzle as will draw away his attention from the pain caused by shoeing or a surgical operation. The common barnacles are rollers of wood bound together and made to enclose and compass the muzzle. Another kind has handles, and operates like pincers; and a third sort are held together at the top by a ring enclosing buttons. From inconsiderateness or cruelty much unnecessary pain is often inflicted with these instruments. In some instances even the highest degree of pain fails to accomplish the veterinary surgeon's purpose, so that he is obliged to have recourse to the strong means of restraint afforded by the side-line hobbles.

Barometer, an instrument which shows the weight of the atmosphere. In the common kind, the higher the mercury is in the glass tube, the heavier is the air. Allowance must always be made for variations of temperature and of height above the level of the sea. Ordinarily the air is heavier in clear weather than just before a storm, and the mercury correspondingly higher. The greatest and most sudden changes of the barometer generally take place in early summer, when the country is subject to violent storms. The instrument, as marked by opticians, with the words "fair," "change," "storm," etc., is often misleading. To foretell the weather correctly, several things must be considered: See Weather.

Barouche (ba-roosh'), a four-wheeled carriage, with a falling top, a seat on the outside for the driver, and two seats on the inside arranged for four persons to sit facing each other.

Bar-Post, a post sunk in the ground to receive the bars of a passage into a field.

Barracan, a thick, strong stuff, somewhat like camlet; used for outer garments.

Barrel, of flour, is 196 pounds; of pork or rice, 200 pounds. Dry measure, a barrel contains 31½ gallons, which lacks but a half gallon of four bushels, even measure. In the South five bushels of corn, shelled, is sometimes called a barrel.

Barrel, of a boiler, is the cylindrical part, containing the flues.

Barren, not capable of producing fruit, or young; as, a barren tree; a barren cow.

Barrens, land not naturally covered with vegetation; often rich enough, however, for certain cultivated crops, fruit, plants, etc.

Barrow, a light, small carriage, borne or moved by hand; also a male hog castrated; also an artificial cave for keeping fruits and vegetables through the winter.

Bars, in farriery, are those portions of a horse's hoof which are turned inward and from the arches between the heels and the frog. The "bars" of a horse's mouth are the fleshy rows across the upper part, reaching almost to the palate. They form that part of the mouth on which the bit should rest and have its effect, the tongue of the curb bit pressing upon it when pulled by the reins in the hands of the driver.

Bar Shoe, a horseshoe of particular construction, adapted to a tender foot and designed to protect a sore or weak point from pressure by causing the whole weight of the limb to be borne by the other portion of the sole. Its chief feature is a continuation of the common shoe around the heels, and its principal use is in cases of corn, sand-crack and pumiced feet; but it requires to be made thick, and it sometimes presses very injuriously on the heels.

Bar-way, a passage into a field composed of bars made to take out of the posts.

Base-court, the back yard or farmyard.

Basin. The basin of an apple, pear or peach is the depression or hollow at the blossom end, which is opposite the stem end of the fruit.

Basket, a vessel made of twigs, rushes, splinters or other flexible things interwoven. Willow twigs are the usual material. Baskets are made in a great variety of shapes and sizes and styles, with reference to the innumerable purposes for which they are designed. In these days of cheap manufacture a farmer would not be justified in undertaking to make his baskets, but sometimes a young genius or an invalid of the household desires to while away a few tedious hours at this kind of work.

Bass, or **Bast**, the inner bark of the basswood or linden tree, easily torn, after soaking in water for about three months, into strips and shreds, which are useful for making mats, cordage, etc. It is the best material for ligatures in tying up vines and branches in horticulture, for binding grafts, buds, etc. The strips, being ribbon-form, are better for many purposes than cordage or twine.

Bassinet, a wicker basker with a covering or hood over one end, in which young children are placed as in a cradle.

Bat, a piece of brick less than one-half of its length; also a heavy stick or club, especially a piece with one end heavier than the other. The other meanings of this word do not come within the scope of this work.

Bat or **Batting**, a sheet of cotton prepared for filling quilts or comfortables.

Bath: See Hygiene, and Horse, Cattle, Sheep, etc., under the sub-head of Diseases.

Bath-Brick, a preparation of chalky earth in the form of a brick, used for cleaning knives.

Battering-Ram, a large beam carried endwise with great force against an object, in order to beat it down. Sometimes used, however, to jar nuts down from forest trees.

Bay, in a barn, is a low, enclosed place, between the main floor and the end of the building, for the stowing of hay. As a color of horses, it is a kind of dark red, inclining to chestnut. A dark-tinted bay approaches a brown, but is more gay and shining. A bright bay horse is exceedingly beautiful, as he has a reddish tint with a clouded appearance, while the mane and tail are black, and his back has a dark stripe along the spine. Many horses of medium-colored bay have also black manes and tails and the dark stripe along the back. Most dark bay horses have their knees and pasterns black; and several kinds of bays have their whole limbs black from their knees or thighs down to their feet. Most bays which want the stripe along the back have a black color over the region of the kidneys, and this runs off by an imperceptible gradation to a light color toward the belly and flank. Some of these bays are inclined to be brown, and are more or less dappled. Horses of all the different shades of bay present a pleasing appearance; and unless they are spoiled by some accident when colts, they are generally well formed and healthy.

Bay Leaves, often used in seasoning food, are the leaves of the cherry laurel, valued for their bitter-almond flavor. Care should be taken not to use too much of this article, as it contains prussic acid, a virulent poison.

Bay Rum, a popular perfume distilled from the leaves of the bay plant. A good imitation can be made by mixing 10 drams of oil of bay, 1 dram of oil of pimento, 2 ounces of acetic ether, 3 gallons of alcohol and 2½ gallons of water, and, after two weeks' standing, filtering it. A cheaper imitation is obtained by saturating ¼ pound block of magnesium carbonate with oil of bay, pulverizing, placing in a filter and pouring water through it; then add alcohol. Or ½ dram bay oil in 1 ounce

of best alcohol 12 hours, then add a gill of cologne spirits and 15 ounces clear water.

Bay Window, one that forms a bay or recess in a room and projects outward from the wall; sometimes incorrectly called "bow" window.

Bead. To "draw a bead" is to take aim, with a gun, alluding to a small piece of metal used in taking aim, called the bead.

Beagle, a small hound, or hunting dog, formerly used in hunting hares.

Beak, in farriery, a little shoe, at the toe, about an inch long, turned up and fastened upon the fore part or the hoof.

Beaker, a large drinking-cup.

Beal, a small inflammatory tumor or pustule.

Beam, of a plow, the main piece, to which the other parts of the plow and the teams are attached; of an engine, the main lever, turning on a center and communicating power from the end of the pitman to the working-rod: called also "working-beam," or "walking-beam;" also, a heavy, square timber used in the frame of a building.

Beam-filling, the filling in of mason work between beams or joists.

Beans. In the United States the bean is a tender annual, either dwarf or climbing, and is cultivated both for the succulent green pods and ripe seeds. The dwarf varieties vary in height from twelve to twenty-four inches, and require no poles. The climbing varieties require poles for their support. There are varieties intermedial between the bush and climbing bean, but which do not require support, as the White Marrow, one of the best of the white varieties, to be used as dry, ripe beans. When ripe, the crop is allowed to stand until the pods are quite dry, and pulled by the roots while moist with dew, the roots being pressed together in the hand and the handfuls set upon their tops in the windows to dry. When sufficiently cured, they are to be laid loosely on scaffolds or laid around branched stakes, the roots in and the tops pointing down, to become quite dry before threshing. When threshed, the beans should be cleaned from the chaff in a fanning-mill and be spread on a smooth, airy floor and turned, from time to time, until they are entirely cured; thus they will not heat and mold when put in barrels. For the general crop of dry beans, they should not be planted until the days and nights are warm, or about the first week in June in the North, since the whole family are inter-tropical plants and exceedingly impatient, not only of frost, but cold storms. The pole varieties should be planted, the lower-growing sorts three feet apart one way, by about two feet the other, and the taller climbers, as Lima, etc., four feet one way by three feet the other. Select light, warm soil, and plant when danger from frost is past, in drills two to two and a half feet apart, dropping the beans about two inches apart in the drill, and cover one inch deep. Keep the ground clean and loose by frequent hoeing, but do not draw the earth up to the plants. Avoid working among them when they are wet, as it will tend to make them rust. For vine or pole beans, set the poles three by three or four feet apart, and plant six to eight beans with the eyes downward around each pole, thinning to four healthy plants when they are up; otherwise cultivate as the bush or bunch bean. They crave a stronger soil, and do best in a sheltered situation. As a rule the dwarf varieties are the earliest and hardiest.

Three species of bean weevil exist, and one is fast spreading over the country. Late planting is a partial remedy, but the most effectual mode is to heat the beans as soon as harvested, to, say 160° or 175°, for a few minutes, which will kill the bugs, but not the vitality of the bean. The ash-gray blister beetle and the Virginia ermine moth sometimes infesting the bean may be picked by hand and destroyed. Chickens catch these insects, but they also pick off the bean-blossoms, and do as much harm as good—sometimes more.

CUT-WORMS, of which there are several species, are generally a dusty, gray or drab color, and, when grown, about an inch in length. They perform their work at night, not being able to stand the sun. The best time to find them is early in the morning before the sun makes its appearance. Remedies: Plow the land early in the fall, so that the bluebird, robin and grakle may have a cut-worm feast before leaving for more genial climes. In garden work, syringe the plants with strong soap suds at the rate of three pounds of soap to 15 gallons of water. Pass along the field in the morning, cut the stock and discover the marauder, and dig out and destroy with the hand, is the only sure method: See also Corn.

FIG. 1.—*Cut-Worm.*

GREEN BEANS may be dried for winter use thus: Pick them while they are tender, cut the ends and strings from them, put them in a pan of hot water, and scald until they change color, then put them on papers and dry in the sun; take them in at night so they will not be subject to the dew. After they are dry, put them in a sack and hang where they will be kept perfectly dry. They want to be soaked over night before cooking. The same recipe is very nice for preparing peas for table use in winter. An old custom is to dry them in the shade, where the wind will strike them.

VARIETIES. Of the dwarf, snap, bush or bunch beans the following are the leading varieties:

Early China, or *Red-Eye*. An old, popular, early variety.

Early Feejee. Very early, hardy and yields abundantly.

Early Valentine. Pod long, round and tender; an excellent, standard early bean for this latitude.

Early Mohawk. Very hardy, early and productive.

Early Yellow Six-Weeks. A standard sort of the early variety.

Early Rachel. A long, straight-podded, early kind.

Dwarf Golden Wax or *York Dwarf Wax.* A new variety which is extraordinarily prolific, and has very large beans and pods.

Rose. Another new and promising variety.

White Valentine. A new and excellent sort.

Red Speckled Valentine. This is a new variety, and gives promise of being a standard bean.

Dwarf German Wax, the long variety. Considered more productive than the round sort. This bean is a great favorite with almost every one.

Dwarf German Wax, the round variety. White pods, beans pure white, very early; first-rate.

White Wax. An excellent new snap-short.

Dun Cranberry. One of the very best for stringing; yield first-rate; early; good either as a green or dry shell bean.

Refugee, or *Thousand to One.* Very prolific.

Intermediate Horticultural. A half-bush variety, very prolific; an excellent substitute for the Pole Horticultural; a superior sort for market gardeners.

Improved Yellow-Eye. One of the best varieties for baking; remarkably healthy, vigorous and prolific.

Concord Bush. A fine variety.

True White-Pea Bean. Fine for baking; beans round as peas.

Navy or *Pea Bean.* A standard sort for field culture; almost round; very productive.

White Medium. A white bush variety largely used by the government.

White Marrow. Early; a standard sort for field cultivation.

Red Kidney. A standard red sort.

Of the POLE, or running varieties, the following are recommended:

Large Lima. Surpasses all other shell beans in quality, but requires a longer season than we have in the Northwest.

Dreer's Improved Lima. Rather later, but more prolific than large.

Mottled Cranberry. Long-podded; very productive and popular.

London Horticultural, or *Wren's Egg.* Pods elegantly striped; excellent for string or shell; productive.

Early Lima Sieva, or *Frost Bean.* Two weeks earlier than large Lima, but requires the entire season in this latitude.

Rhode Island Butter. One of the very best to eat green-shelled.

Golden Butter. A new French wax bean resembling the Indian Chief, but is a better bearer and the pods are rather longer; early.

Yellow-Podded White Wax. Stringless; surpasses the Giant Wax in earliness and productiveness.

Marblehead Champion. Earliest of all; a string bean.

Caroline Pole Bean. New, prolific.

Kentucky Wonder. A snap bean; the most productive of all; pods nearly a foot long.

Lamberson's White. A good, prolific snap bean; color white.

Indian Chief, Black Algerian. Always in order for stringing; pods yellowish white and almost transparent.

Boston Market Pole Cranberry. Standard; very prolific.

Concord. Resembles the Horticultural, but takes to the pole better, is earlier, healthy and prolific; good as string or shell.

Case-Knife. A white bean of great richness.

Giant Wax. Always a snap bean; never stringy; pods yellowish white, very long and remarkably tender.

Southern Prolific Bean. The best pole bean.

White Pole Cranberry. A capital late variety, particularly as a string bean; a little tender.

Painted Lady. Either for ornament or use.

Broad Winsor. A large and excellent English bean, which should be planted two or three weeks earlier than the common bean, in rows two feet apart and six inches apart in the row; covering two inches deep. Pinch off the tops of the plants when the young pods first appear.

BEANS, TO COOK. *String Beans.* Break off both ends and string carefully; if necessary, pare both edges with a knife. Cut the beans in pieces an inch long and put in cold water a few minutes. Drain and put them into boiling water with a piece of bacon or salt pork. Boil quickly for half an hour, or till tender. Drain in a colander and dish with plenty of butter.

Boiled Beans. In preparing dry beans for the table, they should be first soaked in water or parboiled, and the water drained from them, else they will taste rank. Use a large quantity of water, and pour it off when the beans have fully swelled, and finish cooking them in fresh water. If meat is cooked with them, it should first be boiled nearly done in a separate pot, and then put in with the beans. Bean soup is made by finishing off a mess of boiled beans in a large quantity of water, either with the meat soup or milk added. For this purpose, mashing the softened beans is a great aid. Some also pass them through a colander, to take the skins out. Black pepper is the only aromatic admissible in a dish of beans.

Baked Beans First parboil them as above described, put in a piece of pork, bacon or suet, with

a little pepper, and bake in a steady oven for several hours. Basting may be required to prevent the beans on the surface from drying and becoming hard. Saleratus, a teaspoonful to the quart of beans, dissolved in them before baking, greatly improves them.

Lima Beans. Shell them into cold water; let them lie half an hour or longer, put them into a saucepan with plenty of boiling water, a little salt, and cook till tender. Drain and butter well and pepper to taste.

Another: Put a pint of shelled beans in boiling salted water, enough to cover. Cook until tender, then drain them. Melt a piece of butter the size of an egg, and mix an even tablespoonful of flour with it; add a little meat broth to make a smooth sauce, or use water instead. Put the beans in the sauce and set them at the side of the fire for fifteen minutes. Just before serving add a tablespoonful of chopped parsley, and season to taste with salt and pepper.

Pork and Beans. Take one pint of long white winter beans and boil them in water until done, and then have ready some fat sliced pork as if to fry; fresh pork, peppered and salted, or pickled side soaked in cold water over night; place the beans in a baking-dish, put the meat on the beans, and bake until the meat is done.

Beans and Bacon. Put a pint of beans into cold water over-night. Cut half a pound of bacon into half-inch dice, put the bacon and beans into a clean saucepan with just sufficient cold water to cover them; let the beans boil till they are tender, then stir in one or two tablespoonfuls of flour, a little pepper, and a bouquet garni, with a clove of garlic or an eschalot. Let the contents simmer slowly, and when the sauce is sufficiently thickened the beans and bacon are ready. The beans, if old, will require long soaking, or much longer boiling than is is desirable for the bacon.

Fat Pork or Bacon and Beans. Soak a quart of beans in cold water for ten or twelve hours, then boil them with a little salt till they are tender. Take a common yellow dish, and put the beans at the bottom, and on a tripod place two pounds of fat bacon or pork and bake for an hour, or the meat may be roasted and the beans placed in the dripping-pan. The beans should be quite tender before baking.

Bear, in commercial parlance, is one who contracts to deliver, at a specified future time, stocks which he does not own; a "bull" is one who contracts to take them. Hence, in the intervening time, it is the interest of the former to depress stocks, as the bear pulls down with his strong paws, and of the latter to raise stocks, as the bull throws upward with his horns. The stock is, in fact, never delivered, and was never meant to be. When the time for delivery arrives, the losing party pays the difference between the price of the stock then and at the time when the contract was made. The whole transaction is therefore a species of gambling, and has but a temporary influence upon the markets.

Beard. Some men do not pay sufficient attention to their beard. Almost any man's beard and whiskers look much better for being trimmed; by this we mean the cutting off of all straggling locks and hairs, leaving the beard in a smooth, neat form. The principle, indeed, does not differ at all from what we are supposed to observe in trimming the hair of the head. As to any particular shape to wear the beard and whiskers, the rules and conditions are too prolix for enumeration here. The general practice is to let the beard grow wherever it is naturally inclined to grow heaviest, and to shave the other portions of the beard surface. Of course it is understood that, considered as a nice point in physiology, all the beard should be permitted to grow; at least, that all the beard surface should be covered with its natural covering; but there is no use whatever in carrying about with you loose and straggling portions, which project so far out from the face as to be no protection to it, and still less an ornament. The heavy and long mustache, so much in fashion at the present day, looks well, but it is an obstacle to clean eating and drinking.

We have no confidence in any of the vaunted remedies for "making the beard grow." For dyes, see Hair Dyes.

To shave properly, always wash the beard well with soap and clear cold water, and rub it dry before applying the razor to it; then apply the lather, and the more you use the better; never use warm water, for by doing so you make a tender face. The best time to shave is in the morning just after the bath: See also Razor.

Bearing, the surface exposed to friction, as at the journals of machinery, or "spindles" of a wagon.

Beat. A horse is said to "beat the dust" when he takes in too little ground with his fore feet, or when he performs his curvets too precipitately or too slow. To "beat the hoof" is to walk, or go on foot. A stag is said to "beat up and down" when he runs first one way and then the other.

Beaufet (bo'fet), a niche, cupboard or sideboard for plate, china, glass, etc.; a buffet.

Beaver, as the name of a species of woolen cloth, signifies a heavy kind, generally felted, and used for making overcoats, hats, etc.

Beaverteen, a kind of fustian made of coarse twilled cotton, shorn after dyeing.

Bed, in machinery, is the foundation on which a machine rests.

Bed. BEDSTEAD. Many new styles of bedsteads and mattresses are offered to the public,—too numerous to mention here. The best we can do is to indicate the general principles of a good bedstead. Certain points are apt to be left too weak by the manufacturers, as the fastenings at the ends of the side-rails, the support for the mattress frame, freedom from harbors for vermin, etc. Metallic bedsteads, although costing more at first, are generally preferred, on account of the ease with which they can be kept free from vermin. Ordinary slat bottoms generally have the slats too far apart. It would be better to have a continuous floor for a bottom. Several varieties of folding bedsteads are in use. Those which close up with all the bedding contained are liable to the serious objection that they prevent an airing of the clothes, but they are convenient where the room allowed for a bed is limited. Cots, hammocks and lounge or sofa bedsteads are economical conveniences of considerable value.

BEDDING. 1. *The Mattress*. Many substances have been used for the filling of mattresses and ticks, as feathers, hair of different animals, cork shavings, corn-husks, straw, sea-weed, moss, leaves, various vegetable fibers, hay, wire springs, etc. Feathers are unhealthful; and as to the other articles used, the choice may be left to the taste and idiosyncrasies. 2. *Covers*. The American method of sleeping with cotton sheets next the body, and in cold weather with woolen blankets or comforters next outside these, seems to be the best system, in a hygienic point of view. All other matters on this head can be safely left to the taste and fancy of individuals. See also Sleeping.

Bed-bugs. Cleanliness is an important thing in keeping out these pests. It is important that bed-rooms have no cracks or crevices where the bugs can lurk and lay their eggs. There should not be in bed-rooms piles of old rags, paper or anything that harbors dirt or secretes vermin. Anything of this sort promotes the fecundity and growth of bed-bugs. Besides being kept always sweet and clean, every part of a bedstead and bedroom should be exposed and accessible, so that the first appearance of the pests can be noticed and acted upon. Vigilance on the part of a housekeeper, even in an old domicile, will do much toward keeping the pests at bay, and eventually exterminating them. Particular care should be taken in early spring. As early as March and April a careful examination of beds and all harbors for the eggs of bugs should be made, and there should be a thorough cleansing of the bed-room furniture. To kill the bugs and their eggs, use either of the following preparations: 1. Mix together 2 ounces of camphor, 4 ounces spirits turpentine, 1 ounce corrosive sublimate, and one pint alcohol. 2. Distilled vinegar, or diluted good vinegar, a pint; camphor, ½ ounce, dissolve. 3. White arsenic, 2 ounces; lard, 13 ounces; corrosive sublimate, ¼ ounce; Venetian red, ¼ ounce (deadly poison). 4. Strong mercurial ointment, 1 ounce; soft soap, 1 ounce; oil of turpentine, a pint. 5. Gasoline or benzine and coal oil are excellent adjuncts, with cleanliness, in ridding a bed of these pests. 6. When they have a lodgment in the wall, fill all the apertures with a mixture of soft soap and Scotch snuff. 7. A strong decoction of red pepper applied to bedsteads will either kill or drive them away. 8. Take lamp oil, to which add 10 cents' worth of quicksilver. Put it into all the cracks around the bed, and the bugs will soon disappear. First, the bedstead should be scalded and wiped dry, and the mixture put on with a feather. 9. Quicksilver mixed with the white of an egg serves the same purpose as the above. 10. Rub the bedstead in the joints with equal parts of turpentine and kerosene oil, and the cracks of the surface, in rooms where there are many. 11. Persian insect powder. 12. Several more innocent remedies are recommended, as tomato vines and leaves, and other herbs. 13. Re-painting and varnishing is a thorough and effectual method. Fill all crevices with putty or hard soap.

To destroy bed-bugs in papered rooms, clean the paint of the room thoroughly, and set in the middle of the room a dish containing 4 ounces of brimstone. Light it and close the room as tightly as possible, stopping the keyhole of the door with paper, to keep the fumes of the brimstone in the room. Let it remain for three or four hours, then open the windows and air thoroughly. The brimstone will be found to have also bleached the paint if it is of a yellowish white.

Bed chamber. Sweet, clean, airy bed-chambers are a luxury. Every room occupied during the night should be thrown open to the freest exposure of sun and air the next morning. The clothes should be thrown down from the bed, mattress turned over, and window opened from both top and bottom, and left so one-half hour at least. The element of thoroughness is one of the best points in a good chamber-maid. Through and through, from the dusting of the walls and ceiling and the bed-slats on sweeping days, to the wiping off the picture on the bureau or brushing up the hearth each morning, thoroughness should be the motto. Mirrors can be cleaned with a soft cloth dipped in alcohol. Linseed oil and vinegar boiled together make a very good furniture polish. There is a little bug that infests matting which nothing but constant vigilance will destroy, killing every one. Such bugs are effectually killed by turpentine. In furnishing bed-chambers, artistic taste demands that paper for the walls and paint for the woodwork should harmonize in color and design. For

rooms used chiefly in winter, dark colors are suitable. For summer apartments, lighter shades are desirable, and while in large rooms large patterns are not out of place, in smaller-sized rooms the figure of the paper should correspond. It requires a high ceiling for a high dado and deep frieze to look well, while some flitting butterfly or delicate flower pattern gives a summer airiness to the country chamber. Patterns in wall papers, as in most other things, change in fashion, and the curious figures and landscapes of thirty years ago are now never seen. Within the last five or six years decorative art has been the rage, and wall papers have received due attention. For a short time plain, deep-colored paper was much in vogue, with a gilt band as frieze. Now more elaborate, artistic patterns are in use.

The furniture of the chamber ought of course to be in keeping with the rest of the house, and fashion prescribes regular sets. Some will vary to suit their own convenience. If it is required to use the room as a sitting-room during the day, sofa and other furniture beds can be obtained, at all prices, from ten dollars to one hundred and fifty dollars, though, unless the room is really needed, it is better to use the chamber for a sleeping apartment only, thus giving plenty of opportunity for the room and bedding to be well aired during the day.

Bed-pan, a vessel shaped for the convenient use of a bed-ridden patient in making water. To be had at drug or crockery stores.

Bed-sores, running sores caused by keeping the bed, as an invalid, for a long time. Treatment: Gently press out the pus, wash the part, and then cover with collodion when this is dry, fix over it some soft lint or cotton. Or, wash several times a day with a lotion of 1 tablespoonful of powdered alum to 1 teacupful of whisky. Or, apply the white of an egg well beaten and mixed with spirits of wine.

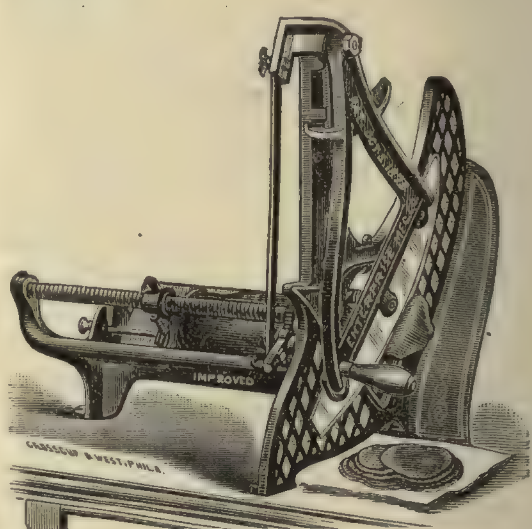
Beech, a forest tree of the oak family. Very abundant in the Eastern United States as far west as Lake Michigan; west of that line it is not found.

Beef. To FATTEN BEEF: See Cattle and Fattening. The parts of a beef are named in the article Carving.

To CURE BEEF. Boil in 4 gallons of water 2 pounds of brown sugar, 3 ounces of saltpeter and 10 pounds of salt until all is dissolved; skim as fast as the scum rises. Pack the meat closely in a barrel, and when the brine is quite cold pour it on the meat. The above quantity of brine is sufficient for 200 pounds of beef. If dried beef is wanted, pieces may be taken from the pickle in five or six weeks and smoked.

To DRY BEEF, cut into slices from 2 to 6 ounces in weight, boil for five or six minutes in just water enough to cover the meat. Lay it in a drying stove, keeping the temperature at about 122° Fahr. In about two days the meat will be completely dry, having lost two-thirds its weight. Add a little salt and spice, especially coriander, to the liquor or soup in which the meat was immersed, and then evaporate it to a gelatinous consistence. When the flesh is perfectly dry, dip it, piece by piece, in the gelatinous matter liquefied by a gentle heat, and replace it in the stove to dry, repeating this varnishing and drying two or three times, so as to get the coating uniformly thick. Meat dried in this way will keep for more than a year.

To SMOKE BEEF, expose the meat previously salted to wood smoke, in a smoke-house, into which the smoke is admitted by flues at the bottom of the side walls. The meat absorbs the pyroligneous acid of the smoke and is dried at the same time. It can be protected from soot by rubbing over with bran or wrapping with a cloth. The smoke from oak or beech wood is preferable, and the smoking is better slow and gentle than rapid and powerful. When the beef is once smoked or dried a beef-cutter is very convenient. We give an illustration of one made by the Enterprise Manufacturing Company, of Philadelphia.



Smoked-Beef Cutter.

The knife is suspended pendulum-like, and with each stroke cuts a slice clean, clear and quickly, taking but a few moments to shave down a pound of beef. Green or soft beef can be shaved equally well. The automatic feed can be regulated to cut from shavings as thin as tissue to slices one-eighth of an inch thick. It is also adapted to slicing potatoes, fruits and vegetables of all kinds.

To Keep Fresh, place the meat on a wooden support (or suspend it), in a close vessel, on the bottom of which some strong acetic acid has been poured.

Marbled Beef is that in which the fat and lean are intermingled in streaks and spots, so that its cut surface presents a mottled or marbled appearance. It is produced by beeves of delicate structure, and the art of producing it has not yet been brought under the control of man. Whether a given animal will produce such beef cannot be foretold with certainty.

Beef Tea. To make beef tea, cut a pound of fresh beef into thin slices, simmer with a quart of water 20 minutes; after it has once boiled and been skimmed, season, if approved. Still another method is to cut lean, tender beef into small pieces, put them into a bottle without water, cork and set into a pot of cold water; then put on the stove and boil for one hour. Season to taste.

To Boil Beef. Reckon the time from the water comes to a boil. Keep the pot boiling, but let it boil very slowly. If you let the pot cease boiling you will be deceived in your time; therefore watch that it does not stop, and keep up a good fire. Just before the pot boils the scum rises. Be sure to skim it off carefully, or it will fall back and adhere to the meat and disfigure it sadly. When you have well skimmed the pot, put in a little cold water, which will cause the scum to rise again. The more carefully you skim the cleaner and nicer the meat boiled will look. Put your meat in cold water; a quart of cold water to every pound of meat. Allow 20 minutes to the pound from the time the pot boils and the scum rises. It is more profitable to boil than to roast meat. Those portions of the ox known to the butchers as the brisket and the plate make by far the best boiling pieces.

Beef a la Mode. Take a piece of meat (cross-rib is the best); put a slice of bacon or some lard in the bottom of the pot, then the meat, and fill up with water till the meat is covered; then take two onions, some peppercorns, cloves, bay leaves, one carrot, and a crust of brown bread, salt and some vinegar; throw all this in over the beef; keep the pot well covered; fill up with more hot water if it boils down, and let it boil three hours; then parch a tablespoonful of flour, with some butter, a nice brown, thin with the gravy, and let it boil up once more with the meat; then put the meat in a deep dish and strain the gravy over it; add more vinegar to taste; serve with fried potatoes and red cabbage.

Boiled Corned Beef. Wash it well, put it in a pot, and, if very salt, cover well with cold water; if only slightly corned, use boiling water; skim often while boiling, and allow at least half an hour for every pound of meat. If it is to be eaten cold, do not remove as soon as done, but allow it to remain in the liquor until nearly cold; then lay it in an earthen dish with a piece of board upon it, and press with a stone or a couple of flat-irons.

Savory Beef. Take a shin of beef from the hind quarter, saw it into four pieces, put it into a pot and boil it until the meat and gristle drop from the bones; chop the meat very fine, put it in a dish, and season it with a little salt, pepper, cloves and sage, to your taste; pour in the liquor in which the meat was boiled, and place it away to harden; cut in slices and serve cold.

Beef-Steak. The tender-loin is the best piece for broiling. A steak from the round or shoulder clod is good, and comes cheaper. If the beef is not very tender, it should be laid on a board and pounded, before broiling or frying it. Wash it in cold water, then lay it on a gridiron, place it on a hot bed of coals, and broil it as quickly as possible, without burning it. If broiled slowly, it will not be good. It takes from 15 to 20 minutes to broil a steak. For seven or eight pounds of beef cut up about a quarter of a pound of butter. Heat the platter very hot that the steak is to be put on, lay the butter on it, take up the steak, salt and pepper it on both sides. Beef-steak, to be good, should be eaten as soon as cooked. A few slices of salt pork broiled with the steak makes a rich gravy, with a very little butter. There should always be a trough to catch the juice of the meat when broiled. The same pieces that are good broiled are good for frying. Fry a few slices of salt pork brown, then take them up and put in the beef. When brown on both sides take it up, take the pan off the fire, to let the fat cool; when cool, turn in half a teacup of water, mix a couple of teaspoonfuls of flour with a little water, stir it into the fat, put the pan back on the fire, stir it till it boils up, then turn it over the beef.

Roast Beef. The tender-loin, the first and second cuts off the rack, are the best roasting pieces; the third and fourth cuts are good. When the meat is put to the fire, a little salt should be sprinkled on it, and the bony side turned toward the fire first. When the bones get well heated through, turn the meat, and keep a brisk fire; baste it frequently while roasting. There should be a tablespoonful of water put into the dripping-pan when the meat is put down to roast. If it is a thick piece, allow 15 minutes to each pound to roast it in; if thin, less time will be required. A piece that seems a little dry or tough should be first steamed half an hour, by putting it into a dripping-pan with half a pint of water and turned over occasionally.

Sirloins and ribs of beef are very extravagant joints, from the weight of bone. The roasting side of the round part of the buttock, and the part called the "top-side," are the most profitable for family eating. The mouse buttock is used for stewing; shin is used for soup or stewing.

Beef Stew. Take three pounds of beef, navel piece is the best, cut in inch-square pieces; peel and slice four or five onions; put a layer of meat in the bottom of the pot, then a layer of onions, and so on until used up; season each layer with pepper and salt; cover with boiling water, boil slowly and keep the pot covered. Peel a quart of potatoes, cut into small pieces; add the potatoes about half an hour before serving.

Beef Stewed with Onions. Cut two pounds of tender beef into small pieces, season with pepper and salt; slice one or two onions and add to it, with water enough to make a gravy; let it stew slowly till the beef is thoroughly cooked, then add some pieces of butter rolled in flour, enough to make a rich gravy. Cold beef may be cooked in the same way, but the onions must then be cooked before adding them to the meat. Add more boiling water if it dries too fast.

Minced Beef. Mince about a pound and a half of beef with six ounces of bacon and two onions, seasoning it highly with pepper and nutmeg. Take a sufficient quantity of stock made from bones, and any trimmings, a piece of butter rolled in flour, and a little browning; make it hot and strain it over the mince; put the whole into a stewpan, let it simmer for a few minutes, and serve it on a hot dish with sippets of toasted bread, and a poached or hard-boiled egg divided and placed on each sippet arranged around the edge of the dish. It is also served surrounded by a wall of mashed potatoes, with two poached eggs lying on the top of it.

To Dress Cold Beef. Mince it fine with pepper, salt and onions, and some rich gravy, and put it into scollop-tins three-fourths full; fill them up with mashed potatoes and brown in the oven.

Beef Balls or Patties. Take a piece of beef boiled tender, chop it very finely with an onion, season with salt and pepper, add parsley, bread crumbs, lemon peel and grated nutmeg; moisten it with an egg, mix well together and roll it into balls, or roll out and cut into shapes like apple puffs. Then dip them in flour and fry them in boiling lard or fresh drippings. Serve them with thickened brown gravy, or fried bread crumbs.

Spiced Corned Beef. For a rump of beef weighing 30 pounds, from which the bones have been taken, use 1 ounce saltpeter, 1 pint sugar and 1 pint salt. Pulverize the saltpeter and mix with ½ teacup sugar and ½ teacup salt. Rub this thoroughly into the beef, cutting it so that it may penetrate well. Let it lie 24 hours. Mix the rest of the sugar and salt and rub well over the beef. Then turn and rub with the brine that is made, every day for 10 days. Take it out and drain for 24 hours. Mix three tablespoonfuls black pepper, 1 ounce cloves, 1½ ounces allspice, 1½ ounces cinnamon, 1 nutmeg. Rub this well into the beef and tie it up. To do this, roll it tightly and wind with twine, fastening it every round, which should be about 1½ inches apart. It is ready for use in two or three days. To cook, shave very thin, and throw into a hot spider in which is a piece of butter, and cook only long enough to change the color. For variety break a fresh egg, and stir in with the meat when cooking.

Beef Tongue (corned or smoked). Soak the tongue twenty-four hours before boiling. It will require from three to four hours, according to size. The skin should always be removed as soon as it is taken from the pot. An economical method is to lay the tongue, as soon as the skin is removed, in a jar, coiled up with the tip outside the root, and a weight upon it. When it is cold, loosen the sides with a knife, and turn it out.

Beef Liver. Slice the liver and pour boiling water over it; wipe dry and cut it into very small pieces. Fry slices of fat, salt pork until brown; take out the pork and fry the liver in the fat; cook thoroughly. When done pour a little water over the liver and thicken with a little flour and water, mixed smooth. Salt to taste.

Calf's Head, Boiled. Let the butcher split the head in halves. Take out the eyes and the snout bone; then lay it in cold water to soak, two hours before boiling; take out the brains and wash them well in several waters, then lay them in cold water. Put the head together, and lay it in a good-sized pot; cover it with cold water and throw in a tablespoonful of salt; let it boil slowly for two or three hours. When it has boiled a little more than an hour, take about a quart of the liquor and put into a stewpan for the gravy; add to it some salt, pepper, a little parsley chopped fine, a tablespoonful of lemon pickle, and then boil. Beat up an egg lightly, with two tablespoonfuls of flour, then remove carefully the skin from the brains, and beat them up with the egg and flour. When well beaten thicken the gravy with it, and stew about ten minutes, when it is ready for serving.

Calf's Liver and Bacon. Soak two or three livers in cold water for half an hour, then dry it in a cloth, and cut into thin, narrow slices; take about a pound of bacon, or as much as you may require, and cut the same number of thin slices that you have of liver; fry the bacon lightly, take it out and keep it hot; then fry the liver in the same pan, seasoning it with pepper and salt, and dredge over it a little flour. When it is a nice brown, arrange it around the dish with a roll of bacon between each slice. Pour off the fat from the pan, put in about two ounces of butter, well rubbed in flour to thicken the gravy; squeeze in the juice of a lemon and add a cupful of hot water; boil it, and pour into the center of the dish. Serve it garnished with forcemeat balls or slices of lemon.

Bee-Keeping is not only a source of profit, but also affords the greatest pleasure to those who become interested in the science. There is a fascination about the apiary which is indescribable. The instincts and habits of the bee are so inexplicable and marvelous that those who study it are continually surprised with new and attractive revelations. Those who are quick to observe, and are cautious and prompt, may, with almost certain success, make bee culture a specialty. Every farmer should devote a portion of his time to the art, and provide his own table, at least, with the delicious and wholesome sweet furnished by the apiary. While the following article is sufficiently full and elaborate to instruct the beginner in the science of apiculture, yet the developments in the art are so rapid that it becomes necessary for one to keep constantly posted. A journal devoted to apiculture should be perused by one who expects to make a success of bee-keeping, and we feel that the *Weekly Bee Journal* of Chicago, Ill., is one to be recommended.

From a financial standpoint bee-keeping as a specialty is a most profitable occupation. The comparatively small amount of capital required, the relatively small amount of labor and expense attending its operation, and the abundant reward to those who follow it intelligently, should attract the attention of many persons who would make excellent and successful bee-keepers. We are largely indebted to Mr. Thomas G. Newman, editor and publisher of the *American Bee Journal*, Chicago, Ill., for the information contained in this article. Mr. Newman takes a particular interest in bee culture, and he is now recognized authority on all matters relating to the science; and few men in America have a greater fund of practical knowledge of this fascinating art than he.

THE QUEEN. A "colony" of bees contains a fertile queen, thirty to forty thousand workers, and in some seasons a few hundred of drones. The queen is the only perfect female in the colony, and is the mother of it. Her only duty is to lay the eggs for the propagation of the species. She is a little larger around the body than the worker, but not as large as the drone. Her body is longer than the worker, but her wings are only about two-thirds of the length of the body, her abdomen gradually tapering to a point. She has a sting, but uses it only upon royalty. Her development is as follows: Having passed three days in the egg and five in the larval state, the workers close the cell, and the future queen commences to spin her cocoon, which occupies about a day.

FIG. I. *Larva of Bee*

Then, apparently exhausted by her labors, for three days she obtains complete repose, and on the sixteenth day, as a perfect queen, she emerges from the cell. The strength of the colony and the character of the season may vary it a day or so. She has been known to come forth as early as the ninth day.

When the embryo queen is nearly mature, within twelve to sixteen hours of emerging, the bees begin to demolish the exterior compartment, or extension of the top of the cell, reducing it to a level with the outer edge of the cap of the cell proper. The convex cap, being then very prominent, is very liable to be injured, and to protect it from injury the bees coat it with a fresh layer of wax, making it nearly as thick as the walls of the cell. The young queen pierces a hole through the edge of the cover with her mandibles, and then makes a circular cut along its periphery. Being nearly detached from the cell walls, the cap drops, opening a circular passage through which the queen emerges from her home.

FIG. 2.—*Finished Queen Cell, sealed over.*
a, convex cap; b, b, the extension of the cell.

From the egg to the queen emerging from the cell takes sixteen days. She is then a virgin queen, and for five or six days she moves around in much the same manner as a worker bee, helping herself to honey from uncapped cells.

FIG. 3.—*Ripe Queen Cell, with the exterior compartment removed.*
a, the convex cap.

About the fifth day, if the weather is pleasant, she may be seen crawling about the entrance of the hive, and if the next day is propitious, she may try her wings some from the alighting board. She will appear somewhat excited, but after awhile she will mount up and circle around, increasing the distance each time, in order that she may mark the hive and insure a safe return from her wedding flight.

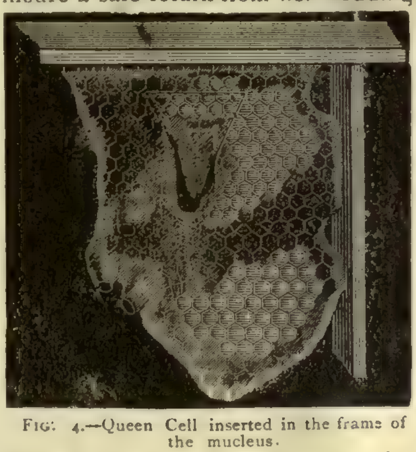


FIG. 4.—Queen Cell inserted in the frame of the mucleus.

During the warmest part of the afternoon, she will spread her beautiful wings and soar into the air to mate with a drone. If successful, she will bear the marks of it on her return; if not, she will, after a time, on the same day, come out again and again, until it is accomplished. She will then return, and in a day or two she will commence to lay, so that, generally, from eight to nine days after emerging from the cell, the queens are laying. Should the weather be unfavorable, and she fails to meet the drone within

about twenty days, she will have failed in the object of her existence, and become only a drone-producer. Once becoming such she is so for life, though she often lives three or four years. On her return to the hive after meeting the drones, if she has been fecundated, the male organs may be seen attached to her abdomen. In about two days after thus mating with the drone she will commence to lay eggs, and she is capable of laying two thousand or more eggs per day.

Fig. 5.—*The Queen Bee, magnified.*

Instinct teaches the workers the necessity of having a queen that is prolific, and should she become barren from any cause, or be lost, they immediately prepare to raise another to take her place. This they do by building queen cells, and if, when these are about one-half completed, the queen has not deposited eggs in any of them, they take eggs from worker cells and supply them. By feeding the embryo queen with royal jelly, the egg that would have produced a worker, had it remained in a worker cell, becomes a queen.

Fig. 6.—*Head of Queen, magnified.*

The queen usually lays from February to October, but early in the spring she lays sparingly. When fruit and flowers bloom, and the bees are getting honey and pollen, she lays more rapidly. An unimpregnated queen is called a "virgin queen." They are capable of laying only drone eggs. A fertile queen is one which has mated with a drone, and is capable of laying eggs which may become either workers, drones or queens. A barren queen is one who has passed the stage of laying eggs which will become either workers or queens, but continues to lay eggs which will produce only drones. The period of fertility lasts from two to three years, and cannot be depended on longer safely. All such queens should be destroyed and fertile ones introduced, that the colony may not become extinct.

Drones. These are non-producers, and live on the toil and industry of others. They are the males, and have no sting; neither have they any means of gathering honey or secreting wax, or doing any work that is even necessary to their own support, or the common good of the colony.

The drones are shorter, thicker and more bulky than the queen, and their wings reach the entire length of their body. They are much larger and clumsier than the workers, and are covered with a short but fine hair. Their buzzing when on the wing is much louder, and differs from the others. Their only use is to serve the queen when on her "bridal trip."

Fig. 7.—*The Drone Bee, magnified.*

Not more than one in a thousand is ever privileged to perform that duty, but as the queen's life is very valuable, and the dangers surrounding her flight are numerous, it is necessary to have a sufficient number of them, in order that her absence from the hive may not be protracted. After mating she returns to the hive a fertile queen for life.

The drone in the act of copulation loses his life, dying instantly. At the approach of the swarming season they are reared to fertilize the young queens; after that is accomplished, they are mercilessly destroyed by the workers.

Fig. 8.—*Head of Drone, magnified.*

Should a colony lose its queen, the drones will be retained later; instinct teaches them that without the drone the young queen would remain unfertilized, and the colony soon become extinct. The youth history of the drone is this: He passes three days in the egg, about six and a half in the larval state, and changes into a perfect drone in twenty-four or twenty-five days, counting from the egg.

Workers. These are undeveloped females, and they do all the work that is done in the hive. They secrete the wax, build the comb, gather the pollen for the young, and honey for all; feed and rear the brood, and fight all the battles necessary to defend the colony.

Of the three kinds of bees, these are the smallest, but constitute the great mass of the population. They possess the whole ruling power of the colony and regulate its economy.

The worker, after passing about three and a half days in the egg, is hatched—a small white worm, grub or maggot—and is called larva (a Latin word signifying a mask, for the bee is concealed or hidden in that state). It remains in this state about five days and then the bees seal the cell over; the larva then spins around itself a silken covering called a cocoon, which occupies about

thirty-six hours. In this third stage it is called a nympha, pupa or chrysalis, in which state it remains until the twenty-first day, counting from the time the egg was laid, when it emerges from the cell a perfect working bee, and is called an imago.

The cocoon, left behind, forms a lining to the cell, and for this reason it is best not to use the same breeding comb too long, for each cocoon left behind, imperceptibly, but not the less really, diminishes the size of the cell for its future occupant, and prevents the bees from attaining their full development of size.

When the weather is cool or the colony weak, the development is retarded to a greater or less extent; the heat should be about 70° Fahr. for the best results. Both the workers and the drones, when emerging from the cells, are rather helpless, and are soft, downy, and light in color.

The workers and drones spin complete cocoons, inclosing themselves perfectly, but queens inclose only the head, thorax, and first ring of the abdomen —evidently to provide for the means of being destroyed by a rival queen, before emerging from the cell, should it become desirable to do so.

The workers are provided with a sack or honey-bag; there is a small cavity on their posterior legs, in which they store the pollen of flowers in very small lumps, being the most convenient form in which to carry it home. They are also provided with a sting, which they use only for defense.

FIG. 9.—*The Worker Bee, magnified.*

They gather honey, which is a secretion in many flowers; pollen, which is the farina of various plants, and which is largely used in forming bee-bread; and also propolis, or bee-glue, a resinous substance that is used in fastening the comb to the sides of hives, and to fill cracks or open places.

Many persons entertain the idea that the worker bees live many years. Their conclusion is drawn from the fact that colonies inhabit the same hive for a long period; but the natural life of the worker honey bee does not exceed six months, and from recent experiments it is ascertained that it does not exceed six or eight weeks in the height of the honey season. Those reared in the fall, having little out-door work to perform, will live till spring. None of them die of old age, but the majority work themselves to death, and many are killed through other causes.

FIG. 10.—*Head of Worker, magnified.*

FIG. 11.—*Anterior Leg of Worker, magnified.*

BROOD. The egg is laid by the queen, in the bottom of the cell; in three days it hatches into a small, white worm, called larva, which, being fed by the bees, increases rapidly in size; when this larva nearly fills the cell, it is closed up by the bees. The time usually taken for this process is eight days for the worker, or queen, and nine and a half days for the drone.

FIG. 12.—*Eggs.*

The workers will develop from the egg in twenty-one days, gathering honey from about sixteen days after emerging from the cell. The drones will hatch in twenty-four days, and if the weather is propitious they will "fly" in a few days after. The queen matures in sixteen days, and are able to fly in a few hours after emerging from the cell, but it is not till the third day that she takes her "marriage flight."

Until the seventeenth day the workers seem only to be fit for the work of the hive. Before that age they seldom leave the hive, their labors being confined to the building of the comb, nursing the brood, feeding the larvæ, capping brood and honey cells, etc.

FIG. 13.—*Brood.*

APIARY. The next thing in importance is the location of the apiary. Select, if possible, a sheltered place, shaded somewhat by trees, with an eastern or southern aspect, where they can be easily seen or heard from the house during swarming season. As regards the distance between the stands, it should be as great as circumstances will admit, two feet being the nearest they should be placed. Get a location where fruit and flowers abound, and where white clover and linden or basswood also flourish. Almost anywhere within the United States will be good.

Unless sandy, the grounds should be well drained. If a grove offers an inviting shade, accept it, but trim high to avoid damp. Such a grove could soon be formed of basswood and tulip trees, which are very desirable, as their bloom offers plenteous and most delicious honey. Even Virgil urged shade of palm and olive, also that the bees might be screened from wind. Wind screens are very desirable on the windward side.

Some use sawdust under and around the hives, to prevent the springing up of grass to the annoyance of the bees. Some use sand or gravel for the same object, with success.

A timber range is very desirable, for a large portion of their honey and pollen they gather from timber and shrubs. Many good localities are found near rivers or streamlets, where linden, sumach, maple, willow, cottonwood, and other trees, shrubs and vines that yield honey and pollen abound. The bees should be near the house, or where they can be heard when they swarm. They should be so located that the north and west winds would not strike them, where they can have a warm, calm place to alight. A hedge, high board fence, or building, on the north and west, are a protection against the strong winds which destroy very many laboring bees in the spring, when one bee is worth as much as a dozen in the latter part of summer, as they are then much needed to care for the brood and keep it warm. If, in April, the day has been rather warm and the evening cool and windy, hundreds of bees may be found on the ground in front of the hive, perhaps loaded with pollen, but exhausted from the flight and chilled with cold. As they approach the hive they relax their exertions, and a light whiff of wind dashes them to the ground, from which they are unable to arise, and before the sun can warm them up, the next morning, they will be dead. If you have no shade for your bees, it would be best to plant fruit trees among them. These would not only supply them with pollen and honey in blooming time, but acceptable shade in hot summer days Another thing is apparent, *i. e.*, the fruit would be a remuneration. The bees would fructify the trees and make them bear plentifully, while in return the trees would afford to the bees that shade which they so much require, from the burning rays of the sun. There seems to be no facing superior to the one that allows the sun's rays to shine directly into the entrance of a hive at 11:30 a. m. There is not a difference of any consequence between a south, southeast or southwest aspect, and selection may be made to suit the apiarist's notion. Next to this, we should say, face to the east; if this is impossible, then west, and when no other is available, submit to a north frontage.

When to Commence. The reason why many are unsuccessful is that they commence at the wrong time. It may have been noticed that about every third year has been a poor season for bees. After such a season but few will commence; while, if the next is a good one, many think the matter worthy of their attention, and if this is followed by another prosperous year, they then decide to embark. But alas! that is just the time to meet the third year's reverse. Those, therefore, who engage in the business should not be discouraged at one reverse.

Early in the spring is the best time to begin, and thus secure an increase of bees as well as honey the first year. Purchase a colony from some reliable breeder or dealer, and, in order to get experience, increase from one or two colonies, not more. As it is essential to know what to do and when to do it, and how to do it, we cannot too strongly advise the beginner to purchase a good manual of the apiary, and study it well. This is absolutely essential to success. If you desire to purchase in the autumn, that you may gain by the experience of wintering, either demand that the one of whom you purchase insure the safe wintering or reduce the selling price, at least one-third, from his rates the next April.

Removing Bees. After procuring the bees and selecting the location and position in the apiary, the next thing is to know when and how to remove the bees. In the spring or fall will be the best time to remove them. In the hot weather the combs may be broken down in transit, and general ruin may be the result. In September or October they may be removed with safety, but the best time to begin an apiary is in April or May. Only strong colonies should be purchased, unless nuclei colonies are desired in the spring to build up into strong ones by the fall. If the distance is less than half a mile, they should be removed late in the fall, or the purchaser may lose heavily by the bees going back to their old location. It is necessary, however, for their health, that shortly after completing their journey they should have one or two fine days on which they can go out and relieve themselves. The disturbance created by transport causes every bee to fill itself with honey, and the condition thereby induced is unfavorable to lengthened confinement. We can always calculate on a fine day occurring after a short interval in the fall, but one suitable for bee flight may not happen in winter till after the lapse of several weeks. If bees eat freely, and are constrained by an inclement atmosphere to remain long within their hives, evil consequences follow. This is what sometimes causes destruction to colonies which are moved during the winter.

What Kind of Bees to Get. Some prefer to purchase black bees in box hives, and then transfer them to movable frame hives in order to get experience. In that case, they should be populous colonies with the comb yellow or brown. Then the honey received will help to pay for the cost of transferring. The best satisfaction may be obtained by purchasing strong Italian colonies in the spring. Such will, doubtless, in a few seasons, pay for themselves, thus proving the cheapest in the end, though a little more outlay is required at first. One such colony is worth two of the former. To examine a box hive, incline it to one side, looking from the bottom up, between the combs. By using a smoker, the bees may be driven back, and one may discover if it has capped brood, larvæ and

plenty of bees. It should have such, to be considered in good condition.

Buying "Swarms." A first swarm is always to be preferred, and if possible from a hive that swarmed the previous year, for then the old queen will be in her second year, vigorous and at her best. A small, second swarm should be passed by, in purchasing. Arrange the frames 1 3/8 inches from center to center; tilt the hive forward at an angle of 20 to 25 degrees, and they will be almost certain to build a straight on the comb-guides. If an old hive is purchased, let it be a heavy one in the spring, with straight comb coming entirely down to the bottom of the frames.

How to Care for a First Colony. If it comes by express or freight, from a dealer or bee-raiser, take it home carefully in a spring wagon. Be sure that the combs run lengthwise of the wagon; drive slowly and handle with care. Place the hive in the position you wish it to occupy, and let it remain until evening, when the wire cloth that is usually nailed over :he entrance may be removed, and some board or other obstacle placed in front of the hive, so that when the bees come out in the morning, they will circle around and mark the location, before going to their work, and thus return in due time with safety. About mid-day, it may be well to open the hive and see whether any combs are broken down, and if so, get them straightened up, and fastened either with twine or wire, until the bees have secured them, when such fastenings should be removed. Be sure to smoke them well, before opening the hive.

It is desirable not to change the location of hives, unless it becomes absolutely necessary to do so. After the bees have become familiar with their location, should the hive be moved a few feet they will not notice it when departing on their daily rounds, and if there are other hives near they may perish in attempting to enter those hives or in wandering about, seeking their own home. This characteristic of the little worker cannot be guarded too carefully.

When it becomes necessary to move the hives, it should he done gradually, not exceeding the breadth of the hive each day. Or if they are to be moved several rods, alarm them by smoke blown into the entrance, then close it, and remove, placing some obstacle before the hive previous to opening the entrance again. In moving half a mile or more, the result is different; they note the new locality and return to it. Be sure to give plenty of room in time for the honey season. Place the additional boxes near the brood combs, and if necessary introduce a little comb with uncapped brood in it, so that the bees may enter them. If they will not enter them, some other arrangement must be adopted, such as long hives, or half or full upper stories, in which frames may be placed.

Preparation of Bees for Winter. The conditions for out-door wintering with success are: Strong colonies, secured by late breeding, 30 pounds of good, capped honey, and vigorous queens. If hives are packed with good, dry absorbing material, with an air space of two or three inches below them, and an opportunity given for the moisture generated by the bees to gradually pass off, without permitting a draft of air through the hives, there will be no trouble with them, either in winter or spring. Great care should be taken in preparation for wintering in the northern climate.

When hives are set about a foot apart, upon low stands, they may be protected by driving stakes on both sides of them (front and rear) and at the ends; and then fill in compactly all around them with hay and straw, two or three inches thick, with a temporary roof of boards to keep the straw dry. This protection is sufficient for any latitude, however cold it may be, and enables the bees to winter with as little loss generally as occurs under any other system. The passage-ways to the hives must not be obstructed by the straw, as bees require an occasional flight in mild weather. Another way is to have cheap outside boxes made, open at both ends, which are to be placed over the hives, and the open space (two or three inches) on each side filled with straw, packed in firmly. A hole in each box, cut out in front of the openings in the hives, having something placed in it to keep the passage-way from being shut up with straw, will afford the bees egress and ingress when it is safe to allow them to take a flight.

The requirements to winter bees in cellars are dryness and darkness, with the thermometer ranging from 35 to 45 degrees, prolific queens, 30 pounds of good, capped honey (no glucose, or uncapped honey that will ferment), a quilt over the frames to absorb the moisture, and a free passage for air all around and below the hives, to prevent dampness, and a ventilator running to the bottom of the cellar, to carry off the impure air. If the combs contain uncapped honey, it should be extracted. If the requisite amount of suitable honey is not at hand, feed good, thick honey which has been extracted early in the season; or, if that cannot be had, make a sirup of coffee A sugar, of the consistency of honey, or just so that it will not crystallize upon cooling. Perhaps the most convenient method of feeding this is to put it in a bag made of drilling, which is tacked to a strip of wood like the top bar of a frame except that it is two inches wide, and has a hole cut in the center one inch wide and two inches long. Hang this between the frames and the end of the hive, and pour in the honey or sirup. The bees will sip it up and store it away as it oozes through the feeder. This feeding should be done as early at least as the last of September, so the bees will have time to cap the cells before the weather becomes too

cold. But it is impossible to have just such air in a cellar as bees have in their native wild state, and hence, even with the utmost pains, we must suffer some loss. The truth in a nutshell, with regard to wintering bees, appears to be this: Confine the bees to as small a space as they can crowd into, with a plenty of good food, pure air, warmth and dryness. Some have very successfully buried their bees during the winter. In such cases the ground should be well drained and sandy, and on a hillside is the best location. Straw should be placed beneath and around the hives, leaving the entrance well open, yet secure against mice.

Some seasons are so unfavorable that it is impossible to have good stock for wintering, as for instance the summer of 1880 in the Northwestern States. The following table shows the subsequent loss, as well as a comparison of the various methods of keeping:

	No. in Fall.	Dead.	Per cent. of Loss.
In bee houses..........	15,863	3,299	.21
In cellars..............	91,171	29,734	.32
Protected.......... ...	145,883	67,238	.46
Total......	252,917	100,271	.39
Unprotected...........	268,313	229,741	.85
Grand Total..... ..	521,230	330,012	.63

Spring Management. During the latter part of March and first of April, when the weather is warm, set the bees out, toward evening. Setting them out in the morning gets them excited and may cause them all to leave their hives and collect into one great "swarm." At this time it is recommended to take a clean, dry hive and set it down beside the first hive, into which blow a little smoke. Carefully open the hive and begin at one side to take out the combs, and if any are wet and moldy, clean them off as well as you can, and put them into the dry hive, taking away the old hive and putting the other in its place. If you have no more empty hives, clean out No. 1, and set it in the sun to dry. Go to No. 2, and if you find the combs all dry and no dead bees on the bottom of the hive, close it up, and in this way go through all; for by doing so, you see exactly what condition they are in, and then work accordingly. Every spring, till the bees begin to gather natural pollen, put some flour and meal (though rye and oats ground together are better) into a cover or shallow box, setting it a little slanting in some sheltered corner, and if you are not troubled with your neighbors' bees, a little well-diluted honey will do them good, even if they have plenty of honey in the hives. The hives should not be placed on their stands until all danger of severe freezing weather is past, as the change from the warm cellar to a cold atmosphere is too great, and liability to spring dwindling is the result.

Hives. Experience has demonstrated that the Langstroth hive is the best of all that have been introduced. In the spring of 1881, Mr. Newman, editor of the *American Bee Journal*, incurred considerable expense to ascertain which sort stood best the severe test of the winter of 1880–1, with the following results:

How Wintered.	No. in Fall.	Dead in Spring.	Per cent. of Loss.
Colonies in Box hives	211,732	187,705	.39
" Frame hives.. ..	309,498	142,307	.46
" Langstroth hives.	195,957	83,965	.42
" Other frames. ..	113,541	58,442	.51
Grand Total..........	521,230	330,012	.63

This table tells its own story, in very plain words.

The Langstroth frame is now very generally used all over the United States, and will doubtless ere long supplant all others. The beginner, therefore, can do no better than to adopt it.

The Langstroth hive is peculiarly adapted for the production of comb honey; its honey rack (Fig. 14) is the best in use, and perfectly adapted to the use of the prize boxes. It holds 18 prize boxes, with the separators between them, marked B, B, in the cut. The wedge A holds all with a vise-like grasp. The outer boxes, C, C, C, are glasses as they stand on the hive. By removing the wedge A any box may be instantly removed, examined, returned, or replaced by an empty one, the rows readily admitting the fingers for that purpose.

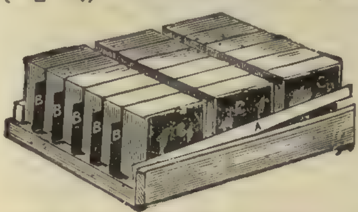


Fig. 14.—*Comb-Honey Rack.*

How to Procure the Best Comb Honey. Not only should we forsake the log-gums and rude straw and box hives of our fathers, and give these busy little workers a neater home with movable frames to contain their combs, but we should teach them to store their surplus honey in small sectional frames and boxes (Figs. 15, 16, 17) so that it can be easily taken from the hives when full, and marketed in convenient shape, suited to the requirements of retail purchasers.


Fig. 15—*The Prize Honey Section.*

This sectional box (Fig. 15) is 5¼ x 6¼ inches outside; the sides are ⅛ of an inch thick and 2 inches wide, while the top and bottom are ¼ of an inch thick, and 1¾ inches wide, the whole weighing but 2 ounces. It is the favorite for marketing comb honey, and is made so that it can be glassed or not, as may be demanded by the market. Honey in this box was awarded the Thurber Gold Medal, in New York, October, 1877, by the National Bee-Keepers Convention, then in session at the Cooper Institute.

The top and bottom being narrower allows room for the glass, and when put on the hive, the space being then doubled by two boxes coming to-

gether, leaves ample means of ingress and egress.

FIG. 16.—*Prize Honey Box, not Glassed.*

The dove-tailed section (Fig. 16) is made of the same thickness at both top and sides, being about three-sixteenths of an inch, and, being dove-tailed, can be put together without nailing. The objection to them is that they are much weaker than those nailed; and if it becomes necessary to nail them, there is no economy in their use. They are intended to be used *without* glass.

FIG. 17.—*Honey Sections all in one piece*

The one-piece sections are made of bass-wood, and are all in one piece, as will be seen by the illustration, with grooves cut so that they may be bent to the proper shape.

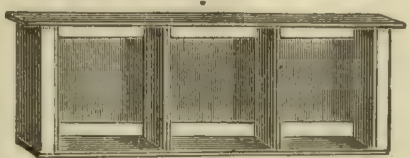


FIG. 18.—*Wide Frame for Langstroth Hive.*

This wide frame (Fig. 18) is made of ¼-inch lumber, 2 inches wide, and holds three prize boxes. Such an arrangement must have a seven-inch story made for it, which may be lifted on and off the hive in one piece. It holds 21 prize boxes, and is used with success by many. Fig. 18 shows the tin separators on the back, one of which is attached to every case. This story and cases being a part of the hive, only the boxes are sold.

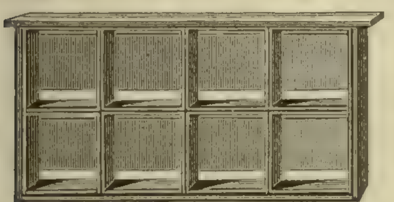


FIG. 19.—*Case of Eight Sections.*

The cut (Fig. 19) shows a case made similar to the above, but of the ordinary size of a Langstroth frame, and holds eight one-pound sections with tin separators between them.

These are used, one on each side of the brood chamber, to induce the bees to start surplus storing early. When commenced, if one has a second story of the same size as the breeding apartment, these may be placed in the center of it to induce the bees to go up there and work.

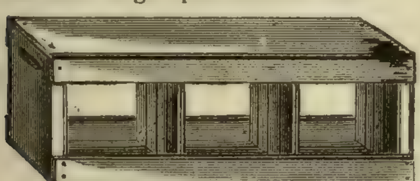


FIG. 20.—*Shipping Crate to contain 12 Sections.*

The favorite shipping crate is that shown in Fig. 20; and honey packed in it is a staple article in cities, especially in the East. It is made to hold one dozen sections of honey, each containing one or two pounds, as may be desired (Figs. 15, 16, 17), and is a very convenient and attractive way of putting comb honey upon the market. Either the "crate" or the "boxes" may be glassed, to protect the honey from the dust of a retail store, and preserve it in its original condition for the consumer's use.

Sections with a tight top bar (2 inches wide) are used in the comb-honey rack, (Fig. 14); those used in cases (Fig. 18) have the top and bottom bars only 1¾ inches wide; the case being two inches in width, prevents any bees from going above it.

To glass the boxes, two tin points (Fig. 21) should be inserted in the top bar of the section, ⅛ of an inch from the edge, and the same in the bottom bar. Between these the glass may be inserted, bending down the tin points closely to it; the sides being full 2 inches in width, while the top and bottom are ⅛ of an inch less on either side, the glass will just make all even, nice and attractive.

FIG. 21. *Tin Points for Glassing Boxes.*

The glass may be taken off at pleasure, by simply straightening up the tin points. Some persons paste paper over the joints, to keep the package air-tight. However desirable the latter may be, the paper is a positive detriment, for it soon becomes covered with fly-specks and dirt, rendering it unattractive to the purchaser.

The above directions are for those used in cases (Fig 18). Those with the tight top bar, used in the comb-honey rack (Fig. 14), have to be fastened with the tin points at the bottom, as before described, and at the top by having a tin point inserted outside of the glass.

MAKING HIVES AND SURPLUS BOXES. To save trouble and annoyance in making hives, boxes, etc., it is best to get them cut and ready to nail together. Should you intend to make them at home, a foot-power saw will be very essential in order to saw the material for hives, frames and boxes, so as to exactly fit.

The stands upon which the hives are set should be as near the ground as can be made safe from dirt and vermin.

The illustrations given in this connection are taken from goods in the bee-keepers' supply house of Thomas G. Newman & Son, 923 and 925 Madison street, Chicago, Ill.

COMB FOUNDATION AND ITS USE. It is estimated that the workers have to consume about 20 pounds of honey to be able to construct one pound of comb. This being true, 1 pound of comb is equal in value to 20 pounds of honey. If, therefore, honey is worth 15 cents per pound, comb costs $3 per pound, when produced by the bees. From this we may learn the value of comb foundation when supplied to the bees.

The comb foundation (Fig. 22) consists of sheets of wax, obtained by dipping wooden or

metal plates into melted wax, and upon being rolled through a machine (Fig. 23), indentations are made on both sides that form the foundation of cells, which the bees readily accept, thin out, and work into comb. These corrugations are made to correspond both with the worker and drone cells, the latter being used for starters in boxes for surplus honey. Fig. 24 shows the rhombs, pyramidal bases and cross-sections of cells. Comb foundation shows all these very plainly.

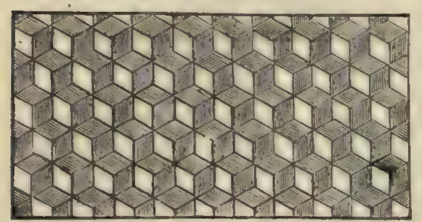


FIG. 22.—*Comb Foundation.*

As a result of several experiments, we will note the following: A brood frame, being filled with comb foundation in the evening, was examined the next morning, and showed that in 12 hours about half of it had the cells built out sufficiently for the queen to lay in them, which she had done. In 24 hours the comb was filled with eggs and the elongation of the cells was rapidly going on. Within 8 days, 10 combs had been built out, filled with worker brood, and sealed over. Only a very few cells had been filled with honey. The beautiful and regularly built comb, with its thousands of little inhabitants, was marvelous indeed! To prevent sagging and bulging, it should not touch the bottom or sides; it being better to leave half an inch of space on either side and an inch at the bottom.

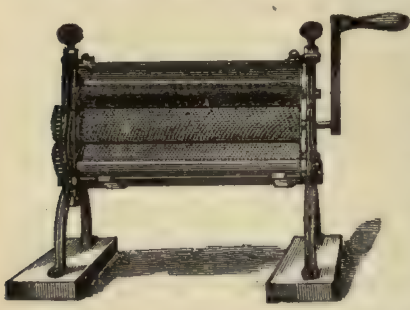


FIG. 23.—*Machine for making Comb Foundation.*

Bees bred in new comb are generally much larger than those raised in old. The cells in the old comb become smaller every year, as every bee that is hatched in them leaves its silky cocoon adhering to the walls of the cell, thus diminishing its size and consequently the size of the bee. When drones are bred in worker-cells (not uncommon) they are stunted in their growth. To raise a queen the cell is enlarged, and the larva that would, if left in a smaller cell, have been a worker, becomes increased in bulk, and, being fed on royal jelly, hatches out a queen. It is safe to say that if an enlarged cell was not necessary to the enlarged size, the bees would not so uniformly require the building of large queen cells.

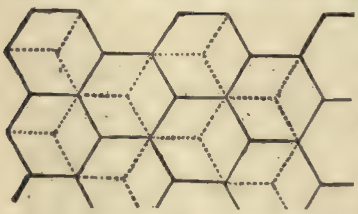


FIG. 24.—*Bases and Cross Sections of Cells.*

Comb foundation may be fastened by rubbing the edge hard against the wood of the top bar with some iron instrument, such as a screw-driver, knife, etc.; a little honey will keep the tool from sticking to the wax. Some use white milliner's glue for fastening it, or a cement made of equal parts of wax and rosin. After placing the foundation in position, top bar downward, the cement being melted over a lamp, with a tin teaspoon bent to a small spout, he pours the cement upon the upper corner of the foundation, which, running down at the junction where foundation meets the top-bar, sticks it so fast that it would be hard to pull it apart again. Another plan for using comb-starters in boxes is to place the honey-box upside-down, then cut the piece of comb about an eighth of an inch longer than the depth of the box, and running one edge of the comb through the lower part of the blaze of a lighted candle until partly melted. Then put this melted edge on the place where you want it to stay on the bottom of the box (which, when righted, would be the top), and crowd the other edge into place. It is very quickly and easily done.

FIG. 25.—*Foundation Cutter.*

HOW TO CUT IT TO DESIRED SIZES. A steel Foundation Cutter is the neatest, cheapest, and best thing we know of (Fig. 25). It is simply a revolving wheel of steel, fastened into a handle.

For cutting it into strips of uniform size, for starters in sections and boxes, one has suggested a grooved board (Fig. 26), the distance between the grooves corresponding to the width of the strips desired to be cut. For starters in boxes or sections, it is quite desirable. A strip one-half an inch wide is sufficient, making an excellent guide.

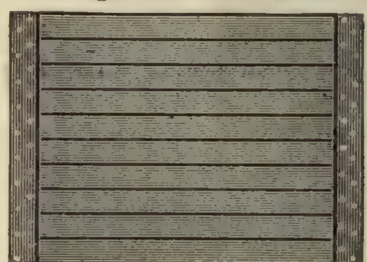


FIG. 26.—*Grooved Board for Cutting Starters Evenly.*

Comb foundation for the brood chamber should be pretty thick, so as to supply material for cells. Starters of foundation in surplus boxes are desirable, as they induce the bees to commence operations there much sooner than otherwise. If natural comb be used in surplus boxes, it must be new and nice. Any other is a damage to its sale as well as to its flavor.

The use of comb foundation bids fair to use all the available wax in the country. Every bit of

wax and old combs should therefore be preserved. By the use of a wax extractor (Fig. 27) even

FIG. 27.—*Wax Extractor.*

the oldest combs can be melted up and reproduced in comb foundation and be given again to the bees.

HONEY BLOOM. Nearly all the flowering trees and plants of the vegetable kingdom yield honey and pollen. In earliest spring comes the bloom of myriads of fruit trees, with the maples, poplar, Judas tree, dandelions, willow, etc. In May we have the white sage, sumac, wistarias, barberry, etc. During June, the white clover abounds; also alsike and melilot clovers, honeysuckle, white sage, motherwort, borage, cotton, milkweeds, mustards, rape, St. John's wort, mignonette, okra, mints, tulips, elders, teasel, raspberries, etc. July gives us the basswood, figwort, sour-wood bloom, boneset, button-bush, catnip, etc.; while August and September present us with buckwheat, sunflowers and myriads of golden rods, and fall flowers generally. Honey-dew is also a source of considerable honey in some sections of the country. Every apiarist should acquaint himself with the honey-plants of his locality, and with the time of their coming into bloom. By so doing he may make calculations in advance, and have the bees in condition to take advantage of the honey harvests as they occur. Bees never puncture fruit, and unless the skin has been broken by other insects or birds they never molest it.

ROBBER BEES. If all colonies are kept strong there is no danger of robbing. It is only the weak ones that are robbed. Working with bees at unseasonable times. leaving honey exposed in the apiary, etc., induces robbing. Black colonies and nuclei are usually the sufferers. Contracting the entrance so that but a single bee can pass is usually a cure for robbing. In times of scarcity of honey, the apiarist should be careful not to keep a hive open long, or robbing may be the result. All strong colonies maintain sentinels at the entrance in times of scarcity. Those of that colony are allowed to pass, but strangers are "arrested on the spot." If a colony is unable to defend itself, close up the entrance with wire cloth and remove it to the cellar, or some other convenient place, for a few days, and when it is returned to the old stand contract the entrance to allow only one bee to pass at a time.

Smoke is harmless and is the best thing to alarm and quiet bees. With a good smoker (Fig. 28), blow a little smoke in at the entrance before opening the hive; give them a little more as you uncover the frames; if very cross repeat the dose, until they yield obedience; then they may be handled with safety. Handle them gently and without fear, avoiding all quick motions; such usually incite them to anger. When honey is being stored rapidly, Italians may be handled without smoke; when there is a scarcity, it is not safe to do so.

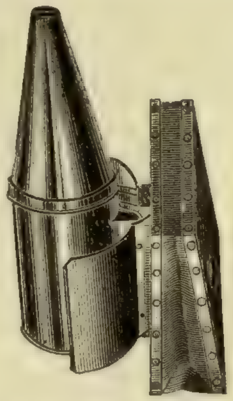


FIG. 28.—*Bingham Smoker.* FIG. 29.—*Bee Veil.*

To those who are commencing, and until familiarity causes the loss of fear, a pair of good gauntlet gloves and a veil are necessary, but after that fear has been overcome, a good veil will be sufficient. Such may be placed over a hat, the bottom of it coming down under the coat or vest, and when thus adjusted it is a complete protection for the neck and face (Fig. 29). Being made of white netting, it does not stain the clothing, and as the piece over the face is black, it can be seen through nearly as well as if not worn. A good one costs 50 cents, and is a yard long; common black ones, so short as to be undesirable, can be obtained at a less price, but are much dearer in the end.

On being stung, if the poison-bag has not been emptied, remove it with a sharp knife, or, better still, with a pair of tweezers so formed as to grasp the sting itself, without pressing on the bag. Common hair tweezers are just the thing. This must, however, must be done very quickly, or it will be of no use. Grasping the bag and sting with the fingers only squeezes the poison out of the bag and into the wound. After the bag has been removed, suck the wound strongly, and apply a poultice of moist mud.

SHIPPING QUEENS AND COLONIES. Before colo-

nies are shipped the frames should be secured so that they cannot move. Old combs should be selected for shipping; and wire cloth nailed over the entrance serves for ventilation as well as to keep the bees in the hive Of course a strip of wood should be nailed each side, from the cap to the bottom board, to keep the whole safely together.

To Introduce a Queen, it will be necessary to find the queen to be superceded and take her away. A black queen, being easily frightened, will hide or run away to some corner; therefore it is best to proceed cautiously and without jarring.

In the middle of the day, when the old bees are at work, carefully open the hive, take out the center frame, examine both sides, and if the queen is not there, proceed with the adjacent frames till she is found. If not successful the first time, return the frames to their places, and close the hive an hour or two, till the bees become quiet, or until next day, and then repeat the operation. An Italian queen would be easily found, but the blacks are more troublesome. When found, either destroy her or make such other disposition of her as may be desired; cage the Italian queen and insert it between two combs containing honey which the queen may be able to reach at pleasure.

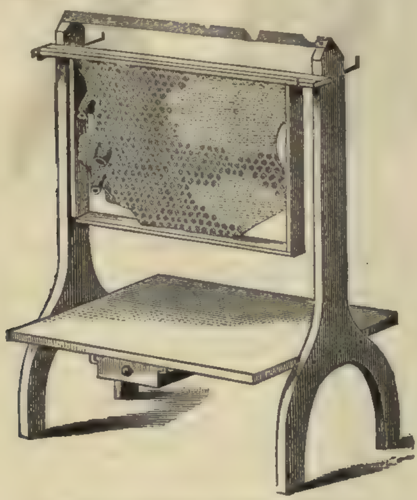


Fig. 30.—*Valentine's Frame Stand.*

Fig. 30 gives a good illustration of a piece of furniture that will be found very useful in an apiary. It is a stand on which to hang the first frames removed from a hive, when an examination of it is made. Usually the first frames are leaned against the hive, standing upon the ground, and more or less bees are injured. With this "stand," they are hung up, entirely out of danger.

The uprights are 1½x⅞, 24 inches high; a piece 1 inch square runs across the top for a handle to lift it by and to hold the top together. Two inches below the top bar are hooks on both sides, so as to hang on two frames if desirable. Four inches below the bottom of the frames (when suspended on the hooks) is a shelf 15 inches wide, to which the uprights are nailed. This makes a nice place on which to lay cages, etc. Under this shelf is a drawer 6x8, that draws out on either side, in which to keep a dozen queen cages, a sharp-pointed knife, and a small pair of scissors.

In about 48 hours release the queen upon one of the combs and see how she is received. If she is attacked by the bees, molesting her wings and legs, return her to the cage for another 36 hours, after which she will no doubt be accepted; or, dip her in a little honey, slightly warmed, if necessary, and dropping her among the bees, they immediately commence licking her off, and forget that she is a usurper. Queen cells, if any have been started, should be destroyed.

Another plan, and one that is regularly practiced in some apiaries with uniform success, is to make the colony queenless for 24 hours, and then

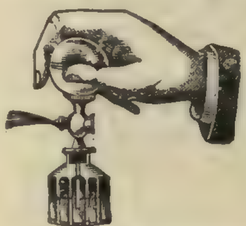


Fig. 31.—*Atomizer for Spraying Bees.*

with an atomizer (Fig. 31) throw a fine spray of peppermint water over both the queen and bees, letting the queen loose upon one of the central combs, and close up the hive. The peppermint water makes the bees and queen of the same scent, and almost invariably she is received with favor. The spray is so fine that it is not the least detriment either to the bees, comb brood or honey. With a valuable queen, where it is not desired to take the least risk, a new colony may be formed by taking hatching brood from several hives. Being all young bees, the queen will be unmolested. This may be done with perfect safety.

Inserting a Queen Cell. A ripe queen cell will almost invariably be received with favor by a queenless colony. Of course all other queen cells must be destroyed. Fig. 2 shows a queen cell finished and ceiled, containing an embryo queen. The orifice *a* is capped, and the cell-walls are thickened preparatory to being extended in the direction of the dotted lines *b*, *b*. When the embryo queen is nearly mature, within 12 to 16 hours of emerging, the bees begin to demolish the exterior compartment (Fig. 3, *b*, *b*), reducing it to a level with the outer edge of the cap of the cell proper (Fig. 3, *a*). The convex cap, being then very prominent, is liable to be injured; and, to protect it, the bees coat it with a fresh layer of wax, making it nearly as thick as the cell walls. Fig. 4 shows the cell as seen after its insertion into the nucleus, it being attached to a wedge-shaped piece of comb whose apex is next to the cell.

The young queen pierces a hole through the edge of the cover with her mandibles, and then makes a circular cut along its periphery. Being

thus detached from the cell walls, the cap drops, opening a circular passage, through which the queen emerges. To cut a queen cell out, commence on each side of the base of the cell, not nearer than half an inch, and cut upward a wedge-shaped piece (see Fig. 4), being careful not to squeeze or even to handle the base of the cell. A similar wedge-shaped piece must be cut out of the frame of comb that it is desired to put the cell into. Then carefully place the cell into the hole thus made, fitting it securely in position ; place the frame into the hive and close it up.

Nucleus Colonies. Nuclei are made by taking two or more frames, as may be desired (at least one of which should contain brood), with adhering bees, and the frame already furnished as above described, with a queen cell, and shaking into the hive bees from one or more frames, so that there may be enough young bees to remain after the old bees have returned to their former hives, to keep the temperature sufficiently high to hatch out the brood as well as to care for the emerging queen. In making up nuclei colonies *be sure not to take away the queen* with any of the frames, else the cell will be destroyed, and all the labor that has been performed will be lost.

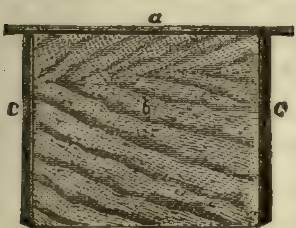


Fig. 32—*Division Board.*

It is better to use the regular frames for nuclei hives, and either use the ordinary hives with a division board (Fig. 32) to contract the brood-chamber, and economize the heat, or make small hives just to suit the number of frames used for the nuclei. A board of one piece is neither patented nor patentable.

As the virgin queen emerges from the nucleus to meet the drones, sometimes the bees will accompany her if they have no unceiled brood. To prevent this, two or three days after the queens are hatched, insert a frame containing eggs and young larvæ in each nucleus. If the queen should be lost on her bridal tour, the materials will be on hand for the bees to get another, should the fact be unnoticed by the apiarist. Should this misfortune befall a colony, the bees themselves are quick to notice it and ready to prepare for another.

When the nucleus colonies are formed, set them away in the shade, and in two or three days the queen will be hatched, and a week or ten days later will become fertilized, and be laying; this may be readily discovered upon examination. Now the apiarist is ready for the formation of new colonies, without the inconvenience of natural swarming, by dividing the colonies. Bees swarm because it is their natural manner of increase. By dividing them we secure the increase without swarming, and save time in watching and hiving natural swarms. This, however, must not be overdone. The beginner sometimes imagines that by dividing he can make almost any number of colonies from each one, forgetting that strong colonies are the only ones that accomplish anything. Dividing should never be done unless the colony be very populous and can well spare the bees and comb, and this is generally after the clover season, and before the linden blossoms appear. To more than *double* the number of colonies each season is not good, unless increase is desired at the expense of honey. Some divide their strong colonies equally, or nearly so, carefully looking for the queen, putting her into the new hive, placing bees and brood in the center, filling up with frames containing comb foundation (Fig. 22), removing the hive with the queen to a new location, leaving the queenless hive on the old stand, to rear for itself a queen from the brood it contains. If the queen be a choice one, and it is desired to get queens from her, this is a good plan to get the queen cells started for the nuclei before described.

Ordinarily the nucleus plan of multiplying colonies is the better. To perform this process, take one of the nucleus hives before described, which should be of the same pattern and size as those to be divided, and remove the division board. Then take a frame containing brood and adhering bees from each colony, placing them into the nucleus until it is full. Be sure not to take the queen away from any hive; supply the nucleus with a new queen. The bees that will hatch out in a few days will make that nucleus a populous colony. Put a frame nearly filled with comb foundation into each hive from which the frame of brood was taken, and in a few days they will have this all worked out into beautiful comb, and in all probability filled with eggs.

The new colony, having a young and fertile queen and plenty of bees, will soon rival the old one in the vigor of its work. Each of the nuclei can be built up in this way, giving a new colony every few days—or, if the apiary be large, several every day—and thus effectually prevent swarming. Increase being secured in this way, none of the colonies are disturbed, and the bees everywhere "pursue the even tenor of their way." All being kept strong in numbers, they are ready for the honey harvest, and will work in boxes very willingly.

Another plan practiced with success is to take away the division board in the nucleus hive, fill the frames with comb foundation, and exchange places with a populous colony, caging the queen of the nucleus for about 36 hours, or until her acquaintance has been made by the strange bees that come pouring into it from the fields; for bees will always return to the exact spot occupied by their home.

Dividing should be done in the middle of the day, when the bees are busy in the fields and the yield of honey is abundant.

It can be practiced up to Aug. 10. We would not advise it done later than that date, because the colony would not have time to rear a sufficient quantity of bees to insure safe wintering. Old bees cannot stand the rigors of winter, and in fact their lease of life would run out before spring. Natural swarming cannot be depended upon for rapid increase. With liberal feeding, and supplying the new colonies with queens, five good, strong colonies could be made from one, between June 1 and Aug. 10. We do not advocate too rapid increase. If forage is not abundant, feeding must be resorted to. Do not let the feeding go till too late in the season, trusting the bees to get their living. Commence to feed as soon as the colony is ready for business, and that will be the next day after they are put into the hive. If you would make this whole arrangement successful, do all the feeding not later than Sept. 20. A little food might be given later to stimulate breeding. All the sirup given them should be sealed up before cold weather sets in or it would sour before spring, and dysentery might be the result.

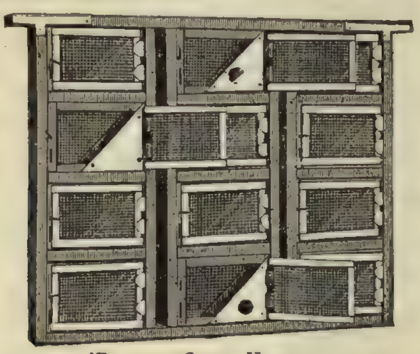


FIG. 33.—*Queen Nursery.*

To raise queens for the purpose of Italianizing an apiary, the Queen Nursery (Fig. 33), invented by Dr. Jewell Davis, may be used with success. Put into the cages of the nursery, between the tins, a few cells of ceiled honey, in new comb if possible. Then cut from the combs of a pure Italian colony as many queen cells, large and well developed, as you have prepared cages with the honey, as above. Suspend one of the cells in each of the cages. Good care should be taken to have the best cells, and not injured by bruising, handling or jarring. Each cage of the nursery should be supplied with a queen cell and food. The food is supplied that the young queens may not starve if the bees do not feed them, a thing they often fail to do when there is a scarcity of honey in the flowers. The nursery cages so prepared are adjusted in the nursery frame. Then, having removed a center comb from a strong black colony, place the queen nursery into the vacancy made by the removal of the comb, there to remain until the queens are hatched, which will be in three or four days, if the cells were not cut from the combs too early, or before the 9th day. When the queens have emerged from the cells, remove the cage and introduce the caged queen to a black colony, liberating her on the next day about sundown—if necessary, spraying the bees with perfumed water by the atomizer (Fig. 31).

FIG. 34.—*Queen Registering Slate.*

To remember dates every one has not the faculty, and yet all the operations of queen-rearing require that it should be done. For instance, the time when a choice colony was made queenless, to have queen cells started—the time these cells are given to the nuclei—the time of hatching—when the queens commence to lay, etc. To save time and trouble in remembering these and other dates, a small slate (Fig. 34), 3x4 inches, with a hole in the center of the top, should be hung on the hive by a small nail with all these dates written thereon. A printed card tacked upon the inside of the cap is used by some to advantage, in keeping track of such dates. It is quite important to be well posted as to the days. The interest a bee-keeper takes in every detail of his work will soon lead him to be careful in this.

If the dividing of colonies be neglected, or if it is not desired to practice that method of increase, the bees will become greatly crowded for room, and will necessarily swarm. For some days before swarms issue the bees may be seen clustering at the entrance of their hive, though some come out when there are little or no indications of a swarm. When honey is abundant and bees plenty, look for them to come forth at almost any time, from the hours of ten in the morning to three in the afternoon (first swarms), second and third from seven in the morning until four in the afternoon. By examining the hive it can be ascertained whether they are about to swarm or not. If queen cells are seen with eggs or larvæ nearly ready to be ceiled over, a swarm may be expected within one or two days after the first cell is ceiled over, or as soon after as the weather will permit. After whirling a few minutes in the air, the mass of the bees will cluster on the branch of some convenient tree or bush, generally one that is shaded from the sun's rays. They should be hived as soon as the cluster is formed, else they may leave for the woods; or, if another colony should swarm while the first was clustered, they would probably unite. Should the queen fail to join the bees, by reason of having one of her wings clipped, or for any other cause, the swarm will return to the hive as soon as they make that discovery. As the bees are gorged with honey, they may be handled without fear of stings. "After-swarms" being unprofitable, all but one of the queen cells should be destroyed, or cut out, as

before described, for nuclei; this will prevent any more swarms issuing. Within eight days the first queen will issue, and finding that she has no rival she will take possession, apparently having no idea of swarming. To ascertain that she has no rival she makes a peculiar sound, called "piping." If there is another queen in the cell nearly ready to emerge, it will answer by a "piping" sound. If this queen still in the cell is protected by the bees, so that the first queen cannot find and destroy it, she will also prepare to swarm in two or three days. After the departure of this swarm and the emerging of the second queen, and her "piping" is also answered by a third queen, a third swarm may also issue. If the desire to swarm is satisfied after the departure of the first swarm, the queen cells will be all destroyed by the first young queen that emerges.

Clipping the queen's wing is done to prevent her from leaving with a swarm. In attempting to fly she will fall to the ground in front of the hive, and the bees missing her will return to the hive. This must not be done until after the queen has met the drones, or she will remain unfertile for life. To perform the operation, open the hive and lift the frame carefully, and avoid jars; when the queen is seen, with a pair of sharp-pointed scissors lift one of the front wings and cut off about one-half of it. It is better that she be walking, or at least standing, so that a leg be not cut off with the wing. She should not be handled; if it becomes necessary to pick her up, be sure not to take her by the abdomen. She may be held by the wings without danger.

If the cluster be low, hiving is easily performed. The queen is usually in the lower part of the cluster, and by finding "her majesty," and putting her into a hive, which should be placed conveniently near for the purpose of hiving the swarm, and with a dipper, or any other convenient vessel, placing the bees down in front of the hive on a sheet, or piece of paper, they will be led to crawl into the hive, and, finding the queen, be satisfied to remain. When the bees are in, place the hive where it is to remain; a shaded position will be the best. If comb foundation be placed in the frames, it will be of very great advantage to comb-building,

If they have clustered on a branch or twig, a basket or bag will be quite essential, into which to shake or brush the bees. If on a wall or fence, or on the trunk of a tree, brush them into the basket, and proceed to hive as before described.

A frame of brood and another of honey placed into the new hive will be of much advantage to the bees. The former will prevent the swarm from leaving the hive, and should the queen be lost, it will give them the means of raising another, and the latter will give them a good start. By filling the other frames with comb foundation (Fig. 22) they will soon be in good condition and perfectly at home in their new quarters.

Sometimes a swarm will make for the woods without clustering; but this is rarely the case.

The beating of tin pans and all such old-fogy notions are, of course, of no avail; throwing a stream of water from a fountain pump is often done to bring down an absconding swarm and cause them to alight and cluster.

THE LOSS OF THE QUEEN. When the bees manifest a restless and uneasy disposition by running about the front of the hive and signaling each other, especially in the morning and evening, it is a sign that they have lost their queen, and they should be examined at once.

It is highly necessary that the bee-keeper should glance at every swarm in the morning for a few days after swarming, so that, if any such loss should occur at this time, it may be remedied at once by the introduction of a cell, or a fertile queen. In early spring, every colony should be examined for her presence. In the box hive, a little smoke may be blown in, and the bees driven back; if any brood can be discovered, it is a sure indication that she is there, and fertile. In the movable-comb hive, it is only necessary to raise out one of the combs in the center of the cluster, and the condition will be recognized at once. If a few imperfect bees are found on the bottom board or in front of the entrance in early morning, it shows that the colony has a fertile queen, and further examination is unnecessary.

The queen has two notes: one of defiance, called piping; the other is a note of fear, a plaintive, pitiful wail, mournful in the extreme, and lingering long in the memory when once heard. This mournful note is set up when removed from her hive, when seized by the other bees to destroy her life, or when her colony are starving. Whenever this note is heard turn not a deaf ear, but immediately respond to the call, for there is something wrong. Rigidly examine the hive and remove the cause of complaint.

Should a colony become queenless from any cause, three weeks may be gained by having an extra queen to give it at once. Upon examination, if no brood is found where the bees are clustering, the colony is queenless. At any time during the season, from March to October, this is a sure sign. Colonies that lose their queen during the winter have a forlorn appearance. The bees walk around the entrance listlessly and without eagerness; but few of them go in search of either honey or pollen.

No time should be lost in giving a queenless colony a comb of eggs or young larvæ, or both, from which to raise a queen. Sometimes such a colony will refuse to raise queen cells; it may be too weak; its queen may be too old to lay, or they may

have a fertile worker. If it be too weak, it should be united with another colony. If its queen be old, she should be removed and the bees given a frame of brood from a prosperous colony. If it has a fertile worker the most effective way to get rid of

FIG. 35.—*Legs of an Italian Worker Bee.*

it is to break up the colony, dividing it among strong colonies having fertile queens.

TRANSFERRING BEES. The best time to transfer bees from the common to movable-frame hives is about the season of swarming, though it may be done on any warm afternoon, when the bees are actively at work.

A transferring board (Fig. 38), about the size of the frame, should be prepared in advance, by making grooves of about one-half an inch wide and one-fourth of an inch deep, and about two inches apart. The spaces between these grooves should be cushioned with several thicknesses of cloth, to prevent the brood from being injured when the comb is laid upon it. Transferring sticks (Fig. 39) should be prepared from some light, tough wood, about one-half inch longer than the frames are deep, and about one-fourth of an inch square. Fasten two of these sticks together with a piece of fine annealed wire, so as to leave about one inch of space between them (Fig. 38); attach a piece of wire to the other end of one of the sticks (Fig. 37, *b*), which is to be used in fastening when placed around the frame of comb (Fig. 36). A small notch should be cut to admit the wire and prevent slipping. These sticks should be made in pairs, and be kept ready for use.

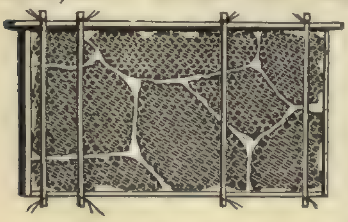


FIG. 36.—*Frame of Transferred Comb.*

After smoking the bees at the entrance of a box hive, remove it some distance from the old stand, leaving an empty hive or box in its place, to receive the bees that return from the fields; invert the hive, place an empty hive or box over it, of the same size and shape, wrapping a sheet or cloth around where they come together, leaving no cracks large enough for a bee to escape. By gently tapping the hive for some time, most of the bees, with the queen, will enter the upper box. When they have nearly all left the hive, place the upper box with the bees on the old stand. Being alarmed and filled with honey, they may be handled without fear. The old hive may now be removed to a convenient room or building, and taken to pieces, by cutting off the nails with a cold chisel and prying off the ends, cutting the combs when taken out as near as possible to the size of the frames to be used. The transferring board (Fig. 38) should be placed upon a table or box, to be in a convenient position for working over it. The pieces of combs containing honey may be placed at one side till some with brood are found; this should be put upon the transferring board (Fig. 38), so that, when the frame is placed in position over it, the brood may be nearly in the same position as it occupied in the old hive and near the top of the frame, as that will be the warmest position in the hive. With a honey knife cut these combs to make them fit. If more are wanted to fill the frame, use the combs of honey first removed from the hive. Then push the ends of the sticks (Fig. 37, *b*) that have no wire attached through the grooves, from the bottom of the frames, where the combs may need support; the other sticks attached place on the top of the comb, and fasten the ends together at the top of the frame, as seen in Fig. 36, to match the fastenings below. Place this frame in the hive, and proceed in the same manner with the next brood comb, and let it occupy the adjoining position in the hive, giving the frames containing honey the outside position on either side. The honey from pieces of comb not used, and especially from all drone comb, should be removed with the Extractor. Carry the new hive to the old stand, and empty the bees out of the box on a sheet, in front of the hive. See that the queen, as well as all the bees, enter it. To prevent robbing, the entrance should be contracted; and in two or three days, when the bees have fastened the combs, the transferring sticks should be removed. Always work slowly with the bees, and avoid jarring. When it is desired simply to transfer from one style of frame to an-

FIG. 37.—*Wired Sticks for Transferring.*

other, smoke the bees well, and after finding the queen and putting her in a tumbler or some secure place, take a frame, and shake or brush the bees off into the new hive; place the frame upon the transferring board (Fig. 38) and cut out the comb; place the new frame over it and cut to suit that frame, in the best way possible. Then fasten as before described with wire sticks (Fig. 37); after thus transferring all the combs, proceed to hive the bees as above directed, letting the queen loose upon one of the brood combs as soon as they are transferred.

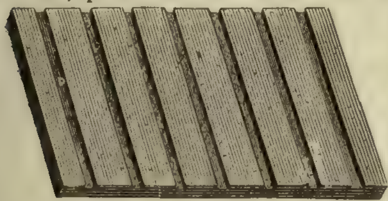


Fig. 38.—*Transferring Board.*

Uniting Weak Colonies. Weak colonies may be united after smoking them well, by removing the combs with adhering bees and placing them together in one hive, spraying them with peppermint water by an atomizer (Fig. 31), to give them all the same scent. Give them ventilation and close the entrance till sunset, placing them where the stronger of the two colonies stood. Swarms issuing the same day can be united peaceably.

Feeding Bees. Extracted honey, or coffee A sugar, reduced to the consistency of honey, is best for feeding, in the absence of good ceiled honey. The poorer grades of sugar and glucose are totally unfit for feeding bees. To stimulate in the spring one-half of a pound per day is all-sufficient for a colony. Every apiarist will receive ample reward by practicing stimulative feeding early in the season. Feeding, too, is often necessary to secure sufficient stores for winter.

Shuck's Bee Feeder feeds at the front entrance, any time in the day, without danger from robbers, as the food can be reached only from the inside of the hive; it is placed on the alighting board, with the side (D) nearly covering the entrance. In the engraving, the top is cut away to show the wood divisions (A A) in the feed cup; the food is poured into it without removing, through the hole (C), which is covered with wire-cloth. When done the cap (B) is closed over it, making all tight.

Fig. 39.—*Shuck's Bee Feeder.*

Division-Board Feeder. The top bar of this (*b*) is two inches wide. In the cut the lower part of the face of the can is removed to show float, etc. From the upper central portion, beneath the top bar, a rectangular piece the size of an oyster-can is replaced with an oyster-can (*g*), after the top of the latter has been removed. A vertical piece of wood (*d*) is fitted into the can so as to separate a space about one inch square, on one side from the balance of the chamber. This piece does not reach quite to the bottom of the can, there being a one-eighth inch space beneath. In the top bar there is an opening (*e*) just above the smaller space below. In the large space is a wooden float (*f*) full of holes. On one side, opposite the larger chamber of the can, a half-inch piece of the top (*c*) is cut off, so that the bees can pass between the can and top bar onto the float, where they can sip the feed. The feed is turned into the hole in the top bar (*e*), and, without touching a bee, passes down under the vertical strip (*d*) and raises the float (*f*). The can may be tacked to the board at the ends near the top. Two or three tacks through the can into the vertical piece (*d*) will hold the latter firmly in place; or the top bar may press on the vertical piece so that it cannot move. Crowding a narrow piece of woolen cloth between the can and board, and nailing a similar strip around the beveled edge of the division-board, makes all snug. The feeder is placed at the end of the brood-chamber and the top bar covered by the quilt. To feed we have only to fold the quilt over, when with a tea-pot we pour the feed into the hole in the top bar. If a honey board is used, there must be a hole in this just above the hole in the division-board feeder. In either case, no bees can escape, the heat is confined, and our division-board feeder is but little more expensive than a division-board alone.

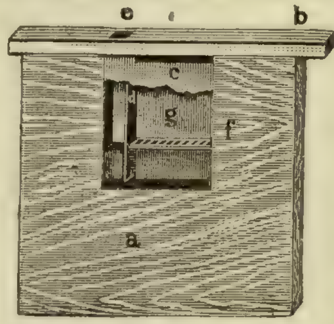


Fig. 40.—*Division-Board Feeder.*

The best time to feed is just at nightfall. In this case the feed will be carried away before the next day, and the danger to weak colonies from robbing is not so great.

In feeding during the cold days of April, all should be close above the bees to economize the heat. In all feeding, care is requisite that we may not spill the feed about the apiary, as this may, and very generally will, induce robbing.

Water is indispensable to bees when building comb or raising brood. Every prudent bee-keeper will see that his bees are supplied with water, by placing shallow wooden troughs filled with straws or floats, that they may drink without danger of drowning. A location near small bodies of water will be sufficient for a supply, but locations near large bodies are injurious.

Extracted Honey is obtained by the combs being uncapped and placed in the basket or frame-holder of a honey extractor (Fig. 41), which being

attached to a single rod in a large can and revolved, the centrifugal force throws out the pure honey from the combs, which runs down the sides of the can and is drawn off and placed in jars or some other desirable receptacle. Extracted honey is the pure liquid, minus the comb

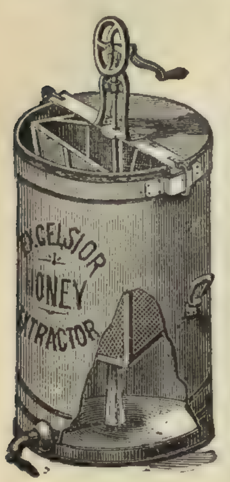


FIG. 41.—*Honey Extractor.*

The essential points in a good honey extractor are: one that can be easily taken to pieces and cleaned; one that the shaft holding the revolving basket in position does *not* revolve in the honey; one that has sufficient room below the comb-basket to allow the honey to remain and ripen before drawing it off, leaving it clean and free from sediment, and fit for the market; one that has an over-motion and strong gearing, so essential to ease of operation and effective work; one that has covers to protect the honey from insects; and one that may be easily operated. Such are all contained in the one illustrated on this page (Fig. 41.)

Honey must be "uncapped" before extracting, therefore a good honey knife is a necessity; such is the Bingham & Hetherington honey knife (Fig. 42). It is made of the best steel, strong at the bend near the handle, and is wide enough to allow the cappings to remain on the knife while running across the comb. Both edges are sharp and are beveled on the side that comes in contact with the combs. This prevents the knife from adhering to the combs and tearing them, while shaving off the cappings. As both edges are alike, it admits of being used for right or left hand work; the sharp point also allows it to be used in corners or uneven places.


FIG. 42.—*Honey Knife.*

Honey can be extracted, if carefully done, without the least injury to the bees or the comb; the latter may be replaced in the hive, and often are refilled by the bees within three or four days.

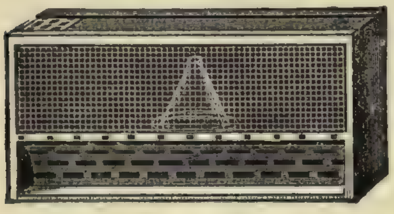


FIG. 43.—*Drone and Queen Trap.*

A drone and queen trap (Fig. 43), is used to capture the queen when a swarm issues, and thus prevent its absconding. Also to capture the drones when their presence is no longer desired in the hive. The principle of its use is that the perforations in the metal will allow the worker bees to pass at will, being smaller than the queens and drones, and at the same time to imprison the latter. As a swarm will not leave without a queen, swarming is by it controlled; and surplus drones can be caught in it and destroyed.

DISEASES. *Dysentery* in the latter part of winter and early spring is a malady that affects some apiaries. The bees discharge their excrement over the hives and combs, producing a dark appearance and offensive odor. The cause is either fermented honey, improper food or no food, or too warm or cold, and poorly ventilated quarters. Give them good capped honey and a cleansing flight. If too cold for this out of doors, take the hive to a warm room, make a box, front and top of wire cloth or mosquito netting, adjust it to the entrance, so the bees must enter it on leaving the hive. This will usually prove an effectual remedy.

Foul brood is the rotting of brood in a hive; the caps of the ceiled brood appear indented and shriveled, and the larvæ and young bees in unceiled cells become putrid, emitting a disgusting stench. With an atomizer (Fig. 31) spray the hive, bees, brood, honey and combs with a solution of salicylic acid, borax and rain water, repeated on the sixth day. Remove the diseased brood from the hive and give them good capped honey, and if not too far advanced this may give relief.

Bees apparently dead from cold may sometimes be restored to life and activity by warmth and food.

Beer. The process of making the strong beers is too complicated for "home" manufacture

To correct acidity in beer put in chalk, lime and alkalies; but it cannot be totally destroyed without spoiling the liquor.

Bittern is employed by fraudulent brewers to impart a false bitter, and strength, to their beers. Bittern balls are used as a fraudulent substitute for hops in making beer, and are different in composition to suit different kinds of malt liquors. There are several processes of "fining" ale by clarifying it. This is done when its quality has not been raised high enough in the brewing process.

To ripen beer add a small lump of white sugar to each bottle of ale or beer, and a teaspoonful of moist sugar to each bottle of porter, at the time of bottling and corking. A raisin or lump of candy is often added to each bottle with a like intention.

Mustiness in beer is remedied by adding to each hogshead one pound of new hops, boiled in a gallon of the liquor, along with seven pounds of newly burned charcoal, coarsely bruised, and a four-pound loaf of bread, cut into slices and toasted rather black; rouse well every day for one week, then

stir in moist sugar, three or four pounds, and then bung down for two weeks.

Common Beer. Allow at the rate of two gallons of water to a handful of hops, a little fresh spruce, or sweet fern, and a quart of bran; boil it two or three hours; strain it through a sieve; stir in, while hot, a teacup of molasses to each gallon of liquor; let it stand till lukewarm; turn it into a clean barrel; add a pint of good yeast to the barrel; shake it well together, and it may be used next day.

Ginger Beer. To make ginger beer, put into one gallon of boiling water one pound lump sugar, one ounce best unbleached Jamaica ginger well bruised, three-fourths ounce cream tartar, and two lemons sliced. Stir the fragments frequently in a covered vessel until lukewarm; then add one and a half to three ounces yeast, and keep it in a warm place so as to excite a brisk fermentation; the next day rack and strain through flannel; let it work for a day or two, then strain again and bottle, wiring down the corks.

Ginger beer, without yeast, can be made by boiling one and a half pounds bruised ginger in three gallons of water half an hour; then add 20 pounds white sugar, one pint lemon or lime juice, one pound honey, and 17 gallons of water; strain through a cloth. When cold add the white of one egg, and half a fluid ounce essence of lemon. After letting stand three or four days, bottle.

Root Beer. Take sarsaparilla (American), two pounds; spice wood, half a pound; guiacum chips, one pound; birch bark, one-fourth pound; ginger, one-half ounce; sassafras, four ounces; prickly-ash bark, half ounce; hops, one ounce. Boil for twelve hours over a moderate fire, with sufficient water, so that the remainder shall measure five gallons, to which add tincture of ginger, eight ounces; oil of wintergreen, one ounce; alcohol, one quart. This prevents fermentation. To make beer, take of this decoction one quart; molasses, eight ounces; water, two and a half gallons; yeast, four ounces. This will soon ferment and produce a good, drinkable beverage. The root beer should be mixed, in warm weather, the evening before it is used, and can be kept for use either bottled or drawn by a common beer pump. Most people prefer a small addition of wild cherry bitters, or hot-drops, to this beer, and some prefer fewer or other ingredients.

Ottawa Root Beer. Take one ounce each sassafras, allspice, yellow-dock and wintergreen; half ounce each wild cherry bark and coriander; half ounce hops and three quarts molasses. Pour boiling water on them; macerate for 24 hours; then filter and add a half pint of yeast; add about six gallons of water, or to taste. In twenty-four hours it is ready for use.

Hop Beer. For half a barrel of beer, boil half a pound of hops in a pailful and a half of water, with a teacupful of ginger. When brewed, put it warm into a clean cask, with half a gallon molasses; shake it well, and fill up the cask with water, leaving the bung open. Fill the cask when it works over. Before bottling, put a tablespoonful of molasses into each bottle.

Spruce Beer. Boil nine and a half gallons of water; let it cool down to 80 degrees Fahr., and then dissolve nine pounds of sugar in it, having previously mixed with it one ounce of essence of spruce. Then add one pint of good brewer's yeast, and pour it in a ten-gallon keg till fermentation is over; then add a handful of brick powder, and the white of two eggs beaten to a froth; mix with the beer, let it stand, and then bottle.

White Spruce Beer. Dissolve ten pounds loaf sugar in ten gallons boiling water; add four ounces essence of spruce; when nearly cold add one-half pint of yeast. Keep in a warm place. Next day strain through flannel, put into bottles and wire the corks.

Spring Beer. Boil down three small bunches each of sweet fern, sarsaparilla, wintergreen, sassafras, prince pine, spicewood, in eight gallons of water to six gallons decoction, or extract; strain; four gallons of water with one-half gallon hops, boiled down to three gallons of decoction; strain; mix the two extracts of decoction together; dissolve in them one-half gallon of molasses, and when cooled to 80°, one and a half pounds roasted bread soaked in fresh brewer's yeast; fill up a ten-gallon keg. When fermentation is over, mix with it the white of one egg beaten to a froth; bung it, and bottle when clear.

Beeswax. To prepare this article, take an old pan (such as you use to set milk in), and make quite a large hole in the bottom of it, large enough to put your finger through. Then have another pan smaller than the first; put some water in it and set it in the oven; then fill the large pan with honey-comb and put it on the small pan; have the oven hot and the honey-comb will melt and the wax will run through the hole into the small pan; with a little pressing with a large spoon you will get all of the wax out. When the pan is full of wax, have a bucket of cold water ready, and turn the wax into the water; when you have enough wax out to make a cake, put it into a kettle and melt it again. Then all the dirt will settle to the bottom, and you can pour it off and leave the dirt in the kettle; the wax will be clean without straining. This may seem a long process, but it is the best known.

To bleach or whiten beeswax, take the cleanest beeswax you can obtain, melt it in hot water, skim it out in a basin previously oiled; when cold cut the wax in thin slices; expose these to the action of the sun and air upon white dishes, sprinkling it, unless there is rain, once or twice a day with clean water.

At the end of a week melt the wax again, and proceed as before. In hot weather the wax may be floated on water in the middle of the day.

The presence of spermaceti in what is sold as "virgin wax" is shown by its reduced melting point, its bending before it breaks, and by its flavor when chewed.

To prepare wax for polishing floors, take 12 pounds yellow wax, rasp it and stir it into a hot solution of 6 pounds of good pearlash in rain water; keep the mixture well stirred while boiling; when the frothing ceases, cool off a little and stir in 6 pounds yellow ocher; pour it into tin cans or boxes and set it away for use. To put it upon the floor, melt a pound of it in 5 pints of boiling water, stir it thoroughly, and put it on with a paint-brush. After drying a few hours, polish with a large floor-brush, and wipe with a coarse woolen cloth. A coat of this wax ought to last six months.

Beet. The best soil is a deep, sandy loam, manured with well decomposed compost; the more mold the better; sod land is poor. Do not manure heavily with ashes or lime. Sow in drills 14 to 15 inches apart, and cover one inch deep. When the young plants appear, thin to four or five inches apart. For early use sow as soon as the ground can be worked in the spring; for autumn use, about the middle of May, and for winter use, about the middle of June; the long varieties a little earlier than the round, early kinds. When sown late, increase the quantity of seed. When young, the plants make excellent greens. To preserve during winter, cover with earth to keep them from wilting. The species called mangel-wurzels are raised principally for stock, and as they grow larger than other beets, they require more room. They should be sown in drills about two feet apart, and thinned to 12 or 15 inches in the row.

Beet crops are valuable for stock feeding and for sugar. They are easily raised, and there is "money" in them. See Sugar.

VARIETIES. *Early Bassano*. One of the earliest, and an old standard.

Early Blood Turnip. Good for both summer and winter.

Long, Smooth, Dark Blood. Flesh dark red; skin smooth; excellent for winter use.

Philadelphia Early Turnip Beet. Follows very closely after the Bassano; it is neither red nor white, but with alternate rings of lighter or darker pink; it boils red, and is, withal, rich, tender and sugary. It is a highly popular sort, identical with the Bastian and Simon beet of some catalogues.

Hatch's Early Turnip. Somewhat flat in form, but a favorite with some.

Yellow Turnip. Of a beautiful golden-yellow color; as early as Bassano.

Egyptian. Earlier than Bassano; tops remarkably small; excellent for market.

Eclipse Turnip. Much like Bastian's Early; top small.

Dewing's Early Blood Turnip. Very symmetrical; free from fibrous roots; dark red.

Bastian's Half Long Blood. A new sort, of a fine dark color.

Henderson's Pine-Apple. Excellent for family use.

Dell's Ornamental Dwarf. Leaves of a peculiarly deep, rich red color, and ornamental; root grows partly above ground.

See also Mangel-Wurzel.

BEETS, TO COOK. Beets should not be cut off or scraped before they are boiled, or the juice will run out, and make them insipid. In summer they will boil in an hour; in winter it takes three hours to boil them tender. The tops in summer are good boiled for greens. Boiled beets cut in slices, and put in cold spiced vinegar for several days, are very nice. One of the most satisfactory ways to cook beets is to bake them. When boiled, even if their jackets are left on, a great deal of the best part of the beet is dissolved, and so lost. It will, of course, take a little longer to bake than to boil them, but this is no objection. Allow from 15 to 20 minutes more for baking; slice them and treat as you would if they were boiled. One nice way to serve them is to chop them fine. After they are cooked, season with pepper, salt and butter.

Beetle, a maul; also, an insect with wing covers. It constitutes one of the largest orders of insects: See Insects, and the various plants which they infest.

To destroy such bugs when they infest a cupboard, sprinkle on the shelf powdered borax, black hellebore, or gypsum. Cucumber parings are said to drive them away, and powdered camphor, spread on the cracks where they frequent, is said to bring them out, so that they may be easily caught and killed.

Belladonna, a very subtle vegetable poison, extracted from the deadly nightshade, a plant native in Europe. It is a powerful narcotic, and with ointments is much used as an anodyne, or painkiller. It is a popular drug among the homeopathists, but is too dangerous for unprofessional hands to deal with.

Bell Crank, a double crank, one arm of which is at an angle to the other. It is to change the direction of motion.

Bellwether, the sheep which has a bell on his neck and leads the flock.

Belt, a strip of timber; a disease among sheep; also to shear, as the buttocks and tails of sheep. The other meanings of this word do not come within the scope of this work.

Bent Grass. By this name are known several of our most valuable grasses, as red-top, white bent, etc. These species have creeping stems, and are therefore difficult to exterminate.

Benzine (ben zeen′), or **Benzole** (ben′zole), a highly explosive oil distilled from petroleum, and

very useful in removing grease spots from fabrics. A bottle of it should not be opened within several feet of a flame, especially on the windward side. To remove the stain it leaves on certain cloth materials, apply moistened gypsum, and take it off when it is dry. A mixture of 10 parts benzine, 5 parts soap and 85 parts water has been very successfully used to destroy the parasites which infest dogs. It has also been used with good results in veterinary practice as an application in certain diseases of the skin, and, thus diluted, is found to answer better than when used pure.

Benzoin (ben-zoin′), a kind of resin from a foreign tree, valuable in medicine and in perfumery.

Berberry: see Barberry.

Bergamot. The oil of bergamot, often called essence of bergamot, is distilled from the fruit of the bergamot tree, which is akin to the lemon. This oil is chiefly used as a perfume. "Wild bergamot" is a name given in this country to an herb similar to horsemint, and is called horsemint in the West.

Bevel, the narrow surface at the edge of a piece of wood or other material, at an angle to the general surface. Used also to denote the action; as, "to bevel."

Bevel Gear, the placing of cog-wheels obliquely to each other to change the direction of motion.

Beverages: see Ale, Barley Water, Beef Tea, Beer, Broth, Champagne (Summer), Chocolate, Cider, Cocoa, Coffee, Cordials, Currant Sherbet, Egg Nog, Ginger Pop, Gruel, Lemonade, Mead, (Metheglin, etc.), Milk, Porridge, Sago Milk, Sago Tea, Shells, Sirups, Soda Water, Tea, Toast Water and Wine.

Bezoar (be′zore), a chalky or stony mass sometimes found in the stomachs of cattle.

Bias. To cut cloth "bias" or biasing, is to cut it slanting across the stripes, warp or figure-work.

Biennial, every two years; also, living for only two seasons, as plants. Cabbage, turnips, parsnips, carrots, beets and many other herbs develop large roots or leaves the first season, and go to seed the next, immediately after which they die, root and all. They are called biennials. Some plants, by changing climate or cultivation, can change their character from annual to biennial, or from biennial to annual.

Biestings, the first milk of cows after calving.

Biffin, a baked apple crushed down into a flat, round cake.

Bigaroon, the large white-hearted cherry.

Biggin, a child's cap or hood, or something worn about the head. Also, a contrivance for holding coffee grounds, through which boiling water is poured; a kind of strainer.

Biggon, or **Biggonet**, a cap or hood with pieces covering the ears.

Bight, the double part of a rope when folded, in distinction from the ends; that is, a round bend or coil not including the ends. Also, the inward bend of a horse's chambrel, and the bent of the fore knees.

Bilberry: see Huckleberry.

Bile, the bitter, greenish fluid secreted in the gall-bladder by the liver.

Bilge, the larger portion of a barrel or a cask, which is generally in the middle.

Biliousness, a feverish state of the system which develops a yellowish skin and an appetite for sour or bitter drinks,—the condition supposed to be due to an overflow of the "bile" throughout the system, caused by a general clogging of the excretories, from malaria, bad diet, etc.

REMEDIES FOR BILIOUSNESS: *Regular:* A blue pill, followed by a mild purgative. *Homeopathic:* 1 drop of aconite 3 times a day; or 1 drop of mercurius vivus in 6 tablespoonfuls of water, one of which may be taken 3 times a day. Nux vomica, given like the last, is indicated by costiveness, loss of appetite, nausea, crampy headache, etc. *Botanic:* Soak some dandelion, both root and leaves, in soft water until the essence is extracted, boil down to a sirup and take 1 to 3 glasses of this a day. *Hygienic:* Diet principally on unseasoned fruits, graham crackers and vegetables; take a good sweating bath 2 or 3 times a week and receive friction or passive exercise. Take no active exercise.

Bill, or **Bill-hook**, a hatchet or hedging knife with a curved point.

Bill of Exchange, an order drawn by a creditor upon his debtor, demanding of him payment of a specified sum of money at a designated time. These bills are used for the settlement of accounts between parties separated by great distances. The acceptance of such a bill renders it a binding obligation upon the person on whom it is drawn.

Bill of Lading, a printed receipt given by the master of a vessel or the agent of a transportation company for freight shipped by such vessel or company, such receipt specifying the conditions upon which the freight is to be transported.

Bill of Sale, list of goods sold, usually attested by a notary, justice or witnesses.

Bills Payable. Written obligations, as promissory notes, etc., are "bills payable" in the payer's accounts and "bills receivable" in the payee's accounts.

Birch, a forest tree, several species of which are found in the temperate zone all around the world.

The black birch is handsome, and valuable for timber. Red or river birch is found on the banks of rivers, and grows as high as the soft maples, with a diameter sometimes of as much as two feet. The canoe or paper birch is common throughout the Northern States in the wooded sections. It is characterized by a white or papery bark. Many ornamental varieties of birch can be had of nurserymen. The weeping variety is very graceful.

Birds As to the comparative utility of most birds, statistics are yet too meager to settle the question. Song and feather enter so largely into the subject that it will mostly be relegated to the domain of taste. Many persons are willing to sacrifice some of their fruits and garden and field products for the presence of song birds and birds of beauty. But from the low utilitarian standpoint, birds are classified as follows:

Birds to be Preserved and Fostered: Blue birds, titmice (chickadees), warblers (small warbling birds found on trees and in gardens), kinglets (ruby-crowned and golden-crowned wrens), nut-hatches and creepers (black, white and brown); wrens, martins (swallows), vireos (greenlets), tanagers, finches, song sparrow, chipping sparrow, field sparrow, clay-colored sparrow, black-throated bunting, indigo bird, cardinal grosbeak, ground robin (chewink); blackbirds (crow, bobolinks, meadow lark and others); all the fly-catchers (including king-birds and the peewee); cuckoos, night-hawks (goat-suckers and whip-poor-wills); swifts (chimney-swallows); all the woodpeckers except the yellow-billed (or sap-sucker) and, perhaps, also the large, red-headed woodpecker; plovers, prairie snipe (prairie plover,) quail. It is also recommended to fruit-growers to raise all species of domestic fowls except geese.

Birds Doubtful, or whose habits are not sufficiently known to justify full recommendation, and whose habits are sometimes beneficial and sometimes injurious: Thrushes—including the common robin, cat-bird, mocking-bird, brown thrasher, wood-thrush, tawny thrush and hermit thrush; shrikes—including the great northern shrike and white rumpled shrike (butcher bird), Savannah bunting, crow, blue-jay, red-headed woodpecker, saw-whet owl, screech owl, horned lark, orchard oriole and pigeons.

Birds to be Destroyed: Cedar bird, Baltimore oriole (hanging bird), larger owls, hawks, the English sparrow and the yellow-billed woodpecker (or sap-sucker). This species is distinguished from the other small woodpeckers by its pale yellowish breast, a large patch of black upon the upper part of the breast; the throat of the male is a bright red and that of the female is white; the adults, both male and female, have the top of the head also red. These points distinguish it from the downy woodpecker and the hairy woodpecker, which it closely resembles in size and form. These two species have the outer tail feathers *white* (or in the former barred with black and white), while the sap-sucker has the outer tail feathers *black*, while the center ones are nearly white. The hairy woodpecker has a *small* red spot on the *back* of the head only, which is easily distinguished from the red upon the head of the yellow-billed (or sap-sucker), which extends from the beak, covering almost the entire crown.

Bird-Catching. A simple method, under favorable circumstances, is to burn sulphur under them when at roost in the low trees. Another plan is to steep some grain in wine lees and hemlock juice, and scatter it in some place where the birds frequent. On eating it they become intoxicated and drop over. The ordinary "quail trap," with which every country lad in America is acquainted, is still a source of uncloying entertainment. Catching birds by the use of "bird lime" has long been popular in the "old country." It is a viscous substance, usually made of the juice of holly bark or mistletoe berries, extracted by boiling, mixed with a third part of nut oil or thin grease. It may be obtained through a druggist. Put this substance into an earthen dish, adding one ounce of fresh lard to every quarter of a pound, and melt the whole gently over a fire. Take a number of wheat heads, with a foot of straw attached to each, and spread the warmed lime over the stalks for six inches below the heads; scatter a little chaff and throw the heads over a space of 20 yards; stick the limed straws into the ground with the heads inclining downward, or even touching the ground; then traverse the vicinity in order to disturb the birds and make them fly toward the snare. By picking at the heads they will become so entangled with the limed straws that they can be easily taken with the hand. This "lime" may also be applied to cords, rods or twigs, especially when it is intended to entangle the larger birds, such as snipes, plovers, thrushes, etc. For the latter purpose, take the main branch of any bushy tree, with long, straight and smooth twigs, such as willow or birch; clear the twigs of every notch and prickle; lime the branches to within two or three inches of the bottom, leaving the main bough from which the others rise untouched with the composition, and place the bush where the birds resort.

Hair nooses, baited with grain and certain seeds, are often successfully used with woodcocks, larks and other small birds when the ground is covered with snow. Stretch over the ground 100 to 200 yards of twine, pegging it down every 20 yards, and fastening at every six inches a noose of double horse-hair. Scatter white oats along the line of the nooses, and await the result. When three or

four birds are taken, remove them from the noose so the other birds will not be deterred.

One of the most successful modes of bird-catching is by the net, which is chiefly employed during the night. The method succeeds best on cold, dark nights. Take two light, straight poles 10 or 12 feet long; tie two corners of the net to the smaller ends, and fasten the other two corners as far as they can be stretched toward the thicker part, connecting the sides of the net along the poles with twine. Go to the thicket where the birds are, unfold the net and pitch it exactly the height of the bushes on the windward side, as the birds always roost with their breasts toward the wind. Let some one with a lantern stand behind the middle of the net while another beats the bushes on the opposite side, driving them toward the light; the birds will fly toward the illuminated net and fall into it.

In open countries a trammel net may be used, which is generally about 36 yards in length and six in breadth. The lower end is weighted to make it lie close while the upper is kept suspended at the two corners. The net is dragged along the ground at about a yard in height. At each end lights must be carried, and persons stationed with long poles to raise up the birds as they proceed, and to take them as they ascend under the nets. Along with the nets and lights a bell is frequently employed in open fields, from the middle of October to the end of March. At night, when the air is mild, take a low bell of a deep and hollow sound; provide a lantern or a square box, lined with tin, and open at one side, into which two or three large lights are placed; fix the box to the breast, carry the bell in the left hand and a hand-net in the right; this net may be two by three feet in size, or the bell may be tied to a girdle around the waist, and, as it hangs down to the region of the knees, the motion of walking will keep it sounding. A companion may walk on each side provided with a hand-net three or four feet square, but keeping a little behind, that he may not be within the reflection of the light. The sound of the bell makes the birds lie close, while the light also tends to overpower them as they are seen lying on the ground.

Some birds, as the goldfinches, wood-larks, titlarks, yellow-hammers, etc., may be taken in the daytime. They fly until noon, and against the wind. Take nets 12 yards long and 2½ wide, spread them on the ground parallel in such a manner as to meet when turned over; have lines attached to them so that by a sudden pull you can draw them over the birds which light between them. Use bird calls and decoy birds, and, better still, birds in cages, one or two individuals of the kind you wish to catch. These will see their species before the catchers can, and call them to the place. Whole flocks are sometimes taken in this way.

Skylarks, in fine sunny weather, may be allured within the reach of clap-nets by means of small bits of looking-glass fixed in a piece of wood in the middle of the nets, and put into a quick, whirling motion by a string. Quails and pheasants may be taken in the evening, by observing where they alight and drawing a net over them.

Cage Birds, Care of. Watch your birds to see if they have diarrhœa or costiveness; examine nests and wood-work for mites, and examine birds for lice; take each bird out and raise its feathers on head and body with darning-needle for lice. Crackers will make them costive. Recipes: Diarrhœa, give cayenne pepper; costiveness, half drop castor oil and change food; for mites, whitewash nests and woodwork with lime and a little carbolic acid to make it pinkish, or repaint cages; and for lice, anoint heads with olive oil, with a touch of carbolic acid in. Do not keep birds too warm, nor in a draught; give a pint of sand in a saucer to rub in and eat, and a saucer of water to wash in.

Canaries. The last of February or the first of March is early enough to mate birds. In cool weather the eggs hatch in 14 days, and in hot weather, 13 days. When the birds wish to hatch, tie to the side of the cage, near the top, and tight enough to prevent swinging, a nest, which may be a small, round paste-board box, or a little basket made for that purpose. Arrange cotton in the nest in the form of wild-bird nests, and line it with flannel. The nests can and should be changed as often as they require it. In raising any considerable number of birds it is next to impossible to keep them free from mites if you do not change the nests. Nests can be made of old collar-boxes, filled with hay or cotton, and covered with cloth. There are very few birds, however, but what will leave the nest if the cage is changed from place to place. They do not like to have strangers around. One person should have the care of them. Feed crackers and milk when they are raising their young. After hatching, take out the old nest, and put a new one in the same place. Feed at all times hard-boiled egg (cut the egg in two, and let them have it, shell and all). Allow them to bathe at all times. A sitting bird will not go back to the nest, after bathing, until her feathers are dry. Feed oats, bread and vegetables during winter. Hemp and canary seed will make them too fat, and should not be fed till time of mating. Mates should be changed as often as once in two years, or three years at the longest. The young birds will then hatch out strong and healthy, and will have much better constitutions. As soon as the birds begin to hatch supply them with hard-boiled eggs and cracker chopped together; also their usual supply of seed, water, cuttle-fish bone or sand. The position of the cage must not be changed until the birds are hatched, as the change of position sometimes causes the female to desert the nest. Con-

tinue the chopped egg and crackers until the young birds are at least a month old. After that they can take care of themselves, and will not need such food. They will not thrive without it during the first few weeks. They do wrong who remove the male bird as soon as hatching begins, as it generally happens that the male bird takes better care of the young ones than the female. Should the female begin to pick the feathers from the young birds (and that is often the case when they are two weeks old), remove her, and the male bird will continue to feed them until they can take care of themselves, and even longer. As soon as the young birds are old enough, remove them to another cage, and remove the mother bird to the hatching-cage, and she will hatch again. Canaries generally hatch six or eight times a year.

Four or five times a year is often enough for a bird to hatch young. Oftener than that is too great a tax on their vigor and vitality. The male birds will get poor in flesh if allowed to feed the young birds. Let the female attend to that. If they act dumpish and puny, with rough feathers, put a rusty nail in their drinking water. Besides the usual care nothing more than this is necessary in order to be successful in raising canaries.

To clean canaries of lice, place a clean, white cloth over their cage at night. In the morning it will be covered with small, red spots, so small as hardly to be seen except by the aid of a glass; these are the lice, a source of great annoyance to the birds.

To Stuff Birds: See Taxidermy.

Birth-mark, some peculiar mark or blemish at birth. Some such marks can be removed by the following process: Mix together one part pure carbonate of potash, four parts of rose water, two parts of Hoffman's Life Balsam and two parts of distilled water. Shake well and apply to the mark twice a day.

Biscuit, an unleavened cake made from flour, generally unsweetened and of a certain size, say two or three to the pint.

Plain Biscuit. One pound of flour, half a pint of milk, two ounces and a half of fresh butter. Dissolve the butter in the milk, made warm, but not hot, and stir it into the flour to make a firm paste; roll it out thin with a plain tin shape or a tumbler; prick each biscuit and bake.

Light Biscuit. Take 2 pounds of flour, 1 pint of buttermilk, half a teaspoonful of saleratus; put into the buttermilk a small piece of butter or lard, rubbed into the flour; make it about the consistency of bread before baking.

Mother's Raised Biscuit. Scald one quart of milk; into this, while hot, put a piece of butter the size of an egg; when cold, add one egg, a teacupful of baker's yeast, or home-made; thicken with sifted flour to a batter as thick as muffin batter; let rise, mold, rise again, bake quickly.

Tuckahoe Biscuit. Three eggs, three cups sugar, one cup butter, one cup sour cream, one teaspoonful soda, essence of lemon to taste, sufficient flour to roll out soft and thin. Bake in tins.

Tea Biscuit. One quart of sifted flour, a little salt, three teaspoonfuls Royal baking powder, a small handful of sugar; mix lightly through the flour; rub a large teaspoonful of lard through the dry mixture; mix with sweet milk or water, the colder the better; roll out soft to thickness of about one-third of an inch; cut with a large-sized cutter, and bake in a really hot oven.

Coffee Cakes. Take some rice that has been boiled soft, twice as much flour as rice, a little fine Indian meal, and a little yeast; mix it with cold water, and let it rise over night; this will make a very fine biscuit for breakfast.

Bread Biscuit. Three pounds of flour, half a pint of Indian meal sifted, a little butter, two spoonfuls of lively yeast; set it before the fire to rise over night; mix it with warm water.

Graham Biscuits. Three parts of Graham, one part of flour; use good shortening, and work into the flour well; to every pint of sour milk use one large spoonful of sugar; make them just as you would any biscuit; do not mix them hard, and bake in a quick oven.

Brown Bread Biscuits. One pound of coarse Graham flour, two ounces of butter, and a little water. Make the butter and water boiling hot, add it to the flour, keeping it very firm. Roll the biscuits out, not too thin, and bake them in a rather quick oven.

Brown Bread Biscuit. Two quarts of Indian meal, 1½ pints of rye, 1 cup of flour, 2 spoonfuls of yeast, and 1 tablespoonful of molasses. It is well to add a little saleratus to yeast almost always, just as you put it into the article. Let it rise over night.

Ginger Biscuits. Eight ounces of flour, four ounces of butter, four ounces of loaf sugar, yolks of three eggs and some ground ginger. Beat the butter to a cream before the fire, add the flour by degrees, then the sugar, pounded and sifted, and a flavoring to taste of ground ginger, and mix the whole with the yolks of three well-beaten eggs. When thoroughly mixed, drop the biscuit mixture on buttered paper, a sufficient distance from each other to allow the biscuits to spread, and bake them a light color in a rather slow oven.

Lemon Biscuits. Dry well before the fire a pound and a half of flour; rub into it a quarter of a pound of butter as fine as possible; mix with it a pound and a half of loaf sugar, pounded, and the peel of three lemons, chopped very fine. Well beat two eggs, add to them the juice of two lemons, and stir thoroughly. Put the mixture into the

flour, and mix all well together till you have a stiff paste; roll it out to the thickness of a penny piece, and divide it into biscuits with a pastry cutter. Bake them on a tin. These biscuits should be kept in a tin box near the fire till wanted, as they are apt to give and spread out.

Bishop, to make an old or bad horse look temporarily young and well, by clandestine arts, in order to deceive a purchaser.

Bismuth. For poisoning by this mineral give a salt-and-warm-water emetic.

Bite of Mad Dog, or other mad animal. Bandage around the part bitten, to prevent the poison from spreading into the circulation; suck the poison out with the mouth as thoroughly as possible; this must be done by a friend of the patient, if such can be found who will undertake the task, if one's mouth is not wounded, sore or raw anywhere, no poison will affect it; next, cauterize the place, either with a hot iron or with a solid piece of nitrate of silver (lunar caustic); sometimes the patient must be chloroformed or etherized. Let him drink plenty of warm water; or take, immediately after the bite, warm vinegar or tepid water, wash the wound clean therewith, and dry it; then pour upon the wound a few drops of hydrochloric acid, because mineral acids destroy the poison of the saliva. Another method is to cut the wound; to do this well, cut out a piece of wood the shape of the wound and insert it, to support its walls, that the cutting may be done more perfectly. In the course of six weeks one can tell whether all danger is passed; for, if by that time the wound has healed over with a sense of itching or burning still persisting in the place, all hope is gone, and the patient must in the course of time have Hydrophobia, which see.

Bite of Rattlesnake, or other poisonous reptiles. Treatment, same as for the foregoing; or, take 30 grains iodide of potassium, 30 grains iodine, 1 ounce water; mix and apply to the wound by saturating lint or batting, the same to be kept moist with the antidote until the cure be effected, which will be in one hour or sooner. Or, dilute carbolic acid or ammonia, applied every few minutes. Some say, when treatment begins, cover up the patient in bed; others, that he ought to be kept moving, in order to keep him out of the stupor that generally sets in at such times. To aid the latter it is recommended to give brandy and water; or, take of brandy, 2 drams; spirits of sal volatile, 40 drops; tincture of valerian, ½ dram; sulphuric ether, 15 drops, and camphor water, 1 oz. The effects of bites of insects can generally be dissipated by rubbing the part, and sometimes putting on a strong solution of some alkaline substance, as ammonia. The juice of plantain leaves applied or drinking a large draught of whisky are also popular prescriptions; see Stings.

Bite, in mechanical work, is the hold which the short end of a lever has upon the thing to be lifted.

Bitters, the bitter properties of bitter roots, barks or herbs preserved in whisky for medicinal purposes. Generally, the beverage is only an excuse for whisky-drinking,—in effect, if not by design. We give a few of the best recipes:

No. 1. Make a strong tea of thoroughwort; strain it; when cool, put to two quarts of it a pint of whisky, the peel of two or three fresh oranges, cut in small bits, and six bunches of fennel seed. Turn the tea and liquor on the peel and seed in a bottle, and cork it tight. The bitters will keep good a long time; they are excellent for bilious complaints, and can often be taken when thoroughwort tea will not suit the stomach. Put a wineglass of the bitters to a tumbler of water, adding a little sugar at the time of drinking them.

No. 2. Take of poplar bark three pounds, prickly ash, golden seal, cloves, ginger, each three-fourths of a pound; balmony, one-half pound; cayenne, six ounces; sugar, five pounds; mix and sift. Dose: a teaspoonful in boiling water. Good in debility, loss of appetite, dyspepsia, etc.

No. 3. Take four ounces of columbo root, two ounces wormwood, two ounces tansy, two ounces quassia, six ounces gentian, four ounces dried orange peel. Bruise and mix well together, and put in two quarts of good whisky. Shake well every day, and at the end of ten days strain. Take a tablespoonful before each meal and two tablespoonfuls after. This is valuable in indigestion and all bilious complaints.

No. 4. Take one quart of good whisky, half pound bruised gentian, two ounces dried orange peel. Mix all together, shaking the ingredients occasionally during the day, and after six days strain off the liquor. The dose is a wineglassful mixed with a little water.

Bitumen (bit-u'men), mineral pitch. The term includes petroleum, asphaltum, mineral tar and naphtha. Bituminous coal is the soft kind, which in combustion yields a luminous flame.

Blackberry. There are several species of this valuable plant native in this country. The best for dessert or for cooking are the low blackberry, a trailing shrub, and several varieties of the high blackberry, which we will name and describe further on.

CULTIVATION. The blackberry is universally propagated by suckers, or offshoots, springing up from the main roots. It may also be grown from pieces of the roots. Blackberry roots are as persistent as those of witch grass. The plants should be set two or three feet apart in the row, and the

rows seven to eight feet apart, with a twelve-foot road at every sixth row for wagoning through the field. Some prefer the closer limit, as the ground is thereby better shaded, keeping it moist and preventing the weeds and grass from starting. Also the plants interlock with their branches and thus support each other when laden with fruit, and sometimes hold the snow up in a body and thus protect the twigs from freezing in severe cold weather. The general advice is to plant in the fall, placing a forkful of manure to each plant for mulching and plant food.

As to the selection and treatment of the ground we should in general endeavor to imitate nature as closely as possible; therefore the soil should be a rich loam, well drained, thoroughly and constantly mulched. Leaf mold is the best, but it is rather too tedious to collect. Very low and level land is objectionable for two reasons, namely: it does not drain well, and fruit trees and plants are far more liable to winter-kill in such situations. Even the Snyder, the hardiest of the blackberries, has been killed by freezing on low ground. No ground, however, can be made to last longer than five or six years with ever so much attention, as some essential element not yet discovered becomes consumed from the soil. The winter of 1878–79 killed all the varieties in the West excepting the Snyder, and even that was damaged in some places.

The cane should be cut back the first week or so of June to two or three feet, and the branches checked at 12 to 15 inches. This work can be done very rapidly with a sharp butcher-knife. Some horticulturists, in the treatment of the Snyder variety, pinch back the branches but once during the summer, and then depend on the winter pruning, when they cut back one-third to one-half.

The object of this clipping off is to cause the canes to throw out lateral or side branches down to the ground, like a low-trained pyramidal tree, and to make the canes stocky and self-supporting. These laterals will soon extend to from one to two feet all around, and must themselves be cut back late in the winter or early spring. Those nearest the ground may be left ten or twelve inches long, those near the top say about two or three inches, and the intervening ones four, five or six inches.

The weakness of the blackberry is to overbear, and the very frequent drouths common in summer aid to ruin a crop.

While this attention is given to the young canes the grower should also be careful to keep the earth mellow by frequent culture and thorough hoeing to kill weeds. These grow on rich blackberry land in May and June with surprising rapidity. The cultivator will take care of those between the rows, but for those that come up in the rows and between the hills (unless so planted as to cultivate both ways) the hoe must be used. But the hoeing need not be deep. The work should not be neglected so long that the weeds can become large or well-rooted, and small weeds hacked or shaved off by a sharp hoe just below the surface of the soil become very much discouraged after two or three operations. The ground then needs no special stirring, as blackberry roots are great ramblers and do not depend for sustenance on the soil within two or three feet of the hills. The weeds should be killed because they pump up moisture, are in the way for picking, and are untidy, but the few that grow just about the hills cannot do extraordinary harm, even if left. But begin with them on their first appearance, and again on their second appearance, and the work is then easy and rapid.

Moisture is what the blackberry specially needs for its perfection. When the rains are insufficient the cultivator and the hoe will go far toward supplying the lack. Constant work only will keep the soil in light and moist condition. The cultivator running through the plantation two or three times a week will usually put the crop beyond serious danger. But when the time for ripening is preceded by a long drouth and the yield of berries promises to be heavy the question of thinning out then becomes a serious one.

The greatest enemy in the culture of this fruit is the orange rust, which alone has caused blackberry-raising to be given up entirely in some localities. The Snyder so far has been almost free from this disease, but it is feared that it also may yet succumb to it. No remedy is discovered except to burn the canes affected as fast as they appear. A mite also attacks the blackberry in some fields, and does perceptible injury. The Kittatinny is sometimes so thoroughly sapped by insects in the fall as to take away their life entirely, and the next year they seem to have been winter-killed. Indeed, some think that this variety never winter-kills, but is sapped to death by insects in the fall.

Wild blackberries are cultivated to some extent, but on account of the difficulty of imitating their wild and native surroundings perfectly, they do not do as well as in the forest. Most blackberries do better when protected by trees and shrubs.

VARIETIES. The principal varieties of the blackberry which have been cultivated in this country are the following:

Ancient Briton or *Britain.* Good in the Northwest; fruit medium size and very sweet; canes hardy, and the plant tolerably free from suckers.

Barnard. This berry is a good one in the Northwest, and the plant stands the winters well.

Brunton's Early Prolific. Hardy, ripens a week before Wilson's Early, of uniform medium size, but being a pistillate it has to be with the Kittatinny or Snyder for the sake of fertilization.

Early Wilson or *Wilson's Early*. Hardy, productive; fruit large, oblong oval, black, firm, sweet. Not much subject to rust. A good market sort.

Kittatinny. In quality of fruit this is the best blackberry and out-sells any other variety; its season is very long, being about six weeks; it does well, even during seasons of comparative drouth. Fruit very large, roundish conical, rich glossy black, moderately firm, juicy, rich, sweet. Until lately it was planted more extensively than any other kind but the Lawton. The cane of the Kittatinny is heavily set with thorns.

Lawton or *New Rochelle*. This variety is of very vigorous growth, hardy and productive, but thorny; fruit very large, oval, fleshy, and when fully ripe intensely black; when mature it is very juicy, rather soft and tender, with a sweet, excellent flavor; when gathered too early it is acid and insipid. It ripens about the first of August, and continues in use five or six weeks. In the older sections of the Union, in protected situations, and where it is best known, it is one of the most popular small fruits that has ever been cultivated. It has been known to produce over one thousand full-grown berries in one season on a single stalk, the average size of fruit being from three-fourths to one and a half inches in diameter; quality excellent, very juicy; seeds very small and few in number. Eight quarts of berries will make one gallon of juice, which, mixed with two gallons of water and nine pounds of refined sugar, will make three gallons of wine, equal in quality to the best grape wine.

Missouri Mammoth. This is the largest blackberry, quite black, firm, rich, juicy, sweet, without any core, ripens early, and continues a long time in bearing.

See's Early. This new variety, which is now being extensively introduced, is very hardy, prolific; berries uniform in size and good for shipping. It ripens about two weeks earlier than most other kinds.

Snyder. At present this variety takes the lead in the West in respect to hardiness. It does not winter-kill except in low grounds in the severest winters, and so far it has resisted the rust better than any other. It has a tendency to overbear, is second best in quality, and ripens late. The canes bear the most the fourth year and afterward. The Snyder requires good cultivation and careful thinning and pruning.

Taylor. This new candidate for public favor is said to be hardy and prolific, the fruit large and delicious.

Triumph of the West or *Western Triumph*. Canes hardy and very thorny; fruit highly flavored, but ripens late.

Wallace. This prolific blackberry is a comparatively new variety now being tested in the West.

Blackberry Brandy. To half a gallon of blackberry juice put one pound and a half of lump sugar, half an ounce of cinnamon, half an ounce of grated nutmeg, quarter of an ounce of cloves, and one ounce of allspice. Boil it a few minutes, and when cool add one pint of brandy. This is an invaluable remedy for diarrhœa.

Blackberry Cordial. To one quart of blackberry juice add one pound of white sugar, one tablespoonful each of cloves, allspice, cinnamon and nutmeg. Boil all together 15 minutes; add a wineglass of whisky, brandy or rum. Bottle while hot, cork tight and seal. This is an astringent. Dose: one wineglassful for an adult; half that quantity for a child. May be taken three or four times a day in severe cases.

Blackbird: See Birds.

Blackboard, COATING FOR. Take pulverized slate or quartz, moisten it to the consistency of a thick fluid with silicate of soda, "water glass" of commerce, and apply with a brush. Or, make a paint of asphaltum or grahamite, dissolved in naphtha. Or, mix flour emery with shellac varnish, which has been dissolved with alcohol, and add enough lampblack to give the required color. It requires a day or two to dissolve the shellac.

Blacking, FOR BOOTS AND SHOES. For liquid blacking, take ivory black, one pound; molasses, three-fourths pound; sweet oil, two ounces; beer and vinegar, each one pint. Rub together the first three until the oil is perfectly killed, then add the beer and vinegar. Other recipes for liquid blacking are given, most of which contain oil of vitriol, which, while it gives a brighter gloss, is said to injure the leather. For paste blacking, take of molasses one pound; ivory black, one and one-fourth pounds; sweet oil, two ounces; rub together and add a little lemon juice or vinegar.

BLACKING, FOR HARNESS AND SHOES. Take three ounces spermaceti, melt it in an earthen vessel over a slow fire; add six drams India-rubber cut into thin slices; let it dissolve; then add eight ounces tallow, two ounces lard, and four ounces amber varnish; mix, and it will be fit for use.

Another: Take camphene, one pint, and put into it all the India-rubber it will dissolve; when dissolved add currier's oil, one pint, tallow, six pounds; lampblack, two ounces; mix thoroughly by heat. This is a nice thing for old harness or carriage tops, as well as for boots and shoes. Or you can dissolve the rubber in the oil by setting them in rather a hot place for a day or two.

Another: Beeswax, two pounds; resin, one-half pound; fish oil, three-fourths of a pint; neatsfoot oil, three-fourths of a pint; spirits turpentine, two

and a half pints; glycerine, one-half ounce; lamp-black, one-fourth pound. Melt the wax and resin, then stir in the other ingredients, when it is ready for use. Apply with a brush, and polish with a wet brush.

Bladder, Inflammation of. "Until the doctor comes," take a warm sitting bath for half an hour, free the bowels with tepid or cool injections, and remain in a state of rest. The general fever may be reduced a little by wetting the body, under the cover of the bed-clothes, and gently wiping off. Bathe only a part at a time, and avoid any draft of cold air upon the body. Eat no highly seasoned food, and drink no herb teas. Any acrid matter has a tendency to irritate the bladder, especially when it is tender and inflamed.

Bladders, To Prepare. Soak them for 24 hours in water, to which a little chloride of lime or potash has been added; then remove the extraneous membranes, wash them well in clean water, and dry them.

Blain, a disease of cattle known by various names: See Cattle.

Blanc Mange (bla-monj'), a fine white pudding made from starch, isinglass or sea moss, with milk, sugar, cinnamon or nutmeg, etc.

Arrow-Root Blanc Mange. A teacup of arrow-root to a pint of milk; boil the milk with twelve sweet and six bitter almonds, blanched and beaten; sweeten with loaf sugar and strain it; break the arrow-root with a little of the milk as smooth as possible; pour the boiling milk upon it by degrees; stir the while; put it back into the pan and boil a few minutes, still stirring; dip the shape in cold water before you put it in, and turn it out when cold.

Oswego Blanc Mange. Four tablespoonfuls, or three ounces, of Oswego prepared corn, or corn-starch, to one quart of milk. First, dissolve the corn in some of the milk; put into the remainder of the milk four ounces of sugar, a little salt, a piece of lemon rind, or stick of cinnamon, and heat to near boiling. Then add the mixed corn and boil four minutes, stirring briskly. Take out the rind or cinnamon, and pour into a mold or cup, and keep until cold. When turned out, pour around it any kind of preserved fruit or jelly; or a condiment of milk and sugar may be used, and you will have a delightful and ornamental dish.

Rice Blanc Mange. Swell four ounces of rice, drain and boil it in good milk to a mash, with sugar, a bit of lemon peel and a stick of cinnamon. Extraordinary care will be required to keep it from burning. Mold as above, and garnish with currant jelly or any red preserved fruit, or serve with cream or plain custard. See also Puddings.

Blanch, to bleach or whiten.

Blaze, a white mark or star in the face of an animal.

Bleaching. Under this head are included general recipes for bleaching or decolorizing fabrics and goods, and if the directions given are carefully followed the best results may be expected.

To Bleach Cotton Pure White. Boil for three hours in water containing one gill to the gallon of either caustic potash or caustic soda; wash well from the lye; then lay the yarn or fabric to steep for four or five hours in cold water containing one pint of bleaching liquor to the gallon (to make this, see next article); then lift out and steep for an hour in a sour of one wineglassful of sulphuric acid to the gallon of water; lift, and wash well; then boil for two hours in caustic lye, half the strength of the first; wash from this, and steep again for four hours in the bleaching liquor; wash from this, and steep again for one hour in a clean sour, made in the same manner as the first; wash well from this, and dry. A little smalt blue is put into the last washing water to clear the white.

Feathers. By the process given below the feathers of ostriches and other birds may be bleached, even if these are naturally of a black or gray color: Place the feathers for from three to four hours in a tepid dilute solution of bichromate of potassa, to which, cautiously, some nitric acid has been added. After this lapse of time the feathers will be found to have assumed a greenish hue, owing to the oxide of chromium precipitated on the substance. In order to remove this, the feathers are placed in a dilute solution of sulphurous acid in water, whereby the feathers become perfectly white and bleached. Care is to be taken that the solution of bichromate be not made too strong, and especially that not too much nitric acid be used, which would cause an irremovable yellow color.

Wool. The first kind of bleaching to which wool is subjected is to free it from grease. This operation is called scouring. In manufactories it is generally performed by an ammoniacal lye, formed of five measures of river water and one of stale urine; the wool is immersed for about 20 minutes in a bath of this mixture heated to about 130 degs. Fahr., then taken out, suffered to drain and rinsed in running water. This manipulation softens the wool, and gives it the first degree of whiteness. It is then repeated a second time, and even a third; after which the wool is fit to be used. In some places scouring is performed with water, slightly impregnated with soap; and, indeed, for valuable articles, this process is preferable; but it is too expensive for articles of less value. Bisulphide of carbon and benzine have been employed for cleansing wool. The fat may be saved by distilling all

the solvent, which may be used over and over again. Sulphurous acid gas unites very easily with water, and in this combination it may be employed for bleaching wool and silk.

Instead of using the fumes of sulphur, one may use the following mixture: Four pounds oxalic acid, four pounds table salt, 200 quarts of water. The goods are laid in this mixture for an hour. They are then generally well bleached, and then only require to be thoroughly rinsed and washed.

Woolen Rags. These are most effectually bleached by the application of sulphurous acid. Of course in many instances the color of the rags, supposing the same to be dyed or printed goods, will also be destroyed. Chlorine cannot be used for this purpose, because it causes woolen and silk fabrics to become yellow, and impairs the strength of the fiber by entering into chemical combination with the wool, silk, and other similar substances of animal origin; as, for instance, sponge, animal gut, isinglass, etc., all of which, if requiring bleaching, are bleached by sulphurous acid.

Bed Blankets. These can be bleached by burning sulphur or brimstone, as in the case of straw hats.

White Flannel. This fabric can be bleached with brimstone. The goods should be washed and rinsed clean before the process is begun.

Wax. Ordinary beeswax is bleached by exposure to the influence of the sun and weather. The wax is sliced in thin flakes and laid on frames, raised from the ground, and frequently turned over and sprinkled. It will require about four weeks. If, on breaking, it is yellow inside, it must be remelted and exposed. Wax cannot be bleached by chemicals. Chlorine will whiten, but also greatly injure it.

Straw Bonnets. Get a deep box, air tight if possible; place on the bottom a stone; on the stone a flat piece of iron, red hot, or a pan of charcoal, on which scatter powdered brimstone; close the lid, and let the bonnet remain a night, suspended on a hook.

Straw Hats. The process of bleaching straw hats is the same as that of bonnets. Here is an excellent recipe for bleaching them: If the hat is badly sun-burned, soak it in sour milk a few days. Wash the hat clean in lively soap suds, with either a flesh or tooth brush, then rinse. Have a tight barrel or box ready. Drive a nail in on one side to hang the hat on, putting a thread through the rim to form a loop to suspend it by. Have the cover ready. Take an old dish, put in some live coals, then throw on some stick sulphur or brimstone, previously pounded into small lumps. Five cents' worth would be enough.

Linen. The lye called "bowking," or "bucking," is prepared by dissolving potash in soft water, to which some soap is added. This liquor is heated to about 100 degrees and poured upon the linen. After the cloth is well down in the lye, it is drawn off, heated a little higher, and again poured upon the cloth. This operation is repeated at intervals, allowing the lye to remain longer at each successive time, and moderately increasing the heat for five or six hours. The cloth should then be left steeping for three or four hours, when it is taken out and well rinsed. But each filament, after the alkaline process, retains a certain impregnation of coloring matter so intimately united as to resist the further action of it. This is removed by the slow and gradual influence of the atmosphere and the rays of the sun, which together decompose it. This is done by spreading the linen upon the grass, securing it by pins; sprinkle water on it, so that it shall not become dry for some hours. After it has lain for about half a day, the watering may be less frequent, and at night it is left to the full action of the air and dews. On the succeeding days it is watered three or four times a day, if the weather be dry. When it has remained till the air seems to have done its work, it should be again returned to the coppers and bucked again with a lye somewhat stronger than the last, rinsed and again spread upon the grass. It is thus bucked and watered ten or fifteen times, according to the weather, making the bucking stronger and stronger till about the middle, and weaker and weaker till the finish of the process. The scouring can be done as in bleaching cotton.

Silk. This textile must first be deprived of the natural varnish with which the filaments are coated, and to which is ascribed much of its stiffness and elasticity. This varnish is of a resinous nature, and is soluble in alkaline lyes. Soap generally removes it; but as the matter separated is very fetid, putrid fermentation will take place and injure the silk, if it be not well rinsed in water. Steam is employed in France for this purpose, and to give silk its complete, splendid whiteness, it is necessary, also, to expose it to the fumes of burning sulphur, to destroy a substance of a yellowish color with which the European silk is impregnated. The silk intended to be white requires to be more completely scoured than that which is to be dyed.

Bleaching Liquor. This is made by taking a quantity of bleaching powder (chloride of lime) and adding to it as much water as will make it into a thin cream; take a flat piece of wood and break all the small pieces by striking them against the sides of the vessel; then add two gallons of cold water for every pound of powder; stir well, put a cover upon the vessel, and allow the whole to settle. This will form a sort of stock vat for bleaching operations.

Bleaching Powder, lime chloride, or chloride of lime.

Bleeding from an artery being divided or torn may be known by the blood issuing out of the wound in leaps or jerks, and being of a bright scarlet color. To arrest arterial bleeding, get a piece of wood (part of a mop handle will do), and tie a piece of tape to one end of it; then tie a piece of tape loosely over the arm, and pass the other end of the wood under it; twist the stick round and round until the tape compresses the arm sufficiently to arrest the bleeding, and then confine the other end by tying the string around the arm. A compress made by enfolding a penny piece in several folds of lint or linen should, however, be first placed under the tape and over the artery. If the bleeding is very obstinate, and it occurs in the arm, place a cork underneath the string, on the inside of the fleshy part, where the artery may be felt beating by any one; if in the leg, place a cork in the direction of a line drawn from the inner part of the knee toward the outer part of the groin. It is an excellent thing to accustom yourself to find out the position of these arteries, or, indeed, any that are superficial, and to explain to every person in your house where they are, and how to stop bleeding. If a stick cannot be got, take a handkerchief, make a cord bandage of it, and tie a knot in the middle; the knot acts as a compress, and should be placed over the artery, while the two ends are to be tied around the thumb. Observe always to place the ligature between the wound and the heart. Putting your finger into a bleeding wound and making pressure until a surgeon arrives will generally stop violent bleeding.

ORDINARY bleeding from a wound on man or beast may be stopped by a mixture of wheat flour and salt in equal parts bound on with a cloth. If the bleeding be profuse, use a large quantity, say from one to three pints. It may be left on for hours, or even days, if necessary. Soot applied to a fresh cut or wound will stop the blood and abate the pain at the same time. To check bleeding from the lungs, let the patient eat freely of raw table-salt. Loaf sugar and resin, equal parts, powdered; take a teaspoonful four or five times a day. It will be found of great use. A tea made of yarrow is very useful in this complaint. Choose a light diet, chiefly of milk and vegetables, and avoid all hot and stimulating drinks. For bleeding at the stomach, take one pound of yellow-dock root, dry it thoroughly and pound it fine; boil this in a quart of milk and strain it off. Use one gill three times a day. Or, take a teaspoonful of chamomile tea every ten or fifteen minutes until the bleeding stops.

In regard to bleeding a horse or other animal in the treatment of disease, see under the names of the respective animals.

Bletting, the spotted appearance of over-ripe fruit from decay setting in.

Blight, death and decay of a plant, caused by various invisible influences or microscopic germs. See the respective trees, as Apple, Pear, etc. The term is also used for an eruption on the human skin, consisting of minute reddish pimples.

Blinkers, bridle blinds: See Bridle.

Blister, of SPANISH FLIES. Melt together seven and one-half ounces each of yellow wax and suet, six ounces of lard and three ounces of resin; when mixed, remove from the fire, and a little before it hardens sprinkle in and mix thoroughly one pound of very finely powdered "cantharides," or Spanish flies. A stronger blister of this kind is made by mixing at a heat just below boiling point four and a half ounces of Venice turpentine, three ounces each of Burgundy pitch and cantharides, one ounce of beeswax, one-half ounce of finely powdered verdigris, and two drams each of powdered mustard and black pepper: See Plaster. This blister may sometimes be dangerous in the hands of unprofessional practitioners, and even in the hands of shrewd doctors. In applying it the case should be closely watched, and as soon as the skin is reddened the plaster should be removed and a poultice of bread and milk, or something else as bland, be substituted.

Blood, To PURIFY. Take falsegrape, dogsbane, burdock root and yellow parilla root, each in coarse powder, one ounce; boil all together in three quarts of water slowly to two quarts; strain and add four pounds of white sugar; then boil again for a few moments, and skim off the scum that rises to the surface. Bottle and keep in a cool place. The dose is half a gill three times a day. Or, agrimony, borage, burdock (sea), chickweed, chervil, fennel, fir tree, fumitory, garden cresses, wild water cresses, ground pine, hops, maiden hair, sorrel or tansy, made into decoctions with hot water, and taken every morning. The "Hygienic" method, as taught by the responsible authors of our school-books, is to live an outdoor life, take a thorough sweat every two or three days, follow a clean, vegetable, grain and fruit diet, and keep in good humor. The blood, which supplies every portion of the frame, can never be any more impure than the rest of the body is.

Blood, SPITTING OF. In cases of spitting of blood it is often difficult to determine whether it proceeds from the internal surface of the mouth, from the fauces, from the stomach, or from the lungs. When the blood is of a florid or frothy appearance, and brought up with more or less coughing, preceded by rigors, a short, tickling cough, a saltish taste, uneasiness and tightness across the chest, its source is the lungs. The blood proceeding from the lungs is usually of a florid color and mixed with a little frothy mucus only. It may be distinguished from bleeding from the stomach by its being raised by

hacking or coughing, and by its florid and frothy appearance; that from the stomach is vomited in considerable quantities, and is of a dark color. What is strictly meant by "spitting of blood" is when the blood is discharged from a ruptured vessel in the lungs. In all cases consult a good physician, and, until he otherwise forbids, moderate the discharge of blood by avoiding whatever tends to irritate the body and increase the action of the heart. A low diet should be strictly observed, and external heat and bodily exercise avoided; the air of the room should be cool, and the drink (which should consist chiefly of barley-water acidulated with lemon juice) taken cold, and the patient not suffered to exert his voice. The recurrence of spitting of blood should be prevented by invigorating the lungs and purifying the blood, and by the use of cooling and astringent medicines. Keep in the mouth a little alum or saltpeter. The patient should partake very freely of acidulous fruits, as roasted apples, fresh oranges, lemons, etc. Alcoholic drinks should be strictly forbidden. A decoction of bark with lemon juice, or a few drops of elixir of vitriol, is of great service.

Blooded Stock, that which is of pure or distinct breed. "Blood," in this connection, means breed, and "purity of blood" denotes the absence of any mixture with other breeds. As example we have, among horses, the "Thoroughbred" (racers), Clydesdale, Morgan, Percheron, etc.; among cattle, "Short-horn," Alderney, Galloway, Devon, etc.; among sheep, Cotswold, South Down, Oxford Down, Merino, etc.; among swine, Poland-China, Suffolk, Chester White, etc., and among poultry, Cochin China, Leghorn, Houdan, Brahma, Black Spanish, etc.: See Breeding, and the respective animals.

Blood-Hound, a variety of dog, with long, smooth and pendulous ears, remarkable for the acuteness of his smell, and employed to recover game or prey which has escaped wounded from a hunter, by tracing by the blood it had spilt.

Blood-Root. This root is of a red color; is valuable in medicine, being used as an emetic and in coughs. In large doses it is poisonous, and should not be given except under the advice of a physician. The leaves are sometimes given to horses to assist in shedding the hair in the spring, and the root, also, to extirpate bots.

Blood-Shot. In farriery, a popular term for that red appearance which the eye exhibits when inflamed The best treatment is to bathe the eye with a lotion composed of one dram of white vitriol (sulphate of zinc) dissolved in half a pint of water.

Blood Spavin, or **Bog Spavin**. In farriery, a swelling of the vein that runs along the inside of the hock of the horse, forming a soft tumor in the hollow part, often attended with weakness or lameness of the hock. See Spavin.

Bloom, or **Blossom**. A general name for the flowers of plants, but more especially of fruit trees. The office of the blossom is partly to afford protection, and partly to draw or supply nourishment to the fertilizing organs of the plant, for the perfecting of the embryo fruit or seed. Bloom is a term applied to the delicate powder which coats the outer surface of such smooth-skinned fruits as the grape and plum. In gathering such fruits, care should always be observed to prevent this bloom from being removed by handling or otherwise, as it injures the appearance.

Blotch, on the skin, is a pustule, a pimple containing pus or "matter;" more particularly a large pustule, or a collection of them, discoloring the skin, etc. Some of them can be obliterated by wetting the part once or twice a day, for four or five days, with a five-per-cent. solution of carbolic acid, or a solution of silver nitrate, one grain to a half ounce of water. Blotches often proceed from bad dietetics, foul air, or the miserable habit of constant dosing for other ailments. In such cases external applications are, of course, of but little use.

Blouse (blowz), a light, loose over-garment, worn especially by workingmen in France. In America the garment is sometimes worn by workmen, and a certain form occasionally worn by little boys is so termed.

Blow-Fly. It deposits eggs upon meat, which in a few hours become maggots, and hasten the decay rapidly. Gauze cloths are used to keep them off; salt or cayenne pepper serves as a preventive, by indisposing the fly to lay eggs on surfaces smeared with them.

Blown, or **Hoven**. Undue distension of the stomach, from fermentation of food, as wet grass, bad fodder, musty hay, ergoty, or even sound grain eaten in undue quantities, causing the liberation of gas faster than it can be passed off, is usually termed hoven in cattle, and also blast, blown, colic and wind-dropsy in farm animals, In cattle and sheep the trouble is in the third stomach, and if relief is not given often ends in death. There will be swelling of the belly on the left side. The bowels will be torpid and constipated, the breathing difficult, the eyes wild, with other indications of intense pain. If the distension has extended to both sides, the danger is imminent. A trocar, or, in lieu thereof, a sharp-pointed penknife, should be thrust into the rumen, where the swelling is greatest, and the opening kept apart by a silver tube, or a large quill thrust in the opening, to allow the escape of the gas. In cases not so severe, pressing and kneading of the stomach, to force the gas up the gullet, may give relief, or a half-inch rubber tube well oiled, and furnished with a button of wool also well oiled, may be

carefully worked down into the stomach. As a stimulant, one dram of green mustard and one ounce of whisky, mixed in a little water, may be given by allowing it to trickle down slowly, to insure its safe passage into the third stomach. This may be repeated as may be deemed necessary. If this does not give relief, four drams of the solution of potash, and one ounce of lard-oil and of common salt may be mixed in a gill of water, and be given. Preventives are, not to turn stock into flush pastures wet with dew when hungry. Sheep may have one-quarter of the above dose. Colic or gripes in the horse must not be confounded with this affection. It is a contraction of the muscular coats of the stomach, and is caused by bad food, exhaustion, drinking cold water, change of food, and various other causes. Intestinal colic is shown by severe pain, looking at the flanks, pawing, lying down, rolling, and then suddenly getting up.

Blueberry: See Huckleberry.

Blue-Bottle, a kind of a plant with blue, bottle-shaped flowers, growing in corn; also a species of fly, with a large, blue belly.

Blue Vitriol, sulphate of copper; a combination of sulphuric acid with copper. Water will dissolve out the acid and deposit the copper as a lining to the vessel containing the solution. Blue vitriol is useful in many of the arts of life.

Bluing. To make liquid bluing, for rinsing white clothes, mix Prussian blue, pulverized, one ounce; oxalic acid, one ounce, with one quart of soft water.

Board Measurement: See Lumber.

Board of Trade, an organized body of active business men, not on a stock or money basis, but for mutual protection, for system in business, and as a safeguard for the rights of all concerned. It is composed of men through whose hands the products of the surrounding country must pass on their route to their final destination, the consumers. Its members are either actively engaged in the kinds of business that come under the supervision of the board, or have been. Some belong who do not actively engage at the business of the board, for once a member a person rarely fails to keep up his identity. Boards of trade in different cities have somewhat different spheres of action in many details, but the nature of such a body in general is well described in the following account of that at Detroit, Mich.:

It is organized under the State law, having a president, vice-president, board of directors, committee of appeals, committee of finance, secretary and treasurer, committee on inspection of flour and grain, committee on inspection of provisions, committee on membership, inspector of flour and grain, and inspector of provisions. The duties of these officers and committees need not be stated in detail. The board makes its own by-laws and regulations. They occupy rooms called "Board of Trade Rooms," "Chamber of Commerce," etc. The meeting of the board is generally at 12 o' clock, and lasts one hour. What is meant by being "on 'change" is being at the session of the board during this hour of business. This is the only hour in the day devoted to business, and during this brief hour all the buying and selling of the day is done. The transactions, even in grain, sometimes amount to hundred of thousands of dollars, and it is easy enough. Every man comes in knowing just what he wants, either to buy or sell, and with that state of mind business is rapidly done. After the board closes the members spend the remainder of the day in paying for grain bought and giving receipts for what has been sold, and getting ready for the next session of the board. The expenses of the board are kept up by membership fees, usually from $25 to $100 per year for each member. This, with a large membership, enables them to erect buildings of their own, and soon to become wealthy. Any person wishing to become a member must have his name presented to the board by some member, and is then voted in or out, after having had his case duly examined by the board; and it is not every one that gains admission. No person is allowed on 'change, except he is a member, or upon invitation of a member, as there is a janitor at the door who refuses admission to all who do not come as stated.

The method of working is as follows: As soon as a new crop of wheat is harvested samples are obtained from all portions of the surrounding country as soon as possible, and these samples are given to the committee of inspection, who, after carefully examining the different qualities, fix upon a standard for the different grades. They take Diehl wheat from the different sections, and selecting the best mix them together, thereby equalizing the color, as the color differs with the soil sometimes, and forming a grade of "extra white" which will suit the whole State. In the same manner they take samples of all white wheat, the best, and mixing them together they form a grade for No. 1 white; in like manner all the other grades. After the committee have done their work it is then submitted to the approval or disapproval of the board, for it is the most particular part of all their business, and requires knowledge of a superior kind relating to grain. Now comes the trouble. Here the farmer finds protection by having two sides to a question—in having bulls and bears. The bulls, or the sellers, want the grade just as low and easy as possible, in order that the country buyer and farmer may get the highest price for their inferior wheat, while the bears, or buyers, want the grade as high as possible, so their customers. the millers, will get as good wheat as possible for the money. They usually come to some compromise that is satisfactory and just to all. Having settled the

standard which shall be their basis for buying and selling from, samples are sent to all the interior buyers, that they may know how to buy. These grades last from one crop of wheat until the next, and the old grade holds good until the new one is established.

The buyers get the grades and dispatches that state the price of each grade on 'change, for instance, to-day. A farmer comes in with a load of wheat, the first of the season; he does not know what grade it is, but usually hopes it is "extra." The buyer takes and compares the standard of extra with it and they tell immediately whether it will go extra. If not that, then it must go No. 1, as there is no intermediate grade. If not No. 1, then No. 2, for there is none between. If not No. 2, then rejected. Just so with amber. The buyer elevates his wheat into separate bins, each kind by itself. He ships out a car of No. 1, for instance. If he is a good buyer he feels sure it will go through all right; but if he is green at the business, and has bought recklessly, has put into his No. 1 bin some friend's wheat that was not quite up to the standard, he feels uneasy until he gets the inspector's report. The car goes to market, where it is inspected by the inspector of the board, a man chosen for that purpose. He examines every car and puts his ticket on it, giving the grade. He does not know who the car came from, or who it belongs to, and is calculated to give an impartial decision of its grade, based on the standard furnished him by the board; and he is under heavy bonds to discharge his duties honestly. It then goes to the elevator and is elevated into bins for that kind of wheat. The shipper sends his agent notice of the kind and number of the car; the agent goes to the elevator, finds the car inspected, elevated and weighed, gets his receipt, goes to the board and sells it for all he can, pays the freight and other charges, deducts his own commission, sends the shipper statement and net proceeds. It can remain in the elevator for ten days without charge; after that it must pay storage. The receipt given the agent has the number of bushels and the grade of wheat. There is no specified number of bushels in a car sold on 'change, as they vary; but a carload is 20,000 pounds, or about 333 bushels. The same wheat while in the elevator may change hands any number of times before being shipped out, as the wheat is held for storage.

We have now traced the wheat to the elevator and to the board of trade; let us now see what becomes of it, and how the board benefits that part of the transaction. Samples of the standards are sent to all the different boards of trade in this country, also in Europe, whither our grain is exported. Now, for example, a dealer in Liverpool wants some grain; he examines the different samples before him and chooses No. 1 Michigan white. He telegraphs to his agent in New York for so many thousand bushels of that grade. In time that agent dipatches to his buyer in Detroit for the amount. This last-named agent goes on 'change and buys it of the agent to whom had been sent the wheat bought of the farmers, making a long series of operations, which pass through a large number of hands, over thousands of miles of land and water; and yet, through the medium of grades established by the board of trade, each transaction has been done intelligently, both parties knowing just what they were buying and selling. Neither does it stop here; it is frequently sold more than once before it reaches port, while in transit, and all is done smoothly and easily.

It enables the farmer to know just how thoroughly to clean up his wheat in order to get such a grade, and it connects the whole business from the time it is first taken to market until it is finally consumed. There is no use of enlarging on its usefulness or its necessity, as it is just as essential to have the board establish the standards of grain, in order to do business understandingly, as it is for Congress to establish the standard of our coin. The influence of the board does not stop here. You will find that all foreigners coming here for information in regard to our productions, our commerce, or for any information as to the development of the country, go to the board of trade for such knowledge, for they there find practical business men who can give information from practical experience. In fact, that body is generally the headquarters for the enterprise and business of the producing portion of the country.

Any person buying anything and refusing to receive it is expelled from the board, and not permitted to do business there any longer. If a party is reported not sound, their affairs are immediately investigated and reported to the board. They have uniform rates to be charged for doing business, and any one charging either more or less is summarily dealt with. During the hour of 'change the board receives telegraphic information from all over the country, and the markets of Europe. Grain dealers accept the price paid for wheat "on 'change" as their guide to make prices from.

The influence of the board tends to remunerate business integrity, and gives preference to those old, honorable dealers who have spent the best part of their lives in building up business reputation. A man, to become influential, has to do so by years of patient industry in his business. A man of no experience cannot be recommended to engage in transactions on the Board, or to send to commission men to have them make investments for him.

Boat. Many farmers, as well as sportsmen, combine profit and pleasure by hunting. One of the requisites of a successful hunter is a good boat, without which certain kinds of game cannot be successfully hunted. A boat will also be found a great convenience in many other ways, besides a source of much healthful recreation.

a cheap and durable boat, we give plans of two of the leading kinds of small boats.

A cheap and durable flat-bottomed boat may be made in the following way: The bottom is of two white-pine boards, or other light, strong stuff,

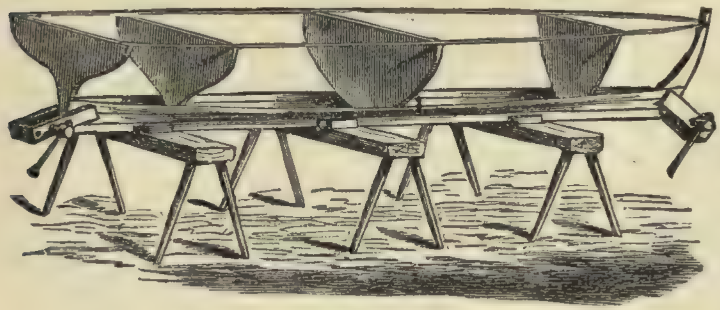


FIG. 4.—*The Trestles, Keel, Stem, Stern, etc., of Lap-Streak Boat.*

tongued and grooved together, and afterward cut to the shape shown in Fig. 7. The proportions given in the engraving may vary to suit circumstances. Cut the edge very accurately, giving to it a slight bevel upward that the joint with the side-boards may be close and water-tight. The stern is usually made of a tamarack "knee," though other wood will answer, in the shape shown in Fig. 5. The front of the upright part of the "knee" should be beveled to an edge, the bottom being dressed and fastened to the keel with screws or wrought nails. The stern should be six inches wider at the top than at the bottom; ¼-inch spruce stuff is best for the sides. To give the proper shape to the boat, two mold-boards are put in at the dotted lines shown in Fig. 7, to be removed when the sides are in place. Clamps should be used to hold the side-boards in position while being fitted to the stem and stern. Lap the second board nearly one inch over the first, and place a piece of cotton cloth dipped in tar between the boards to make the joints water-tight. After the sides are in, remove the molds and put in two ribs, which should be of white oak, ½ by 1½ inches, made pliable by soaking in water, and secured in place by clinched nails. A strip of board, two inches wide, should be nailed around the outside of the boat near the top, or gunwale, and the seats, etc., put in, as shown in Fig. 8. The pair of oars may be of ash, but many will prefer paddles for a small boat of this kind. The cost of such a boat will depend very much upon the finish given it.

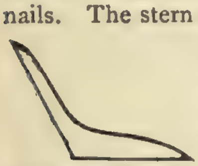


FIG. 5.—*A "Knee."*

LAP-STREAK BOATS, suitable for rowing or sailing, may be made of any desired size; the proportions to be observed in building them are, to have the length four or five times the width, the greater width being adapted for mast and sail. The first item in the construction of this boat is the keel, which should be a piece of strong white oak, six inches wide and two inches thick, dressed to an inch at the bottom, and grooved at the top to receive the first streak, or side-board. This keel should be fastened upon trestles, by means of wedges, to enable the work to be conveniently done. The stem of the boat may be of a "natural crook" of hard-wood, sawed to a proper curve, and mortised to the end of the keel. The stem, after being cut to a proper shape, is firmly fixed to the rear end of the keel of the boat by a "knee." The three mold-boards, to give shape to the boat, are next made, and fitted lightly to the keel, as they are to be removed when the sides are finished. The trestles and keel, with the stem, stern and mold-boards, are shown in Fig. 4. The next work is laying on the streaks, or side-boards. These should be made of white pine, spruce, or cedar, smoothly dressed. They need to be cut of a particular shape, and this is determined by clamping the streak upon the molds, as shown in Fig. 4, marking the line to be cut, with a pencil. The first board is fitted to the keel and firmly nailed the whole length, no nails being driven into the mold-boards. The nails should be very pliable, so that they can be easily clinched on the inside with a light hammer, a heavy one being held on the head of the nail. As soon as the sides are finished, the ribs may be put in; they should be made of white oak, and secured in

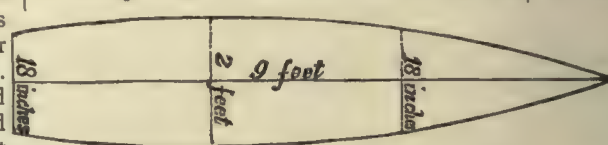


FIG. 7.—*Bottom of Flat-Bottomed Boat.*

FIG. 8.—*The Flat-Bottomed Boat Completed.*

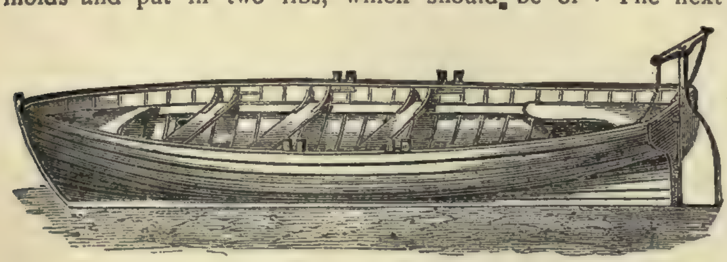


FIG. 6.—*The Lap-Streak Boat Completed*

place by clinched nails. There should be some short ribs running up only part way from the bottom of the boat. A narrow board is nailed upon the inside to the ribs, a short distance below the rim, for holding the seats, etc. The gunwale is made by nailing a streak along the inside of the boat, it resting upon the ribs. The row-locks, rudder, etc., may be arranged as shown in Fig. 6. If it is desired to have the boat arranged for a sail, the mast can be "stepped" into a piece of plank placed in the forward part of the boat, with a strap of iron to embrace the mast, fastened to one edge of the forward seat. All the parts as they are put together should receive a good coat of paint, so that the boat may be water-tight, and as durable as possible. When not in use keep it under cover.

Bobbin, a small wooden pin or bolt, with a head, on which thread is wound for making lace. A similar instrument bored through to receive an iron pivot, and with a border at one or both ends, is used in spinning, to wind thread on, as in sewing-machines, etc.

Bockey, a bowl or vessel made from a gourd.

Body, Human. The proportions of a perfect human body are these: The height is equal to the distance between the tips of the middle fingers when the arms are fully extended. Ten times the length of the hand, or seven and a half times the length of the foot, or five times the diameter of the chest from one armpit to the other, are also each equal to the height of the whole body. The distance from the junction of the thighs to the ground is the same as from that point to the crown of the head. The knee is just midway between the same point and the bottom of the heel. The distance from the elbow to the tip of the middle finger is the same as from the elbow to the middle line of the breast. From the top of the head to the level of the chin is the same as from the latter point to the level of the armpits, and from the heel to the toe. The length of the face, or distance from the hair over the center of the forehead to the tip of the chin, is one-tenth of the height of the individual.

Body Lice or **Vermin**: See Lice.

Boil, a hard, painful, inflamed tumor which on suppuration discharges pus ("matter") mixed with blood, and discloses a small fibrous mass of dead tissue called the "core." Treatment: Poultice the boil and paint it with aqueous extract of opium, or tincture of iodine; renew the process every two or three hours. A piece of lint soaked in olive oil may be strapped over the boil if the person is necessitated to do business. Take alterative pills night and morning, and a decoction of sarsaparilla. If a boil breaks apply the black salve or apply a little Venice turpentine; or an equal quantity of soap and brown sugar well mixed; or a plaster of honey and flour; or of figs; or a little saffron in a white bread poultice; or a tablespoonful of yeast in a glass of water twice a day. Take an aperient.

Hygienic: Constant application of cold water; do not let the wet cloth become warm before renewing it with cold water. Preventive: Clean food, well prepared and well chewed, and out-door work. Physicians begin to believe that boils, carbuncles and other eruptions do *not* purify the system.

Boiler. To prevent lime from being deposited in a boiler, put in the cistern, from which the boiler is fed, a sufficient amount of oak tan-bark to color the water rather dark; run four weeks and renew. Sprouts from malted barley, two or three quarts to each boiler, have been used with success. In using these the engineer must not be deceived by the foaming of the water when he is heating up. See Engine.

Boll, the seed-pod of a plant.

Bologna (bo-lon'ya) **Sausage**, a large sausage made of bacon, veal and pork suet, chopped fine and enclosed in a skin.

Bolster, of a Wagon, the beam fixed under the fore end of the box to support it square with the hinder axle while the wagon is turning. It is connected with the fore axle by the "king bolt."

Bolt. To "bolt" food is to swallow it without sufficient chewing. Domestic animals often do this as well as human beings. A bolt is a strong pin used to fasten or hold anything in its place.

Bond, a written contract, whereby the principal maker agrees and obligates himself, under certain penalties therein named, to do or not to do a certain thing, or that some other person shall do or not do a certain specified thing. There must be two parties, a maker and the person to be paid. It must be in writing and generally under seal. No particular form of words is essential, but any words which distinctly declare the intention of the parties and indicate that one is bound to the other will be sufficient. After it is signed and witnessed it must be delivered.

Bones, Broken, to Manage. When a bone in the arm or leg is broken, take several sheets of cotton batting, a piece of comfort or thin pillow, wrap it around the arm or leg, pulling on the foot or hand as the case may be. On the outside of the wrapping apply common laths or slats of wood, and bandage firmly. In case of fractured rib, skull, spinal column and jaw, do nothing until the surgeon arrives.

Bones, as Fertilizers: See Fertilizers.

Bone Spavin, a disease of horses: See Horse.

Bonny Clabber, or **Clabber**, sour milk that has thickened, or set like jelly. In Ireland the word is used for sour buttermilk.

Book: HOW TO DISTINGUISH A GOOD ONE. There are no reliable external "ear-marks" of a good book. Our best publishers and "best" authors often put forth poor books—at least poor for some people. As a general rule those books are best which have originality or freshness in their style, either in the thought or language, or both; but it requires a student to discern even these characteristics. To ascertain the degree of thoroughness in a work requires a scholar. Books which show great care in their compilation and make-up are generally the most popular among the critics in their respective *roles*. Our general advice is, first fix clearly and precisely in your mind what you want, and then consult the men you consider the best judges in that line. At the present day book agents introduce nearly all the good books.

The farmer who "cannot afford" to buy books which are specially designed to help him in his work is practicing a false economy. The lawyer who should try to get along without a library because books cost money which he did not want to spare would never succeed. The doctor who used no books and read no papers devoted to his profession would ruin himself and the few patients who might employ him. The farmer who has books and papers devoted to his work has an immense advantage over his neighbor who has neither of these aids. One man plods on alone while the other has the recorded experience of many successful farmers and the results of an immense amount of hard study and close observation to help him. Instead of saying that he cannot afford to purchase these aids, the farmer should feel that he cannot afford to do without them.

Book-Case, Holders, Stands, etc. The book-case which every laboring man in the country wants is a closed one, which will keep the books away from dust and vermin; but the books and papers should be aired occasionally, to prevent a rank decay that poisons the atmosphere. A large one, set in the parlor, should have glass doors. Stands, for holding books when one is reading them, have been invented, but racks fastened to easy chairs are better. A rack for this purpose is easily devised, to be attached to the arms of the chair, and made adjustable to suit the convenience of the reader. Straps for carrying books to school are very common at the present day, and are a great economy. Insects often collect in the book-case, where their presence is a constant annoyance. One of these is a kind of small beetle which makes a clicking noise like the ticking of a watch, and hence called by the superstitious the "death-watch." Books should all be taken down occasionally and smartly slapped upon a table where the little creatures, thrown out, cannot get away until they are killed. There is no drug that will keep them out of the book-case but what is worse than the pest.

Book-Keeping. The keeping of a systematic record of transactions and events, carried out in money value. While it is not expected that every person can or will become a first-class book-keeper, yet it is necessary for every one engaged in the ordinary pursuits of life to have such knowledge of the essential principles of the science as will enable them to keep an ordinary set of books accurately.

If persons in general were to keep correct accounts, they would be less liable to run in debt beyond their ability to pay, and there would be far less litigation among neighbors and those who have occasion to transact business with one another. Indeed, were persons universally to receive an equivalent for their wares when sold, and were they able to pay at the time for what they have occasion to purchase, it would still be desirable to keep a record of their business transactions. This necessity becomes imperative whenever products and goods are bought and sold without making payment at the time.

The object of this article is to give such plain and practical information of the science as will enable young men and women to keep a set of books, either in the single or double entry systems, also to provide the merchant and professional man with full directions for keeping a systematic account of his business. A very plain and simple system of book-keeping has been prepared for the farmer. The various illustrations of book-keeping given are after the most modern forms, and are recognized as standard by the best authorities.

DEBTOR AND CREDITOR. Before giving explanations of the different systems of book-keeping, we wish to speak of two or three of the fundamental principles of the science, which must always be taken into consideration.

Whenever one person receives anything from another, which he does not pay for at the time, he is said to *go in debt* for it, and is called a Debtor. A person who sells property without receiving his pay at the time is said to *give credit* for it, and is called a Creditor. In other words, the *receiver* is always the Debtor, and the *giver* is always the Creditor. In keeping accounts it is customary and more convenient to abridge and write Dr. for Debtor, and Cr. for Creditor.

TRANSACTION. The act of buying or selling is called a Transaction. In every transaction there must be both a *buyer* and a *seller*. Where the property which exchanges hands is not paid for at the time of the transfer, the buyer becomes a Debtor, and the seller a Creditor. The following will serve as an illustration of the correct use of the terms already employed.

Example.—L. W. Johnson buys of Samuel Smith one suit of clothing, for which he is to pay him $37.

In this transaction L. W. Johnson is the Debtor, because he is the *receiver*, and Samuel Smith is the Creditor, because he is the *furnisher*.

These gentlemen make the following entries in their respective books, under the date of the transaction.

L. W. Johnson writes in his book as follows:

Samuel Smith, *Cr.*
By one Suit of Clothing, . . $37.00

Samuel Smith writes in his book,

L. W. Johnson, *Dr.*
To one Suit of Clothing, . . $37.00

It will be observed in the above that the debtor writes the creditor's name in his book, and the creditor writes the debtor's name in his book. This must always be done.

This transaction would be entered in their books in the following manner:

Samuel Smith writes in his book,

1883. *Mar.*	*1*	*L. W. Johnson,* . . *Dr.*		
		To one Suit Clothing, .	*37*	*00*

L. W. Johnson writes in his book,

1883. *Mar.*	*1*	*Samuel Smith,* . . *Cr.*		
		By one Suit Clothing . .	*37*	*00*

The word *To*, with which the creditor commences the entry in his book, indicates the passage of whatever has been sold from him *to* the debtor; and the word *By*, with which the debtor commences the entry in his book, the reception *by* him of that which the creditor has charged to him. In other words, the *To*, on the Dr. side of an account, indicates indebtedness *to* us from the person named in the account, and the *By*, on the Cr. side of the account, indicates indebtedness *by* us to the person named in the account.

Abbreviations Used in Book-Keeping.

We give below the abbreviations used in book-keeping. The object of abbreviations is to express the facts definitely and clearly, and yet save both time and space:

A.

@.—At or to.
Acct.—Account.
Amt.—Amount.
Ans.—Answer.
Apr.—April.
Aug.—August.

B.

B. or Bk.—Bank.
Bal.—Balance.
B. Rec.—Bills Receivable.
B. Pay.—Bills Payable.
Bbl. or *Brl.*—Barrel.
Bot—Bought.
Brot. or *brot.*—Brought.
bu.—Bushel.
bgs.—Bags.
bdls.—Bundles.
bls.—Bales.

C.

¢ or ct.—Cents.
C. B.—Cash Book.
Chgd.—Charged.
Co.—Company.
C. O. D.—Collect on delivery.
Com—Commission.
Cr.—Creditor.
cs.—Cases.
Cwt.—Hundred-weight.

D.

d.—Pence.
D. or d.—Dollar.
Dec.—December.
do.—Ditto (the same).
Dep.—Deposit.
Dft.—Draft.
Dis.—Discount.
doz.—Dozen.
Dr.—Debtor.
d's.—Days.
dwt.—Pennyweight.

E.

E. E.—Errors Excepted.
Exch.—Exchange.
E. & O. E.—Errors and Omissions excepted.
embd.—Embroidered.
Eng.—English.
Ex.—Example.
Exp.—Express or Expenses.

F.

fav.—Favor.
Feb.—February.
fig'd.—Figured.
For'd.—Forward.
fol.—Folio.
frt.—Freight.
fr.—Francs.
ft.—Feet.

G.

gal.—Gallon.
gr.—Grain or Gross.

H.

hf.—Half.
hhd.—Hogshead.

I.

Ins.—Insurance.
I. B.—Invoice Book.
inst.—Present month.
int.—Interest.
inv.—Invoice, Inventory.
I. O. U.—I Owe You

J.

J.—Journal.
Jan.—January.

L.

lb.—Pound or Pounds.
Led.—Ledger.
L. F.—Ledger Folio.

M.

M.—One Thousand.
Mar.—March.
Mdse.—Merchandise.
mo.—Month.
MS.—Manuscript.
MSS.—Manuscripts.

N.

N.B.—Note Book. Take particular notice.
No.—Number.
Nov.—November.
N. P.—Notary Public.

O.

Oct.—October.
oz.—Ounce, ounces.

P.

p.—Page.
pp.—Pages.
P. B.—Pass Book.
pay't.—Payment.
Pd.—Paid.
per—By.
P. & L.—Profit and Loss
pr.—Pair.
pcs.—Pieces.
pts.—Pints.
prem.—Premium.

Q.

qr.—Quarter.
qts.—Quarts.

R.

R. R.—Railroad.
Rec'd or rec'd—Received
rec't—Receipt.

S.

Sept.—September.
Sund.—Sundries.
Schr.—Schooner.
Str.—Steamer.

T.

Treas.—Treasurer.
Treas'y—Treasury.
Trcs.—Tierces.

U.

ult.—Ultimo (las. month).

V.

viz.—To wit. Namely.

Y.

yds.—Yards.

yr.—Year.

SIGNS.

$.—Dollar.

".—Ditto (the same).

£.—Pound Sterling.

%.—Per cent.

—.—Sign of subtraction.

=.—Sign of equality.

a/c.—Account.

SYSTEMS OF BOOK-KEEPING.

There are two recognized systems of book-keeping, or distinct methods of keeping accounts, termed Book-Keeping by *Single Entry* and Book-Keeping by *Double Entry*.

The particular mode of keeping one's accounts, and the number of books necessary for use, must depend upon the nature and extent of his business. While we give the different systems and forms, which may be adopted by mechanics, farmers, mercantile or professional men, we have prepared a special system for the farmer, given in the latter part of this article, which we believe will be found of great value to him. He may, however, should he desire to do so, adopt any of the forms given. Should his business be extensive he should keep his books by the double-entry system.

Single-Entry Book-Keeping.

This system is denoted by the name it bears, transactions being posted *singly*, or only once in the Ledger, that is, consists of but one *debit* or one *credit*. Under this system of book-keeping we shall give two forms of accounts. The first form is adapted to persons who have but a limited amount of business to transact, and is the simplest form of book-keeping.

First Form of Accounts. The Ledger is the only book necessary in this form of accounts, and its object is to show how the owner stands toward the various persons with whom he has credit transactions.

Two pages opposite each other are appropriated for each individual account. The name of each person with whom we open an account (and his residence, when this is necessary to identify him) should be written in a bold hand at the top of the page, or at the head of the account, as in the annexed examples.

The left-hand page is devoted to the Dr. entries of the account, and the right-hand page to the Cr. entries.

The words *To* and *By*, as signs of Dr. and Cr. entries, are sometimes omitted in both Single and Double Entry; and the Dr. and Cr. sides of an account are often both kept on the same page, though not in this form of accounts. But in every form of accounts *two sets of money columns* are required. The *left-hand set* is uniformly employed for Dr. entries, and the *right-hand set* for Cr. entries.

In the first form of accounts each page is divided by perpendicular lines into five spaces; in the first of which, commencing at the left hand, the year and month are entered; in the second, the day of the month; in the third, the items bought or sold; and in the fourth and fifth, their value in dollars and cents.

The index may be written in a few of the first pages of the Ledger; but where large Ledgers are used it will be found more convenient to have a separate index.

Example. Below we give an account with Samuel Stover, a carpenter, in which five transactions are entered. Each column is intended to represent a separate page:

SAMUEL STOVER, *Dr.*

1886.			$	cts.
Mar.	7	To 8 Bu. Potatoes . . .50	4	00
May	22	" 5 Bbls. Flour . . . 7.00	35	00
Dec.	1	" Cash to Balance . . .	10	50
			49	50

SAMUEL STOVER, *Cr.*

1886.			$	cts.
Mar.	6	By 5 days' Work . . 3.00	15	00
July	22	" 2 M ft. Lumber . . 15.00	30	00
Sept.	9	" 100 ft. Molding . . .	4	50
			49	50

In the first transaction Samuel Stover works for me five days, for which I agree to pay him $3.00 per day. Here I am the receiver, and hence the debtor. Samuel Stover is the giver, and therefore the creditor. Having written his name in my book, I credit him with the amount of work done for me.

In the second transaction I sell Samuel Stover 8 bushels of potatoes, for which he pays me 50 cents per bushel. In this transaction he is the receiver, and hence the debtor, and I accordingly debit him with the amount.

In the third transaction I sell him 5 barrels of flour, amounting to $35 00, for which amount I again debit him, as in the preceding transaction.

July 22, I bought of him 2,000 feet of lumber at $15.00 per thousand, and on September 9, 100 feet of molding for $4.50. In these two transactions he becomes the furnisher and I the receiver. I therefore credit him accordingly.

Settlement. Accounts should be settled at least once a year. Therefore at the close of the year, or the beginning of the new year, I call upon Mr. Stover for annual settlement. We first add the sums in the money colums of the credit side of the account, and find they amount to $49.50. We next, in like manner, add the sums of the debit side, and they amount to $39.00, which is the sum total of all

goods I sold to him. We then subtract the amount of the debits, and find we have $10.50 remaining, which is the amount of my indebtedness to him. I pay him this sum and debit him "To Cash to Balance, $10.50." I then draw a single line under the money columns, and after adding them and placing the amount, $49.50, under each, draw a double line beneath, to show that the acount is balanced and closed.

Should one side of the account contain more entries than the other, an oblique line should be drawn across the unoccupied space, as you will notice is done in examples given further on in this article. The Dr. and Cr. amounts, when footed, should equal each other, and be on the same horizontal line.

Accounts may be kept with individuals, with wheatfields, with bills receivable, cash, etc., in a similar manner to the above example, or as given in the following form of the Cash account.

Cash. An account may and should be kept with Cash, the same as with an individual, as in the above example. Persons who have limited cash dealings may keep their Cash account in the Ledger, and in the same manner they do their personal accounts. But when one's account is extensive, or the entries in it become frequent and numerous, it will be on the Dr. side; for no person can pay out money unless he first has it on hand. It is likewise apparent that the credit entries in the Cash account can never exceed the debit entries. When these are exactly equal, there can be no Cash on hand. When the Dr. side of the account amounts to more than the Cr. side, the difference, if the account has been correctly kept, will exactly equal the Cash on hand.

An account may be balanced and continued on the same page. Whenever a folio is filled, and the account not closed, the two sides of the account should be added and the amount carried to some other folio designated.

Rule for Dr. and Cr. Entries. The books of the Creditor should specify every item sold, and give the value and quantity. The books of the Debtor should likewise specify both the quantity and value of every article purchased by him, unless bills are received of goods bought by him. Should this be done, which is preferable, the holder of them may only enter the *amount* in his account, but he should keep the bills on file until the settlement. In case goods are paid for in money when purchased, it is sufficient for each party to enter the transaction in his Cash account.

When payment is made "by note," the Creditor should make the necessary entry under the head of

CASH, *Dr.*

1886.				$	cts.
Jan.	*1*	*To Cash on hand*		*25*	*75*
Feb.	*2*	*" 2 Bbls. Flour*	*8.00*	*16*	*00*
"	*10*	*" 5 Gal. Molasses*	*1.08*	*5*	*40*
"	*23*	*" 10 Cords Wood*	*3.00*	*30*	*00*
				77	*15*
Mar.	*1*	*To Balance brought down*		*67*	*25*

CASH, *Cr.*

1886.				$	cts.
Jan.	*10*	*By Repairing Wagon*		*2*	*50*
"	*23*	*" Books as per Bill*		*4*	*00*
"	*26*	*" 20 lb. Rice*	*.07*	*1*	*40*
Feb.	*9*	*" 20 " Sugar*	*.10*	*2*	*00*
"	*28*	" Balance on hand		67	25
				77	*15*

be best to keep the account in a separate Cash-Book provided for that purpose, which should be balanced at the close of each day. In opening the account, Cash should be debited with the amount on hand. All moneys *received* should be entered on the Dr. side of the Cash account, and all moneys *paid out*, on the Cr. side of the account. In balancing the account, Cash should be credited with the amount on hand. But as this is *not* paid out, it is here entered in different type, and usually in red ink, to denote that fact. Cash is then debited for the balance.

The amount on hand at the opening of an account with Cash, together with the sums *received* at different times, should exactly equal the amount of the sums *paid out* and the cash on hand at the time of balancing the account. The Dr. entries show what Cash has been received for, and the Cr. entries show what Cash has been paid for.

The first entry in the Cash account must always

Bills Receivable, and the purchaser under the head of Bills Payable; and in case there is an account between the parties the whole transaction should be shown. But when a bill of goods is "charged in account," the merchant should simply debit the purchaser with the items sold, which should be credited in the books of the latter.

Bills Receivable. This term includes all written obligations for the payment of money which you hold against other persons, such as Promissory Notes, Due Bills, Orders, Drafts, etc. When any of these are received by you, they should be at once entered under the head, Bills Receivable, noting particulars, after which they may be placed on their proper files. Then by referring to the Bill-Book it will be easy to see when any obligation you hold against another becomes due, where it is payable, etc. You thus save yourself the trouble of examining various packages of papers, the contents of which are here noted. Bills

when thus entered may be readily referred to by number. Persons engaged in extensive business find it convenient to keep separate Bill-Books; but those who transact a limited business may require only a folio of their Ledger, properly ruled.

BILLS PAYABLE include all written obligations for the payment of money, of whatever kind, given by you to other persons. Whenever you give such an obligation you should enter the particulars in the Bill-Book. It is of the utmost importance to note, at the time, at least the *amount* and *when due*, together with the *payee's name* and *where payable*.

The *maker* of a note (called also the giver or drawer) is the person who gives the note, and who must sign it. The *payee* of a note is the person to whom it is made payable. The place where a note is payable should always be specified whenever the payee (or holder of the note at the time it becomes due) does not expect to call at the *maker's* place of business, or at his residence, for payment.

In connection with the general statement concerning Bills Receivable and Bills Payable, presented above, it will be found convenient to keep a Dr. and Cr. account with each. This is done in the same manner that an account is kept with an individual, or with Cash.

When we *give* anything for a Bill, or on its account, we *debit* it. When we *receive* anything for a Bill, or on its account, we *credit* it. The first entry to every Bills Receivable is on the Dr. side of the account. The first entry to every Bills Payable is on the Cr. side of the account.

Bills receivable and bills payable may be kept in the first or simplest form of accounts, as given in the following example:

NOTES AND BILLS RECEIVABLE.

No.	Date.		Maker's Name.	Indorser's Name.	Where Payable.	When Due.		Amount.		Remarks.
	1884.					*1885.*				
1	*Jan.*	*2*	*Allen Ferry*	*Joshua Miller*	*My Store*	*July*	*5*	*250*	*75*	*Pd. July 3, 1885.*
2	*July*	*20*	*Thomas Lincoln*	*Martin James*	*1st Nat. Bank*	*Jan.*	*25*	*75*	*00*	*Paid at Maturity.*
3	*Dec.*	*1*	*Wm. Sherman*	*None*	*My Store*	*June*	*4*	*180*	*00*	" " "
	1885.					*1886.*				
4	*Mar.*	*5*	*Damond Lever*	*Samuel White*	*Farmer's Bank*	*Jan.*	*2*	*400*	*50*	*Pd. Dec. 1, 1885.*

NOTES AND BILLS PAYABLE.

No.	Date.		Payee's Name.	Indorser's Name.	Where Payable	When Due.		Amount.		Remarks.
	1885.					*1886.*				
1	*Jan.*	*4*	*Calvin Cutter*	*None*	*Cutter's Office*	*July*	*7*	*50*	*00*	*Paid at Maturity.*
2	"	*20*	*D. G. Goodman*	*Harvey Roberts*	*My Home*	*Dec.*	*20*	*284*	*50*	*Pd. Dec. 18, 1886.*
	1886.					*1887.*				
3	*Jan.*	*20*	*Doc Johnson*	*None*	*Farmer's Bank*	*Jan.*	*1*	*500*	*00*	

GENERAL SETTLEMENT. A General Settlement shows how a person stands with the world, or with all persons with whom he transacts business, taken collectively. It is made by taking an inventory of one's property, to the fair value of which he must add the sum of the balances due him from others in the settlement of his personal accounts, and the balance due him on bills receivable. From the total amount of these he must deduct the sum of the balances due others in the settlement of his personal accounts, together with the balance that may become due from him on bills payable. The difference of these accounts will evidently represent his exact standing with all persons with whom he has business relations.

When a person's indebtedness exceeds what he possesses and what is due him, taken together, he is insolvent, and is sometimes said to be worse off than nothing.

SECOND FORM OF ACCOUNTS IN SINGLE ENTRY.

In this form of accounts, which is adapted to persons more extensively engaged in business than rep-

resented by the foregoing, two principal books are used—the Day-Book and the Ledger. Besides these there are some smaller books which are convenient, some of which are necessary to be kept. Of these the Cash-Book is the most important.

DAY-BOOK. All transactions are entered in this book which require a debit or credit to any person with whom you have dealings. The form of entry is very simple, thus: "John Carter Dr. To 6 lb. Nails @ 7, 42," or "Ira Kost Cr. By Cash on acct. $5.00;" in every case specifying the details which constitute the debit or the credit.

Whenever you do a job of work for a person or sell him anything, or pay him money, or he in any other manner becomes indebted to you, he must be charged or (debited) with the same in this book, to show that *he owes you*. And whenever any person sells you anything, pays you money, or does work for you, or you in any other manner become indebted to him, he must be credited with the same in this book to show that *you owe him*.

This is the only book from which you post; and therefore every entry which you wish to bring into any account in the Ledger must be entered here.

Erasures are *not allowable* in the Day-Book, as they look suspicious, and frequently render invalid the evidence of entries therein.

In entering *purchases*, it is allowable to say, "Am't as per bill," or, "Am't as per Invoice," and omit the detail of items, since you have the Invoice filed away, or pasted in a book so that you can refer to it at any time; but in entering *sales*, the *items* should *always* be mentioned in your Day-Book, as this is your legal evidence of the transaction; and in order to be taken as evidence, each article must be distinctly named.

LEDGER. Into this book all sums entered in the Day-Book are transferred, an account being opened with each different person, into which every debit and credit made to that person is collected. This process is called posting, and the advantages derived from it are, that by looking at any person's account in the Ledger, you can see at a glance your whole dealings with that person, and also the balance which is due him or you, which you could not find without much trouble and great liability to error, if the amounts of debit and credit were all left standing scattered through the Day-Book. The *amount only* of the articles purchased at any one time is carried to the Ledger.

Instructions are sometimes given to note in connection with debit and credit entries in the Ledger the words "Sundries," "Groceries," "Goods," "Merchandise," "Cash," "Note," "Order," etc., as the case may be. This may be properly done whenever such an entry will save the necessity for referring to the Day-Book for explanation; for we should keep as few books as will answer our purpose, and with the least writing practicable make them tell the most possible. But as such entries give the Ledger a bad appearance, they should be employed only when useful.

CASH-BOOK. The Cash-Book is simply a memorandum for keeping the Cash account correctly. There are various ways of keeping the Cash-Book, but the form here shown is perhaps as simple as any, as easily kept, and as little liable to mistakes, for persons whose cash transactions are not very numerous, and who are not scientific accountants.

Wherever money is received from any source whatever, it must be entered in this book as "Rec'd" (describing for what), and the amount must be extended into the left-hand dollars and cents column, which is called the *debit* column; and whenever money is paid out for any purpose whatever, it must be entered in this book as "Paid" (telling for what), and the amount extended to the right-hand dollars and cents column, called the *credit* column. Thus if the account is kept correctly, the difference between these two columns will show at all times the *balance* of cash on hand and will agree with the actual amount of money in possession, counting that which is deposited in the bank as well as what is in the store or shop; and if it does not so agree, there has been some error, which must be searched for and corrected. The credit column can never be the larger, since it is impossible to pay out more money than you receive.

The Cash-Book should be balanced at the end of each week—or daily when much business is done—by entering in the credit column the balance of cash on hand (usually done in *red* ink) ruling and footing both columns, and underneath the closure entering the balance on hand (in black ink) in the debit column.

The Cash-Book should be posted once a month. That is, the entries in it should be transferred to the Ledger, and entered there each in its proper account. As these transfers are made, the *folio* (or number of the page) of the Ledger to which the Ledger is posted should be written in the Cash-Book in the column ruled for that purpose, which is immediately on the left of the dollars and cents column. This insures accuracy in referring from the Cash-Book to the Ledger. The Cash-Book is said now to be *closed*—that is, all the entries for the month have been transferred to their proper places in the Ledger; and the book-keeper is ready to commence the record of the transactions of the next month.

The Cash account may be tested at any time, without balancing the Cash-Book, by finding the difference between the debit and credit columns, on a scrap of paper, and comparing that difference with the cash on hand. This should be done daily when the Cash-Book is balanced only once a week.

PETTY CASH-BOOK. It is the custom of most book-keepers to use what is called a Petty Cash-Book. Any blank book ruled with dollars and cents columns will answer. The Petty Cash-Book is used for expenditures only, and its use saves the book-keeper a great deal of time and labor which would be required were all the minor expenses of an establishment

entered in the Cash-Book and transferred separately to their proper accounts in the ledger. The book-keeper enters all the sums paid out day by day in the Petty Cash-Book as "Sundry Expenses," "Freights," "Interest," money paid to employes who have no fixed pay-day, "Telegrams," "Porterage," etc. At the end of the week or month, as his custom may be, he adds these expenditures in the Petty Cash-Book, and enters the aggregate amount on the *credit* page of the regular Cash-Book, from which it is posted to the Ledger in the ordinary way. Bear in mind that *the Petty Cash-Book is used for entering minor expenditures only, and never for entering money received.*

POSTING. Posting books is transferring the accounts of various persons from the Day-Book through which they are scattered to the Ledger and arranging each on a folio by itself, with the proper reference figures in the Day-Book to show the folio of the Ledger into which each entry is posted, and with corresponding reference figures in the Ledger to show the page of the Day-Book *from* which each entry is posted.

Posting is done as follows: Take the Day-Book and turn to the first unposted entry, and by means of the index find the account in the Ledger to which the entry belongs, if such an account has been opened. If no such an account has been opened in the Ledger, write the proper title in the index, opposite which place the folio of the Ledger that is to be devoted to the account, and then, having entered the title in the Ledger, proceed with the posting. Entries may be posted directly from the Cash-Book.

If at any time it is ascertained that a transaction has not been recorded in its proper place, and under its appropriate date, the entry should be immediately made with the proper explanations.

Should an entry at any time, by accident or carelessness, be made on the wrong side of an account, it should not be erased; but the same amount should be entered on the opposite side of the account, "To Error," or "By Error," as the case may be. It is apparent that the only effect of the last entry will be to *counteract the mistake;* this done, the correct entry should be made. In case a transaction is entered to the wrong account, the correction is made in a similar manner; but too great pains cannot be taken to make the original entries correct. It should be the aim and pride of the book-keeper *never to make a mistake in the entry of his accounts.*

When the Ledger is filled and a new one is opened, any unsettled accounts may be carried to the new Ledger in the same manner that an account is carried from one folio to another.

When a person has several Ledgers, they should be designated by the letters of the alphabet, thus: Ledger A, Ledger B, etc. Day-Books should be lettered in the same manner; and the first entry that is posted from a *new* Day-Book into the Ledger should show in the Ledger the Day-Book from which it is posted. For example, if you commence Day-Book A and Ledger A, at the same time, the Day-Book may be filled when the Ledger is not more than one-fourth full. In this case the first entry to each account that is posted from Day-Book into Ledger A should be entered thus: *To or By* (as the case may be) *Day-Book B, p. 1.*

Example. To illustrate the mode of making entries in the Day-Book, and posting them into the Ledger, we give the following forms. These show a number of transactions made by a retail merchant, with the day-book entries and ledger postings which such transactions require. The learner can regard himself as the merchant, and suppose these to be actual transactions occurring in real business. The following are the transactions given in the order of their occurrence:

Tuesday, Jan. 4, 1886.

I sold to C. P. Corey 1 overcoat at $35.00, 1 pair rubbers 75 cts., 1½ dozen linen handkerchiefs at $4.00 per dozen.

Wednesday, Jan. 5, 1886.

This day I sold to Winter Scripps 25 yards of sheeting, at 10¾ cents a yard, 4 gallons sirup at $1.00 a gallon. I bought of him 8 bushels of apples at 60 cents per bushel, and 16 bushels of potatoes at 40 cents per bushel.

The same day I sold to W. H. Lawrence 1½ pounds of cinnamon at 80 cents a pound, 8 pounds of sugar at 10 cents per pound, 1 barrel of flour at $7.50.

Thursday, Jan. 6, 1886.

I received of Marshall Field & Co., Chicago, 5 dozen handkerchiefs, $3.00 per dozen; 75 yards of lace, 30 cents per yard; 500 yards prints, 5 cents per yard; 187⅓ yards carpet at 65 cents per yard, and 1 rug at $7.50.

The same day I sold David Clarke 18 yards carpet at 90 cents per yard, 22 yards prints at 7 cents per yard.

Saturday, Jan. 7, 1886.

On Saturday, C. P. Corey settled his account by paying me $41.75 cash.

Upon the same date Winter Scripps bought 10 yards carpet at 90 cents per yard, and one valise, $6.00.

Tuesday, Feb. 2, 1886.

David Clarke bought of me to-day 1 pair of boots at $6.50, and Winter Scripps bought 18 yards of silk at $1.75 per yard, and 1 umbrella at $3.50.

Wednesday, Feb. 3, 1883.

I sold C. P. Corey 1 set of spoons at $9.00 and 1 set of forks at $12.00.

The same day Winter Scripps bought two window curtains at $3.00 each, and paid $51.48, being the balance due me.

MANSFIELD, JANUARY 4, 1886.

L. F.						
	C. P. Corey	*Dr.*				
85	To 1 Overcoat		35	00		
	" 1 Pair Rubbers			75		
	" 1½ doz. Handkerchiefs @ $4.00 . . .		6	00	41	75
	Wednesday, Jan. 5.					
	Winter Scripps	*Dr.*				
21	To 25 yds. Sheeting @ 10¾¢		2	68		
	" 4 gal. Syrup @ $1.00		4	00	6	68
	Cr.					
21	By 8 bu. Apples @ 60¢		4	80		
	" 16 bu. Potatoes @ 40¢		6	40	11	20
	W. H. Lawrence	*Dr.*				
33	To 1¼ lb. Cinnamon @ 8c¢		1	20		
	" 7 lb. Sugar @ 10¢			80		
	" 1 bbl. Flour		7	50	9	50
	Thursday, Jan. 6.					
	Marshall Field & Co.	*Cr.*				
	By 5 doz. Handkerchiefs, $3.00		15	00		
40	" 75 yds. Lace, 30¢		22	50		
	" 500 yds. Prints, 5¢		25	00		
	" 187⅓ yds. Carpet, 65¢		121	80		
	" 1 Rug		7	50	191	80
	David Clarke	*Dr.*				
41	To 18 yds. Carpet, 90¢		16	20		
	" 22 yds. Prints, 7¢		1	54	17	74
	Saturday, Jan. 7.					
	C. P. Corey	*Cr.*				
85	By Cash				41	75
	Winter Scripps	*Dr.*				
21	To 10 yds. Carpet @ 90¢		9	00		
	" 1 Valise		6	00	15	00
	Tuesday, Feb. 2.					
	David Clarke	*Dr.*				
41	To 1 Pair Boots				6	50
	Winter Scripps	*Dr.*				
21	To 18 yds. Silk @ $1.75		31	50		
	" 1 Umbrella		3	50	35	00
	Wednesday, Feb. 3.					
	C. P. Corey	*Dr.*				
85	To 1 set Silver Spoons		9	00		
	" 1 " " Forks		12	00	21	00
	Winter Scripps	*Dr.*				
21	To 2 Window Curtains @ $3.00				6	00
	Cr.					
21	By Cash to Balance				51	48

Dr. *C. P. COREY.* *Cr.*

1886.						1886.					
Jan.	4	*To Sundries*	30	41	75	Jan.	7	*By Cash*	30	41	75
Feb.	3		35	21	00						

Dr. *WINTER SCRIPPS.* *Cr.*

1886.						1886.					
Jan.	5	*To Sundries*	30	6	68	Jan.	5	*By Produce*	30	11	20
"	7	" "	32	15	00	Feb.	3	" *Cash*	31	51	48
Feb.	7	" "	32	35	00						
"	2	" "	35	6	00						
				62	68					62	68

Dr. *W. H. LAWRENCE.* *Cr.*

1886.											
Jan.	5	*To Sundries*	30	9	00						

Dr. *MARSHALL FIELD & CO.* *Cr.*

						1886.					
						Jan.	6	*By Mdse.*	30	191	80

Dr. *DAVID CLARKE.* *Cr.*

1886.											
Jan.	6	*To Sundries*	30	17	74						
Feb.	2	" "	30	6	50						

Proof of Postings and Balances.

We give below a test of the correctness of posting the preceding accounts, The debit and credit sums of each account of the Day-Book are entered as though they were each an entire page of the Day-Book. The sums of each page of the Day-Book need only be taken in testing your postings and balances. As every debit amount of the Day-Book has been posted to the Dr. side of the Ledger, and every credit sum to the Cr. sides of the Ledger, the difference in the amounts of the Dr. and Cr. sides of the Ledger balances should exactly equal the Day-Book balances. All those accounts which exactly balance should be omitted from the trial balance.

It appears that the Cr. amounts of the Day-Book when added together exceed the Dr. amount $137.06, as shown by the *Balance*. In obtaining the Ledger balances, equal amounts have been omitted from each side of the account, and the difference in the amounts of the Dr. and Cr. Ledger balances is also $137.06, or exactly equal to the Day-Book balances; hence we conclude that the postings and balances of the Ledger are correct.

PROOF OF POSTING AND BALANCES.

Day-Book Drs. and Crs., March 1, 1886.

Dr. Sums.				Cr. Sums.			
Dr. sums on page	*1*	*41*	*75*	*Cr. sums on page*	*2*	*11*	*20*
" " "	*2*	*6*	*68*	" " "	*5*	*191*	*80*
" " "	*2*	*9*	*50*	" " "	*7*	*41*	*75*
" " "	*6*	*17*	*74*	" " "	*13*	*51*	*48*
" " "	*8*	*15*	*00*				
" " "	*9*	*6*	*50*				
" " "	*10*	*35*	*00*				
" " "	*22*	*21*	*00*				
" " "	*23*	*6*	*00*				
Balance		137	06				
		296	*23*			*296*	*23*

Dr.				*Ledger Balances, March 1, 1886.*			*Cr.*
C. P. Corey p.	*85*	*21*	*00*	*Marshall Field & Co. p*	*40*	*191*	*80*
W. H. Lawrence p.	*33*	*9*	*50*				
David Clarke p.	*42*	*24*	*24*				
Balance		137	06				
		191	*80*			*191*	*80*

Double-Entry Book-Keeping.

Double Entry is a system of book-keeping in which every transaction is *twice* entered; first on the *debtor* side of one or more accounts, and then on the *credit* side of one or more accounts, to which it also belongs. It is from this circumstance that it derives its name. It is now universally admitted that this system is better adapted to heavy, responsible or speculative trades, and for extensive mercantile concerns, and indeed is the system in general use where any considerable business is transacted.

The origin of the science of keeping books by Double Entry has been a matter of much speculation by different writers on the subject, but nothing definite can be ascertained respecting it. McCullough, in his Commercial Dictionary, says "it was first practiced in Venice, Genoa and other towns of Italy where trade was conducted on an extensive scale at a much earlier date than in England, France or other parts of Europe." Kelly, in his treatise on Book-Keeping, published in London in 1833 (first edition in 1801), says "it is generally supposed to have been first practiced at Venice in the fifteenth century, when the city was

the grand Emporium of Europe;" although he adds "it is remarkable that the first European who translated Algebra from the writings of the Arabians is also supposed to have written the first treatise on book-keeping. It was published in the Italian language at Venice, about the year 1495, by Lucas de Burgo, a friar, who likewise wrote several useful books on mathematical subjects." Colt, in a lecture delivered at Boston, says the Italians "most likely picked up, among other things, all they ever knew of Double-Entry Book-Keeping, at Constantinople, Alexandria, or some other eastern city, whose traders more anciently may have practiced it in their commerce with Northern Africa, Hindostan, and the countries bordering on the Red Sea;" and thinks it more likely that Hanseatic merchants are the inventors of Double Entry than the Italians.

To whomsoever the credit properly belongs, the Italians have pretty generally received it, and that system (embracing the day-book in history form (originally called waste-book or blotter), the journal and ledger, as the main books of entry—is usually denominated the *Italian method*.

The Golden Rule of Double Entry, which may be concisely stated in six words, is, *Every Debit must have its Credit.*

By bearing this constantly in mind, and applying it to each and all of the details of practical book-keeping, the difficulties of the system will entirely disappear and its perfect simplicity be apparent.

Different Books.

In Double-Entry Book-Keeping three principal books have generally been employed, viz,: a Day-Book, a Journal and a Ledger. But many of our best book-keepers now dispense with the use of one of these books, by combining in one all that is essential of two, and thereby save themselves much time and labor in writing. A set of books should contain a distinct and systematic record of all we wish or need to know about our business. That is the best system of book-keeping which is most easily kept, which enables us most readily and certainly to know the exact state of our affairs, and which is most intelligible to others.

While we shall only illustrate the forms of the Ledger and the Journal, we shall briefly define all books ever kept in any form, without it be for a peculiar business that might demand a special book, suited only to it.

Day-Book. The Day-Book is a plain history of your business transactions, written in the order and date of their occurrence. It is necessary to open the Day-Book by giving therein a statement of your effects at the commencement of business, and also of what debts you owe. Afterward record in detail every transaction that occurs in the course of business, making the entry in history form, should you choose to do so, in as few words as possible, and have it complete. [See Day-Book, page 115.]

Journal. This book is intended to either contain the particulars of every business transaction, or to make special reference to the name and page of the book in which they are to be found, or, if to papers on file, to their titles and numbers. In it the entries are so recorded that they may readily be posted to their proper accounts in the Ledger. It is ruled like the Day-Book, but is used differently. The Dr. amounts are all entered in the left-hand columns, and the Cr. amounts in the right-hand columns.

In all cases the Dr. amount posted from an entry, whether to one or more accounts, should exactly equal the Cr. amount.

In case there are several Dr. items in an entry, to be posted to as many different accounts, their sum will exactly equal the sum of the Cr. items. In such cases it is customary to use the word "Sundries" before the several particulars that are entered on the Dr. side of the account.

When a page of the Journal has been written up, the money columns should be footed, and in case the Dr. and Cr. sides exactly agree, the inference is that the sums have been correctly entered. If they disagree, it is certain a mistake has been made. The work should then be carefully reviewed, and all errors corrected.

In writing up the Journal, the principles already elucidated for debtor and creditor are applicable. But the usual Dr. and Cr. signs are omitted. The word "To," as employed in the Journal, indicates that the titles of accounts preceding it are Dr., and those following it Cr.

Invoice-Book. This is a book in which are entered at length all *invoices*, or bills of goods purchased. It may be made by copying invoices into a book for that purpose. But this requires much unnecessary labor and is really of little use; for in case of any difficulty with the seller, it is necessary to refer to *his own list*, and not to a copy of it. Invoices should be carefully compared with the goods actually received, so that in case of disagreement any error may be corrected, and then placed on file for future reference, as occasion shall require. When found correct, they should be entered in the Day-Book, to the credit of the person of whom the goods have been received, as in case of credits per bill.

Sales-Book. In this book are entered at length all bills of merchandise sold. It is kept like the Day-Book.

Bill-Book is a book in which is kept a memorandum of notes, bills receivable, bills payable and bills of exchange. For a description of the manner of keeping this book see forms of "Bills and Notes Receivable" and "Bills and Notes Payable," given on page 117.

Memorandum-Book is used for recording memorandums of various kinds, agreements, and all important particulars relating to a person's business that belong neither to the Day-Book nor Ledger.

Letter-Book contains copies of all business

letters, which ought always to be written in a neat, legible hand, and to be as clear and as concise as possible. By using a copying-press much labor may be saved in keeping this book, and at the same time perfect accuracy secured. Copies of letters thus taken afford better evidence before a legal tribunal than the most perfect copies with the pen. The Letter-Book should contain copies of all important business letters.

LEDGER. The Ledger may be appropriately styled the *grand resorvoir* of accounts, into which all records in the other books flow as naturally as streams to the ocean. It may also be styled the *business man's directory*, from which he can refer to the details contained in the books of original entry, with the same ease as he would trace out the residence of a friend by searching the street and number in the city directory. Its principal use is to collect under one head all sums belonging to the same account.

TITLES OF ACCOUNTS.

An account is a written statement of business transactions so arranged as to show the debits and credits. The following are the different accounts usually kept in the Ledger of a merchant or a firm engaged in business:

Stock or Partner's Account. This is the first account opened in the Ledger on beginning business. It represents the person or company that conducts a business. The term " Stock " is used to denote the proprietor of the business. In a partnership the names of each of the persons composing it are used instead.

On the Dr. side of this account are entered all the sums they owe on commencing business, and on the Cr. side the amount of money and the value of property they carry into business. The excess of the credits over the debits will be the *net* amount of property invested in trade.

Merchandise Account. This is usually the second account opened in the Ledger. It shows how much has been paid for Merchandise, and how much it has been sold for. On the Dr. side of this account are entered the value of all the Merchandise on hand at the time of commencing business, and the amounts paid for all subsequent purchases. On the Cr. side of the account are entered the amounts of sales. In case the Merchandise is all sold, the difference between the Dr. and Cr. sides of the account will exhibit the gross gain or loss on Merchandise. If any goods remain unsold, their value should be ascertained by taking an inventory of them, and then be entered on the Cr. side of the account.

Cash Account. The third account opened is the "Cash Account." This account shows the receipts and disbursements of *cash*, including specie and bank notes. In it may also be entered certificates of deposit, checks and drafts, which are the representatives of cash.

Expense Account. This account represents the expenses of the business for which there is no return. All expenses of this kind must be posted in the Ledger to the Dr. side of this account. The entries embrace such expenses as rent, clerk hire, furniture and fixtures, freight, etc. The Cr. side of this account contains nothing until the close of the books. The amount necessary to *balance* the account is then entered on the Cr. side, the same amount likewise being entered on the Dr. side of Profit and Loss account.

Profit and Loss Account. As its title implies, this account exhibits the profits and losses in one's business. On the debtor side of this account are entered all *losses* sustained, and money paid for labor, taxes, etc., which do not belong more properly to other accounts, including the sum necessary to balance the " expense account." Upon the credit side are entered all gains of whatever kind arising from the business. On closing the account, if the sum of the credit entries is *greater* than that of the debtor, the difference will be the amount of *profit* that has risen from the business, but if it is *less*, it will exhibit the amount of *loss* sustained.

Personal Accounts. These are accounts kept with persons and show the relation of the individual, company or corporation to our business, whether they owe us or we owe them. They are debited with all they buy or receive on account, and credited with all we buy or receive from them. The difference between the sides of the account will show the balance due us or them. If the *debit* be the larger, the person or company owes us; if the *credit*, we owe them.

Bills Receivable. This account shows the notes received by us in the course of business. It is *debited* with the notes and drafts given us, and *credited* as these are paid or indorsements made thereon. The difference between the sides should show exactly the amount due on all negotiable time bills. These are always debited and credited with the sum expressed on their face; if more or less is received, the amount goes to " Interest and Discount." See paragraphs on this account on page 115.

The following items come under the head of Bills Receivable:

1st. A note in our possession drawn to another person, payable to us or order.

2d. A note drawn by another person, purchased by us, although not originally made payable to us.

3d. A draft or bill of exchange drawn by one party on a second, and coming in our possession as a third party, whether accepted or not.

4th. Our draft on another, accepted by him and retained in our possession.

Bills Payable. These are notes and bills held by other parties. The account is *credited* when our notes are given, and *debited* as they are paid. The difference will show the amount of our *written* obligations outstanding.

The following items come under the head of Bills Payable:

1st. Our notes payable to another person.

2d. A draft or a bill of exchange on us, and accepted by us.

3d. Any bond or obligation in contract, with our signature and requiring payment of us.

Bank Account. This account represents the dealing with the bank in which the funds of our business are deposited. It is the reverse of the account kept by the bank with him. All money deposited by him is posted in the Ledger to the *debit* of this account, and all money drawn out of the bank by him is posted in the Ledger to the *credit* of this account.

Interest Account. This account represents the interest due on all notes of accommodation given by the merchant or accepted by him in the transaction of his business. The rate of interest varies in the different States. All interest due by the merchant to other persons, *when paid*, is posted in the Ledger to the debit of the interest account, and all interest due by his customers to the merchant, *when paid*, is posted in the Ledger to the *credit* of the interest account.

Balanee Account is the title of an account sometimes employed for the purpose of balancing unclosed accounts; hence its name. In this work the Ledger Balances are obtained without the use of this account.

ILLUSTRATIVE EXAMPLE.

Having described the various books, and explained the uses to which they are put, we will now illustrate the method of opening a set of books, and the mode of journalizing and posting transactions. We also wish to give the method of closing a set of books in Double Entry. We suppose the merchant to have kept a full set of books. References to accounts or transactions that have been made in the various books are given. We have explained how these should be entered in these books and therefore refer to them as having been fully recorded in their right books and in a proper manner.

Monday, Feb. 1, 1886.

We suppose the merchant begins his business this day. The first step is to state his capital. The merchaht now purchases his stock of goods, and these being received are entered by the book-keeper in the Day-Book, the entry being made in the name of the various persons from whom the goods were purchased.

These entries have placed the merchant (so far as his books are concerned) in a condition to commence business. "Cash" has been *debited* with the capital paid in, and the merchant has received credit for this amount. Merchandise has been *debited* with the goods purchased by the merchant, and the persons from whom they were purchased have been properly *credited* with the goods supplied by them.

The next step is to enter the sales made and the money received and paid out in the course of business. These must be entered in the proper books and under the proper heading as explained, the book-keeper being careful that each entry is correctly made in the right place.

The Ledger is then prepared for the various accounts it is to contain, the first portion of it being given to the accounts we have described as common to every business. New accounts will have to be opened with individuals and firms as the business progresses, and the book-keeper must use discretion in the arrangement of these.

His capital is as follows: Cash on hand, $4,000.00; Merchandise in store as per Inventory, $3,565.00, and one note (No. 1) against Lorenzo Davis for $258.00, and one (No. 2) against S. B. Nelson for $190.000.

His indebtedness is as follows: He owes Franklin MacVeagh & Co., on account for Mdse., as per Invoice Book A, p. 6, $1,850.00, and Williams, Johnson & Co., as per Invoice Book A, p. 9, $1,261.50.

Tuesday, Feb. 2, 1886.

I have this day sold Mdse. to S. S. Chapman, as per Sales Book A, p. 18, to the amount of $456.00.

Wednesday, Feb. 3, 1886.

I have sold this day for cash, Mdse, to various persons, as per Sales Book A, p. 21, to the amount of $360.50.

Saturday, Feb. 6, 1886.

The sixth transaction was the payment by S. S. Chapman in cash on account of Mdse. bought Feb. 2, $150.00.

Monday, Feb. 8, 1886.

This day I bought Mdse. for cash in Chicago, as per Invoice Book A, p. 29, to the amount of $2,187.00. I paid freight on the above goods to the amount of $31.50, and my expenses were $18.25.

Tuesday, Feb. 9, 1886.

Lorenzo Davis paid his note of $258.00 to-day, S. S. Chapman bought Mdse. as per Sales Book A, p. 27, amounting to $67.35.

Wednesday, Feb. 10, 1886.

I paid Franklin MacVeagh & Co., on account, $1,000.00, and paid Williams, Johnson & Co. $1,-261.50, in full of their account.

Thursday, Feb. 11, 1886.

I bought Mdse. of Franklin MacVeagh & Co., on account, amounting to $765.50, as per Invoice Book A, p. 30.

Friday, Feb. 12, 1886.

I paid $75.00 clerk hire this day.

I also accepted Franklin MacVeagh & Co.'s draft to Williams, Johnson & Co. for $650.00. I have paid $500.00 of this amount in cash, and the balance is placed to the credit of Williams, Johnson & Co.

	Friday, Feb. 1, 1886.					
	Sundries	*Dr.*				
1	Merchandise in Store		3565	00		
2	Cash on Hand		4000	00		
3	Bills Receivable					
	No. 1, Lorenzo Davis	$258.00				
	" 2, S. B. Nelson	190.00	448	00		
1	*To Stock*				8013	00
1	*Stock*	*Dr.*				
	Invoice Book A, pp. 6 & 9		3111	50		
3	*To Franklin MacVeagh & Co.*				1850	00
4	" *Williams, Johnson & Co.*				1261	50
	Feb. 2.					
5	*S. S. Chapman*	*Dr.*				
	Sales Book A, p. 18		456	00		
1	*To Merchandise*				456	00
	Feb. 3.					
2	*Cash*	*Dr.*				
	Sales Book A, p. 21		360	50		
1	*To Merchandise*				360	
	Feb. 6.					50
2	*Cash*	*Dr.*				
	Rec'd of him on acct.		150	00		
5	*To S. S. Chapman*				150	00
	Feb. 7.					
1	*Sundries*	*Dr.*				
	Merchandise		2187	00		
	Invoice Book A, p. 29					
7	Expense: To Chicago for Goods	$18.25				
	" Freight on "	31.50	49	75		
2	*To Cash*				2236	75
	Feb. 8.					
2	*Cash*	*Dr.*				
	Of Lorenzo Davis, Note No. 1		258	00		
3	*To Bills Receivable*				258	00
5	*S. S. Chapman*	*Dr.*				
	Sales Book A, p. 27		67	35		
1	*To Merchandise*				67	35
	Feb. 9.					
2	*Cash*	*Dr.*				
	Sales Book A, p. 30		765	00		00
1	*To Merchandise*				765	
3	*Franklin MacVeagh & Co.* Paid them on Acct.	*Dr.*	1000	00		
4	*Williams, Johnson & Co.* Paid them on Acct.		1261	50		
2	*To Cash*				2261	50
	Feb. 10.					
1	*Merchandise*	*Dr.*				
	Invoice Book A, p. 30		765	00		
3	*To Franklin MacVeagh & Co.*				765	00
	Feb. 12.					
7	*Expense*	*Dr.*				
	Clerk Hire 1 month		75	00		
1	*To Cash*				75	00
3	*Franklin MacVeagh & Co.*	*Dr.*				
	For their Draft		650	00		
4	To Williams, Johnson & Co.				150	00
	To Cash				500	00

1886. Dr. **STOCK.** Cr. 1886.

Feb.	1	*To Franklin MacVeagh & Co.*	1	1850	00	Feb.	1	*By Sundries*	1	8013	00
"	1	" *Williams, Johnson & Co.*	1	1261	50	"	14				
"	14	" Bal. [for trial]		4901	50						
				8013	00					8013	00
Feb.	13	To Bal. [of acct.]		4976	75	Feb.	14	By Bal. [for trial.]		4901	50
						"	"	" Loss and Gain [Gain]		75	25
				4976	75					4976	75

1886. Dr. **MERCHANDISE.** Cr. 1886.

Feb.	1	*To Stock*	1	3565	00	Feb.	2	*By S. S. Chapman*	1	456	00
"	7	" *Cash*	1	2187	00	"	3	" *Cash*	1	360	50
"	10	" *Franklin MacVeagh & Co.*	1	765	00	"	8	" *S. S. Chapman*	1	67	35
"	14	" Loss and Gain [Gain]		200	00	"	9	" *Cash*	1	765	00
							14	" Bal. Inv.		5068	15
				6717	00					6717	00

1886. Dr. **EXPENSE.** Cr. 1886.

Feb.	7	*To Cash*	1	49	75	Feb.	14	By Bal. [for trial.]		124	75
"	11	" "	1	75	00						
Feb.	14	To Bal.		124	75	Feb.	14	By Loss and Gain		124	75

1886. Dr. **CASH.** Cr. 1886.

Feb.	1	*To Stock*	1	4000	00	Feb.	7	*By Sundries*	1	2236	75
"	3	" *Mdse.*	1	360	50	"	9	" "	1	2261	50
"	6	" *S. S. Chapman*	1	150	00	"	12	" *Expense*	1	75	00
"	8	" *Bills Receivable*	1	258	00	"	12	" *Franklin MacVeagh & Co.*	1	500	00
"	9	" *Mdse.*	1	765	00	"	14	" Bal. [on hand]		460	25
				5533	50					5533	50

1886. Dr. **FRANKLIN MacVEAGH & Co.** Cr; 1886.

Feb.	9	*To Cash*	1	1000	00	Feb.	1	*By Stock*	1	1850	00
"	9	" *Sundries*	1	650	00	"	10	" *Mdse.*	1	765	00
"	14	" Bal. [due them]		965	00						
				2615	00					2615	00

1886. Dr. **WILLIAMS, JOHNSON & Co.** Cr. 1886.

Feb.	9	*To Cash*	1	1261	50	Feb.	1	*By Stock*	1	1261	50
"	14	" Bal. [due them]		150	00	"	12	" *Franklin MacVeagh & Co.*	1	150	00
				1411	50					1411	50

1886. Dr. **S. S. CHAPMAN.** Cr. 1886.

Feb.	2	*To Mdse.*	1	456	00	Feb.	6	*By Cash*	1	150	00
"	8	" "	1	77	35	"	14	" Bal. [due us]		373	35
				523	35					523	35

Dr.				Trial Balance. (February 14, 1883.)			Cr.
Merchandise	1	4868	15				
Expense	7	124	75	*Stock*	1	4901	50
Cash	2	460	25	*Williams, Johnson & Co.*	4	150	00
Bills Receivable	3	190	00	*Franklin Mac Veagh & Co.*	3	965	00
S. S. Chapman	5	373	35				
		6016	50			6016	50

Dr.				Ledger Balance. (February 14, 1883.)			Cr.
Merchandise	1	5068	15				
Bills Receivable	3	190	00	*Stock*	1	4976	75
S. S. Chapman	5	373	35	*Franklin Mac Veagh & Co.*	3	965	00
Cash	2	460	25	*Williams, Johnson & Co.*	4	150	00
		6091	75			6091	75

My Assets and their value.

My assets, February 14, 1883, consist of—

Mdse. as per Inventory.......	$5,068.15
Cash, as per Cash Acct.......	460.25
Bills Rec. (notes due)........	190.00
S. S. Chapman owes me.......	373.35
Total Assets.....................	$6091.75

Liabilities.

I owe Williams, Johnson & Co.	$150.00
I owe Franklin MacVeagh & Co.	965.00
Total Liabilities................	$1115.00
Net Assets Feb. 14................	$4976.75
" " " 1................	4901.50
Net Profits.........................	$75.25

Process of Closing.

The Trial Balance. If the Ledger is correct, the total debits and the total credits will be the same; hence the trial balance as a test.

An Inventory of all goods, etc., unsold, that should go to the Ledger.

We now open an additional account in the Ledger, "Loss and Gain," to show all the losses and gains from the different accounts; and another, called "Balance," to exhibit all the balances, that is, the resources and liabilities. Some book-keepers put the balance account in the Ledger, but we prefer to indicate it on the balance sheet as above shown.

The next step is to carry to the credit of their respective accounts the value of such unsold or other property as has not been credited by sales or otherwise—the Inventories. If there is remaining on hand Merchandise to the value of $5,068.15, that sum must go to the credit of that account. The words "By Balance" are used because the unsold goods are a resource.

Begin with all these accounts to which inventory balances have been carried and close them up first. The difference in the sides, if any, will show a gain or a loss; either that the account has produced more than it cost, or *vice versa*. The closing entry (in red ink) expressing this difference is *To* or *By Loss and Gain.* These finished, take the other accounts in the Ledger not closed, omitting Stock or Partners' Account, closing By or To Balance, if a resource or a liability, and To or By Loss and Gain, if there is a loss or gain; rule, and bring down the totals.

The Loss and Gain red-ink entries in the several accounts are now all carried in black ink to the opposite side of Loss and Gain, and the "balances" to the Balance Sheet. When this is done the first will exhibit all the gains and losses of the business under one head, and the latter all the resources and liabilities.

Loss and Gain Account is now closed in red ink, By (or To) Stock, because the investment has been increased if there has been a gain, or diminished by the loss, and this is carried to Stock, in black. In a partnership each partner is credited or charged with his proportion.

All the accounts are now closed except Stock and Balance, should one be kept. Take the difference between the sides of Stock Account, and enter in red ink, To or By Balance. This goes to Balance, in black, and completes the process of closing the Ledger.

Farm Book-Keeping.

While it cannot be said that an exact statement of the business of the farm is essential to success, yet the importance of keeping a true record of everything connected with the finances of the farm will be denied by no intelligent farmer. Those who understand the value of farm accounts are surprised at the general neglect of them by farmers. The principal reason of this neglect is from the misapprehension of the difficulties of the work. To the uninitiated, book-keeping seems like a dark science, and only suited to commercial transactions. And in our agricultural journals, which earnestly and properly insist on the importance of exact farm accounts, the plans suggested are usually too complicated, and those who enter upon them get puzzled and give it up. The books, also, which are prepared for farm records are usually exposed to the same objection. They overdo. Very few continue to use them.

The first and most important question answered by a correct farm account is, What is the profitable income of the farm? This is answered by finding the difference between the whole income and the expenses, and the simplest way to find this is the best way. It is not practicable to open an account with each particular field or crop, or with every animal or kind of stock on the farm, as some theorists have advised.

The farm expenses should be separated from the family expenses, and from all others.

The "income" of the farm arises from what is sold and what is used for the family. The record

of income does not take notice of all that is produced on the farm. The hay and grain fed to the stock appear in the returns of the dairy, or in the beef and pork. Grain sowed or fed is not counted in the income But the provisions raised on the farm and used for the family—grain, meat, milk, butter, eggs, chickens, vegetables and fruit—are as much a part of the income of the farm as anything sold from it. They may constitute a principal part of the income when the farmer's family is large or his farm small. There can be no true statement of the value of the farm products if these are not counted, and the exact figures which exhibit this part of the farmer's income will surprise some of the most careful observers. Besides these, any addition to the value of the stock produced on the farm is a part of the income. Also any permanent improvements produced by the ordinary labor of farm hands and teams.

The "expenses" of the farm are labor, repairs, taxes, stock purchased, feed purchased, seed and fertilizers purchased, decrease in value of stock (if any), board of laborers and insurance. That is all.

Interest on the value of the farm and stock is not a part of the annual expense of the farm, but it will naturally enough be compared with the net income. Neither is the interest on any debt which may be due for the farm or stock. The salary of the manager, if he is the owner, is not a part of the expenses. His salary is in the net income.

Necessary repairs of buildings and implements are expense, but any entirely new building, in addition to what was, and any other improvements of the farm, are not expense, and if these improvements are made by the farm labor in part, so much of the cost of them must appear in the account. As it is a valuable addition to the farm, it is so much increase of capital, and so much of it therefore as appears in the account of labor may be put in the column of income, as will be shown by example.

INCOME AND EXPENSES OF THE FARM.

INCOME.		EXPENSES.	
Sheep sold	$176.29	Farm labor	$1,011.13
Wool	116.95	Repairs	224.38
Wheat	513.61	Extra labor	210.00
Corn	5.00	Seed purchased	73.48
Pork	185.40	Taxes	123.76
Beef and Cattle	329.43	Stock purchased	520.00
Milk	2,650.87	Board of men	240.00
Butter	252.00	Plaster, fertilizer	36.00
Veal	53.20		$2,438.75
Hay sold	68.70		
Wood sold	21.00		
Apples	35.00		
Potatoes	60.00		
Poultry	75.00		
Rent of tenant-house	50.00		
Improvements	250.00		
Increase of stock	130.00	Net income	2,539.70
	$4,978.45		$4,978.45

This example is taken because it presents nearly all the variety of accounts. The income includes what was sold and what was used in the family. The corn raised was all fed to the stock except $5 worth used in the family. The hay and wood sold include that to the tenant, which, with rent, is part of his wages. The permanent improvements were in conducting a spring of water to the barn, and the exact cost is put down, and not the value. The cost of it appears in the farm labor and extra labor, and as it is not an annual expense, but a valuable investment, it must appear in the income column. If it should appear only in the expense column, it would show money out of pocket. Farm labor and extra labor are increased by the permanent improvements in the other column. The repairs include farm tools, horse-shoeing, etc. No part of family expenses is here. The board of farm-hands is a farm expense, and as it adds so much to the cost of the household, it should appear, either being deducted from the sum of the family expenses, or added to the income of the household, as if the farmer paid his wife so much, say $240, for boarding his men, which would be a handsome way of putting it.

Insurance will probably not appear every year. Decrease in value of stock may not appear every year. It may increase in value, and will then appear in the column of income. To ascertain this, and for other reasons, an inventory of the stock is taken at the end of the year. The board of farm laborers is clearly one of the farm expenses, and should be properly noted and separated from the account of family expenses.

DAY-BOOK. This book is kept as a daily memorandum, out of which the ledger is posted. This may be a simple pocket diary, or a larger book kept at the house. In this all sales, contracts, etc. are noted under their proper date, similar to the following:

April 1, 1865. Have this day taken inventory of farm and what is on it, all of which are worth, at the market value, about $2,000.

May 3, 1865. Sold one yoke of oxen for $150, which cost $100 last fall.

July 4, 1865. Sold Milo C. Summers 2 horses, for $200. Received cash $100, and his note, due in 60 days, for $100.

Sept. 3, 1865. Paid S. J. Chapman $15 for 15 bushels of wheat for seed. Received for milk for August, $18.

Dec. 20, 1865. Paid for provisions, cloth and sundries, $56.

Dec. 31, 1865. Paid Michael (the hired man) in full for services for four months, $80

These items should be posted under their proper headings in the ledger at least once a week.

The LEDGER should be ruled so that the "Dr." account will always be on the left, and the "Cr." account on the right hand side. The first ten pages of the ledger should be left for inventories, or accounts of stock, which should be taken once a year, if possible on the first of January. It must be a fair statement of the resources of the farmer, and include everything he owns—cash, land, tools, stock, notes and accounts due him, the amount spent for crops in the ground, all of which are entered under the head of "Resources;" also

everything he owes, which are entered under the head of "Liabilities." Then foot up the columns of each, subtract the smaller from the greater, and he will know just how he stands. Compare this inventory with the one taken last year, and he will know whether he is making or losing. Example:

Inventory of the resources and liabilities of Harvey Williams, January 1, 1886.

RESOURCES.		LIABILITIES.	
Farm of 160 acres and improvements, @ $75 per a.	$12.000	Mortgage on farm..........	$2,000
10 head horses, @ $100.....	1,000	Note to C. C. Chapman...	150
5 cows @ $35...............	175	Taxes due...............	60
20 hens @ 50 c.............	10	Small accounts..........	100
1 mowing machine.........	90	Total..................	$2,310
150 bushels corn @ 50 c.....	75		
Note against S. Johnson...	300		
Outstanding accounts....,.	200		
Cash on hand..............	200	Net resources...........	11,940
Total..................	$14,250		$14,250

The first account opened in the Ledger should be "Cash." In it, the farmer keeping the account considers "Cash" as an individual and charges "To" him the amount on hand and all moneys received, and credits all moneys paid out "By" him. Thus all moneys received are entered on the "Dr." side, and all moneys paid out on the "Cr." side. The amount on hand at the opening of the account, together with the sums received at different times, should exactly equal the sums paid out and the cash on hand at the time of balancing the account. The Cash account should be balanced every month. The following illustrates the manner in which the Cash account should be kept:

Dr. *CASH.* *Cr.*

1885.					1885.				
Jan.	1	To cash on hand	$200	00	Jan.	1	By 1 pr. Pants	$5	00
"	6	" 4 cords Wood @ $2....... ..	8	00	"	1	" 10 lb. Sugar	1	00
"	13	" 10 lb. Butter @ 25 c. - -	2	50	"	[illegible]	" 10 lb. Nails		60
"	16	" D. Love, on account - -	100	00	"	13	" Bill Crockery	20	00
"	23	" 1 pair Horses	200	00	Feb.	1	" Bal. on hand	483	90
			$510	50				$510	50
	1	" Bal. on hand	$483	90					

After the Cash account will come accounts with individuals. That of a farm hand would run something as follows:

Dr. *JOHN MORGAN.* *Cr.*

1885.					1885.				
Jan.	1	To Suit Clothes	$20	00	Jan.	1	By Bal. from 1884	$50	00
"	6	" Pair of Boots	5	00	Apr.	1	" 3 Mos. work at $18.00 - -	54	00
"	8	" Tobacco -	1	00					
Feb.	4	" Cash - -	2	00					
"	27	" 1 Knife - -	1	00					
Mar.	10	" Cash - -	1	00					
Apr.	1	" Note at 3 mos. to balance -	74	00					
			$104	00				$104	00

The following may have been Mr. Williams' account with the store and shows the manner of balancing an account and opening a new one on the same page:

Dr. *JAMES CHAPMAN.* *Cr.*

1885.					1885.				
Jan.	1	To 10 lb. Butter, " @ 10 c. - -	$1	00	Jan.	1	By 100 lb. Sugar, -	$10	00
Feb.	1	" 100 bu. Corn, @ 50 c. - -	50	00	Feb.	4	" 20 yds. Calico -	1	00
Oct.	4	" 50 bu. Wheat, - @ $1.00 - - -	50	00	Mar.	5	" Cash advanced on Corn - -	30	00
1886. Jan.	1	" Bal. due him	1	10	May	3	" Cash advanced on Wheat . -	40	00
					Oct.	1	" 10 lb nails @ 6 c		60
					Nov.	1	" 1 Curry-comb,		50
					Dec.	13	" Cash on acc't -	20	00
			$102	10				$102	10
1886.					1886.				
Jan.	1	To 4 cords Wood @ $5.50 - -	$22	00	Jan.	1	By bal. due him -	$1	10
						3	" Cash to bal. -	20	90
			$22	00				$22	00

All accounts should be balanced as in the above example at least once a year. The best time to do it is at the time the annual inventory is taken, January 1; the balances can then be inserted in the "Resources" or "Liabilities," according as they are on the "Dr." or "Cr." side.

We believe the foregoing comprise all that is necessary to show how to keep an accurate and complete account of farm affairs. Nothing can be more simple, and the farmer who fails to adopt some method and stick to it faithfully will undoubtedly be a loser in many inscrutable ways, and will suspect that his neighbors or his own family have been cheating him when they are entirely innocent. In case a farmer cannot "journalize" and "post" books, he should *at least* keep a full memorandum of all his transactions, so that some one else can post them for him.

FARMING ON SHARES requires a method of its own, in keeping the accounts between the proprietor and the tenant. The book should be kept by one or the other in his own name, and not as a partnership. The pecuniary relation of the two parties sometimes becomes perplexed, and difficult to settle, when the book is kept in the name of both parties. It is generally better that the book be kept by the tenant, who is always on the ground, and manages a greater number of sales and purchases. All his dealings with others, except the owner of the farm, are accounted in the same manner as the accounts of other farmers are kept. There are three methods or conditions of farming on shares: First, when the owner furnishes all the stock and tools, and pays the taxes, pays for the seed and commercial manures, and has two-thirds of the products of the farm. This is on the theory that one-third of the products is sufficient to pay for the labor on the farm, which is correct if the farm is a good one. Second, when the tenant owns the stock and tools, and pays for the seed and manure and taxes, and has two-thirds of the products. Third, when half of the stock belongs to the owner, and half to the farmer, and the products equally divided. The theory in these three conditions is, that one-third of the products

of the farm pays the interest on its value, one-third pays for the labor, and one-third pays the interest on the cost of the stock and tools, the depreciation in the value of the stock and tools, and the taxes, insurance and repairs. In all the conditions the grain used for seed or for feeding is taken out of the common stock, which is the same as each party furnishing his portion of the grain. If any feed is purchased, each party pays his proportion. The farmer generally has the rent of a house, and other things, according to agreement.

The account between the parties is most conveniently kept in a book by itself. The farmer (if he keeps the account) gives credit or makes a charge for every item between them, on separate pages, as above.

The proprietor is charged $90, his half of the $180 paid for a yoke of oxen. So of the other stock. The whole cost should be stated, and the half indicated. April 30, the proprietor is charged $5 for 20 pounds of butter, and on the Cr. page he is credited with $2.50, which is his half. So also December 8th the beef delivered to the proprietor is charged to him, 130 pounds at 8c., $10.40. Then his half of its value is put to his credit, $5.20. So, also, the proprietor has credit for one-half of the beef which the farmer puts to his own use. By this method the account between the two parties is clear, and can be balanced at any time. At the end of April the balance due to the proprietor, who seems to furnish the capital, is $162, and at the end of December, $12.05, which is paid or allowed to stand, as agreed. It is decidedly best that the balance should be found *often*—every month if the proprietor is at hand, at least two or four times a year. It requires but a few minutes of time, and often would save endless perplexity. This is in accordance with the teaching of long experience in the books to which we have been permitted to refer. If it is more convenient, the proprietor may keep the account, in his own name, and give to the farmer Dr. and Cr. in a similar manner, which is much better than to keep the account as of a partnership.

If all the transactions between the two parties are considered cash transactions, and each party receives his part of the income at the time in cash, or pay his part of the expenses at the time in cash, there would be no place for error. If the account is treated as such, the party who keeps the account is to pay over to the other his portion when he receives it, or otherwise he treats it as so much money borrowed, for which he gives the party credit.

1885.	Ewing Summers, Proprietor.		Cr.
April 1.—	Cash for Oxen, etc. (by check)		$500.00
14.—	Cash by Brown for Hay, 3 tons, $42	(half)	21.00
	Calves sold to butcher, $26	do	13.00
28.—	Calf sold to butcher, $14	do	7.00
	Butter used in my family	do	3.50
	Butter to myself, 20 lb., 25c.,	do	2.50
			$547.00
Dec. 8.—	Beef for my family, 280 lb., at 8c.. $22.40	(half)	$11.20
	Beef to himself, 130 lb., $10.40	do	5.20
	Cash for Beef sold to Brown, 200 lb., $16,	do	8.00
	Hide sold for $3.60	do	1.80
	Cash for Wheat sold, at the Mill, 160 bu., $280,	do	140.00
			$166.20

1885.	Ewing Summers, Proprietor.		Dr.
April 1.—	Cash Paid T. Smith for Oxen, $180	(half)	$90.00
	Cash paid for 6 cows,	300 do	150.00
20.—	Cash paid for bran, 2 tons,	50 do	25.00
25.—	Cash paid J. Jones by his order		12.00
	Cash paid to himself		40.00
30.—	Cash paid Mills for Horse, $120 (half)		60.00
	Cash freight on Horse as agreed		3.00
	Butter to himself, 20 lb., at 25c.		5.00
	Cash to balance		162.00
			$547.00
Dec. 8.—	Beef to himself, 130 lb., at 8c.		$10.40
20.—	Wheat put into his granary, 25 bu., $1.75		43.75
	Cash		100.00
31.—	Cash to balance		12.05
			$166.20

Boots and Shoes. Almost everybody seems to know what a good shoe is, theoretically, yet, on account either of his own negligence or the mad persistence of the fashion-mongers in the manufacture of unhealthful articles, he has corns, or bunions, or blisters, or cold feet, or tender feet, or some other ailment—more, indeed, than he is willing to acknowledge. A good boot or shoe has low heels, wide toes, thick, stiff soles, soft uppers, and all of porous leather. The trouble is, most people will claim that their shoes are large enough, when they are not, as is evinced by their tender or sore feet. A perfectly formed foot is that which one would have if he went barefoot the year through in a climate that would admit of it. India-rubber, oilcloth and water-proof boots are all necessarily unhealthful, and should be worn only a short time in special emergencies.

Water-proof Composition for boots and shoes: Beef tallow, 4 ounces; rosin, 1 ounce; and beeswax, 1 ounce; melt together. When cold, add an equal quantity of neatsfoot oil. Rub into the boot well while it is being heated before a fire. Two such applications should be made. Or, dissolve a piece of paraffine in the best winter-strained lard oil—a piece the size of a hickory nut in a pint of the oil, aided with a gentle heat. Or, dissolve by heat an ounce of pure bottle India-rubber shavings in a quart of neatsfoot oil, and add two ounces of tallow. Specially recommended for sportsmen. For the soles, tar is best. See Blacking.

Borage, a rough weed, growing about two feet high. It is an excellent honey plant.

Borax, an alkaline substance of great utility. It is a necessity in welding steel. It removes stains and dirt from the hands better than soap, and a

the same time softens and smooths the skin. It is splendid for washing the hair, and will, without injury cleanse brushes and combs in a few moments. For washing purposes it saves both soap and labor. It will extract the dirt from articles of delicate texture without rubbing, it being only necessary to put the articles to soak in a solution of borax, over night, and needs only to be rinsed in the morning. Two tablespoonfuls of pulverized borax dissolved in a quart of water, to which water enough is added to cover a pair of blankets, will cleanse them beautifully. It also saves great labor in washing paint. It drives away ants and roaches, if sprinkled on the shelves of safes and pantries.

Border, IN GARDENING, the edges of beds; also, a specially prepared and protected bed for assisting the early growth of plants that require some forcing to enable them to mature before the autumnal frosts, and also used for hardening plants before they are transplanted.

Bore: A horse is said to "bore" when he carries his head to the ground.

Borecole (bore'cole): See Kale.

Borer: See under Apple, Peach, etc.

Bot-Fly, an insect which lays its eggs on the hair of horses, especially on the under jaw and on the legs. These eggs are taken into the stomach and intestines of the animal, where they hatch, and as larves eat into the walls of the alimentary canal, causing the disease called "bots." See Horse.

Bots, small worms found in the intestines of horses. They are the larves of the bot-fly.

Bottles, TO CLEAN. Chop up a potato very fine, or break up some charcoal, put it in the bottle with some water, and shake it violently. Empty bottles, unless absolutely clean, should not be left with the corks in them, as in such case a very foul odor develops in them which is very difficult to get out.

Bouillon (bool'yong), soup.

Boulet (boo-let'), a horse whose fetlock or pastern joint bends forward, out of its natural position.

Bound, costive or constricted; said of an animal when constipated in the bowels. When a horse is subject to other kinds of unnatural constriction he, is said to be "hide-bound," "hoof-bound," etc.

Bovine (bo'vine), pertaining to the ox genus; belonging to cattle.

Bowels, INFLAMMATION OF. Apply wet cloths to the abdomen, of the temperature which is the most soothing, until the pain and inflammation are somewhat reduced; then give tepid injections. When diarrhea accompanies, give a warm sitting bath and cool injections. Let the food be very bland, and let the patient rest. These things do, and if the case does not get along well, send for a doctor.

BOWEL COMPLAINT. This is a mixture of diarrhea, dysentery and cholera morbus. The best medicine is a dose of castor oil and a few drops of laudanum. Oil is the best purgative for children in this disorder. Give it every other day with laudanum until the disease is checked. The non-medicinal plan is: Free the bowels with copious injections of tepid water; cool hip baths every two or three hours; entire abstinence from food until the inflammation is somewhat subsided; then take bland food, such as toasted bread, gruel or mush, with sweet cream, etc.; rice, arrow-root and farina pudding, if made plain, are good.

Bows, OF A SADDLE, two pieces of wood laid archwise to fit the upper part of the horse's back, and to give a saddle its proper form and to keep it steady.

Box Elder or **Ash-leaved Maple**: See Forestry, etc.

Boxes, CONTENTS OF. A box 24 inches by 16 inches, and 22 inches deep, contains 1 barrel; a box 16 inches by 16½ inches and 8 inches deep contains 1 bushel; a box 7 inches by 4 inches and 4½ inches deep contains ½ gallon; a box 8 inches by 8½ inches and 8 inches deep contains 1 peck; a box 4 inches square and 4½ inches deep contains 1 quart.

The general rule for finding the contents of any box is to multiply together the length, width and height in inches and divide the product by 2150.42, for bushels, or by 231, for gallons, "struck," or even measure.

Boy: See Children.

Brace, in rural affairs, when said in connection with fowls, and (rarely) some other animals, denotes a pair; as, a brace of Houdans, etc. Also a piece of timber or iron framed into a part of a building or any other structure, to support or strengthen it.

Bracket, a piece or combination of pieces, of wood, stone or metal, triangular in general shape, and either plain or ornamental, usually projecting from or fastened to a wall or other surface to support shelves, statuary or other objects, and to strengthen angles.

Brad, a nail with scarcely any head, to drive into nicely finished wood without breaking the surface around it.

Bragget: See Mead.

Brain, COMPRESSION OF, may be from any cause, such as apoplexy, or a piece of fractured

bone pressing on it, and there is loss of sensation. If you tickle the feet of the injured person, he does not feel it. You cannot arouse him so as to get an answer. The pulse is slow and labored, the breathing deep, labored and snorting; the pupil enlarged. Raise the head, loosen strings or tight things, and send for a surgeon.

INFLAMMATION OF THE BRAIN begins with inflammatory fever, a flushed countenance, redness of the eyes, pain in the head, disturbed sleep, dryness of skin, constipation, restlessness, irritability, pain in the stomach, a tendency to delirium. It is caused by hard study, intemperance, grief, anxiety, stopping of evacuations, exposure to the heat of the sun, external injuries, etc.; respiration deep and slow, and sometimes difficult. The disease is a dangerous one, and often proves fatal in a few days, if not speedily arrested. Cure: promote the evacuations. Remove constipation by purgatives, clysters, and mix niter with tea and other beverages. Divert the blood from the head by restoring the circulation in the extremities; equalize the circulation. Bathe up to the knees in hot water. In excessive inflammation apply cups to the temples and the nape of the neck. Perspiration should also be promoted as much as possible. Should the disease appear obstinate, put a mustard plaster between the shoulders and to the feet at night. Frequently apply vinegar cloths to the head and temples. The less irritation, noise, light, the better it will be for the patient. Cold water to the head, or tepid water if more comfortable, and tepid or hot water to the surface of the body, have a powerful effect in forcing the congested blood from the head and restoring an equilibrium in the circulation The food must be simple and light, as panada, water-gruel, toast and water, or lemonade, light jellies, barley-water. Nothing stimulating must be taken. The unbeliever in drug medication will do all the above things except administering the drugs, with greater hope of success.

Braising. By this process more than mere "stewing" is, of course, intended. In braising, the meat is just covered with a strong liquor of vegetable and animal juices, in a closely covered vessel, from which as little evaporation as possible is permitted, and is exposed for a considerable time to a surrounding heat just short of boiling. By this treatment, tough, fibrous flesh, whether of poultry or of cattle, or meat unduly fresh, such as can alone be procured during the summer season in towns, is made tender, and is furthermore impregnated with the odors and flavors of fresh vegetables and sweet herbs. Thus, also, meats which are dry or of little flavor, as veal, become saturated with juices, and combined with sapid substances, which render the food succulent and delicious to the palate.

Brake, IN MACHINERY, is a lever or other contrivance used for retarding the motion of a wheel by friction against it; also, in agriculture, a large, heavy harrow for breaking clods after plowing.

Bramble, wild briars of the blackberry and raspberry kind.

Bran, the skin or husk of corn, particularly wheat, separated from the flour by the process of bolting. It operates by mechanical irritation, as a very gentle aperient, merely quickening the passage of the contents of the intestinal canal; and when given in the form of mash, and used with caution and moderation, it certainly is useful as an occasional aperient. But it ought in no instance, whether in the raw or in a scalded state, be used constantly as an article of diet; for, if so used, it is apt to weaken a horse's bowels, and to excite in them many disorders. A very large proportion of ammoniacal phosphate of magnesia exists in wheat bran, and this salt forms large, crystalline concretions, often amounting to several pounds in weight, in the cœcum of horses belonging to millers. Bran is used for dry food for sheep, and in the stall-feeding of cattle, and an infusion of it is said to be a remedy for scurf and dandruff.

Branches, OF A BRIDLE, are two pieces of bent iron which bear the bit, the cross chains and the curb.

Branding, the stamping upon an animal of the initials of its owner's name, or other marks to denote property. One method is to burn in the initials or marks with a hot iron, and this is properly branding. Another method is to stamp them on with an iron dipped in a boiling mixture of tar and pitch; this is termed "buisting."

Brandy, an ardent spirit distilled from wine. The name is also given to spirit distilled from other liquors, particularly, in this country, to that which is distilled from cider and peaches. In the north of Europe the term is also applied to a spirit obtained from grain. The art of distilling spirituous liquors is, of course, entirely without the scope of this work, but we will tell how to make some kinds of fruit brandy:

BLACKBERRY BRANDY. Grind to a coarse powder one-fourth ounce each of cinnamon, cloves and mace, and one dram of cardamom; mix these with sixteen pounds of mashed blackberries and five gallons of ninety-five per cent. alcohol; let it stand two weeks, press it and add ten pounds of sugar dissolved in three gallons and three pints of water. Filter.

CHERRY BRANDY. Mash sixteen pounds of black cherries, with their stones; add five gallons of ninety-five per cent. alcohol, and let stand two weeks; press; add ten pounds of sugar dissolved in three gallons and three pints of water. Filter.

Another : Cherries, thirty-six pounds, half red and half black; squeeze them with the hands, and add one and a half gallons of brandy; let them infuse twenty-four hours; then put the bruised cherries and liquor into a canvas bag, a little at a time, and press it as long as it will run; sweeten it with fine sugar and let it stand a month; bottle off putting loaf sugar into every bottle.

Another : To every gallon of brandy put four pounds of red and two pounds of black cherries, one quart of raspberries, with a few cloves, a stick of cinnamon and a little orange peel; closely stop for a month in a barrel; bottle off as before.

PEACH BRANDY. Mash eighteen pounds of peaches, with their stones; macerate them for twenty-four hours with four and three-fourths gallons of ninety-five per cent. alcohol and four gallons of water; strain, press and filter; add five pints of white, plain syrup; color dark yellow with burnt-sugar coloring.

PEPPERMINT BRANDY. Take forty gallons of proof spirit, add four ounces essence of peppermint dissolved in ninety-five per cent. alcohol; color with half pound powder of turmeric infused in one gallon of ninety-five per cent. spirit; use this infusion in such quantity as to get the proper shade.

Brass and Copper Utensils. Many lives have been lost in consequence of carelessness in the use of these utensils. Thoroughly cleanse with salt and hot vinegar, brass and copper, before cooking in them, and never suffer any oily or acid substance, after being cooked, to cool or remain in any of them. Take one ounce of oxalic acid, three-quarters of a pint of New England rum, and three-quarters of a pint of oil. Put the mixture into a bottle, cork it close, and let it stand two or three days before using it. It should be shaken occasionally. Rub the brass with a clean woolen cloth dipped into a small quantity of this liquid, then rub it with dry rotten stone with another cloth. The bottle should be labeled as poison. At the present day brass and copper utensils are superseded by the greatly superior granite ware, which may be found in every market.

Breachy, apt to break fences and get into or out of enclosures; said of live stock. See respective animals.

Bread. In order to secure good bread, it is best economy to purchase the best flour, even at greater cost. Newly ground flonr which has never been packed is much superior to barrel flour. Indian meal, also, is much the best when freshly ground. Ground rice is best if picked over and then washed and prepared like the wheat. Rye flour is very apt to be musty or grown. No one thing is of more importance in making bread than thoroughly kneading it. When bread is taken out of the oven, never set it flat on a table, as it sweats the bottom, and it acquires a bad taste from the table. Always take it out of the tins, and set it up edgewise, leaning against something. If it has a thick, hard crust, wrap it in a cloth wrung out of cold water. Bread made of wheat flour when taken out of the oven is unprepared for the stomach. It should go through a change, or ripen before eaten. Bread will always taste of the air which surrounds it, while ripening—hence it should ripen where the air is pure. It should be light, well baked and ripened, before it is eaten. In summer, bread should be mixed with cold water; in damp weather the water should be tepid, and in cold weather quite warm.

Rice flour added to wheat flour enables it to take up an increased quantity of water. Boiled and mashed potatoes mixed with the dough cause the bread to retain moisture, and prevent it from drying and crumbling. Rye makes a dark-colored bread; but it is capable of being fermented and raised in the same manner as wheat. It retains its freshness and moisture longer than wheat. An admixture of rye flour with that of wheat decidedly improves the latter in this respect. Indian corn bread is much used in this country. Mixed with wheat and rye, a dough is produced capable of fermentation, but pure maize meal cannot be fermented so as to form a light bread. Its gluten lacks the tenacious quality necessary to produce the regular cell structure. It is most commonly used in the form of cakes, made to a certain degree light by eggs or sour milk and saleratus, and is generally eaten warm. Indian corn is ground into meal of various degrees of coarseness, but is never made so fine as wheaten flour. Bread or cakes from maize require a considerably longer time to be acted upon by heat in the baking process than wheat or rye. If ground wheat be unbolted, that is, if its bran be not separated, wheat meal or graham flour results, from which graham or dyspepsia bread is produced. It is made in the same general way as other wheaten bread, but requires somewhat peculiar management. Wheat meal, and especially if it is ground coarsely, swells considerably in the dough, and therefore the dough should not at first be made quite so stiff as that made of superfine flour; and when it is raised, if it is found too soft to mold well, a little more meal may be added. It should be remarked that dough made of wheat meal will take on the acetous fermentation or become sour sooner than that made of fine flour. It requires a hotter oven, and to be baked longer, but must not stand so long after being mixed before baking, as that made from flour.

Good yeast is essential in making bread. It can either be made out of potatoes or hops, viz.: Boil potatoes soft, peel and mash them and add as much water as will make them of the consistence of common yeast; while the potatoes are warm put in half a teacupful of molasses, and two tablespoonfuls of

yeast. Let it stand near the fire until done fermenting, when it will be fit for use. Or,

Boil a handful of hops in two quarts of water; strain, and pour the liquid hot upon half a teacupful of wheat flour. When about milk warm add one teacupful of yeast. Let it ferment, when it will be ready for use and may be bottled.

For the yeast cakes, take a large handful of hops, tie securely in a cloth; pare three large potatoes; put hops and potatoes in a quart of water and boil until potatoes are done; take them and mash fine; pour the hop water over them, thicken with corn meal; when cool stir in two good yeast cakes, or one cup of soft yeast; when light add more meal (never use flour) until hard enough to roll out; roll a quarter of an inch thick and cut with a biscuit cutter; lay on tins or on a clean board under the stove; when dry they are ready for use. The night before you are ready to bake, take the amount of water you wish, thicken with flour, stir in two of you yeast cakes well soaked, let them stand till morning; then take the sponge, a tablespoonful of salt, one quart of water (never use milk in warm weather), mix hard and let rise twice; make in loaves; when light bake in moderate oven over one hour. In cold weather set the sponge at noon and mix at night; then you get your bread baked early in the morning.

"Bread Preparation," sold in some groceries, seems to work very well, but on account of its liability to adulteration, it is safe to avoid using it. All so-called "baker's" bread is adulterated with alum, sometimes with other drugs and common dirt, and should never be eaten.

Standard White Bread. The day before you bake, either in the morning or at dinner time, or, if the weather is warm, it will do at tea time, boil about a dozen good-sized potatoes, pared, mash them in the water in which they were boiled, and rub them through a coarse sieve; have enough water to make it quite thin; when cool, add a handful of yeast-cakes which have been soaked in warm water. In a few hours this will be very light, and ready for use at any time. Early the next morning fill the bread-bowl with flour; salt, then pour in the potato mixture, with enough warm water to mix the flour; knead just long enough to make a smooth dough; set by the stove, and cover with a warm blanket; usually it will be light enough to mold into loaves in less than two hours, when you should endeavor to get it into the oven at just the right lightness.

Another: Put seven pounds of flour in a deep pan; make a hole in the center of the flour, into which pour one quart of warm water, in which has been dissolved one cake of compressed yeast. Now, with a large spoon beat the mixture well, cover the flour, and set to rise in a warm place. In two or two and a half hours it will be ready for kneading. Dissolve a handful of salt in about three pints of warm water, with which make the whole into a soft, smooth dough. Knead well with the hands, and set to rise for two or three hours. Then work and make into loaves; set these to rise about two or three hours; then bake in a good hot oven.

Cream Tartar Bread. One quart of flour; two teaspoonfuls of cream tartar; one of saleratus or soda; two and a half cups of milk; bake 20 minutes. Rub the flour and cream tartar well together; dissolve the saleratus or soda in the milk; wet the flour with it; bake immediately. Water can be used in place of the milk, but the bread will not be quite so rich. This also makes good pie-crust or biscuit.

Milk Bread. One pint of boiling water, one pint of new milk, one teaspoonful soda, the same of salt, flour enough to form a batter; let it rise; add sufficient flour to form a dough, and bake immediately.

Sour Milk Bread. Have ready the flour; sweeten the milk with a little saleratus; add a little salt; make it rather soft, and pour it into the pan and bake it.

Breakfast Rolls. Two quarts of flour, two tablespoonfuls of white sugar, two tablespoonfuls of cold lard; rub these thoroughly together, then add a pint of scalded milk, partly cooled, and two-thirds cup of yeast; mix milk and yeast with two-thirds of the flour and set in warm place to rise. When light mix all together, and mold thoroughly, and let rise again. When very light roll out with as little flour as possible; cut in shape, rub melted butter over the top, fold together and bake.

Graham Bread. Take two cups buttermilk or sour milk, one-half cup of best sugar-house sirup, one teaspoonful of soda, half teaspoonful of salt. Stir with a spoon to a stiff mass (not too stiff or the bread will be too hard); put it into a three-pint or a two-quart basin well buttered; put into a steamer over cold water, which gives the loaf more time for rising. Steam about an hour; then place it in the oven just long enough to give it a good rich brown color.

Another: Take one quart of graham flour at bed-time; scald it thoroughly, and after it cools, mix in a cupful of good yeast (potato preferred), cover with flour (dry) and set in a warm place to rise. In the mornipg add a teacup of warm milk and six dessert spoonfuls sirup or two-thirds of a cup of sugar. If you use sirup it will need an even teaspoonful of soda to counteract acidity. Make up in a sponge, and let rise till light; then bake one hour in a moderate oven. If preferred, it may be placed in a pan and steamed for two hours.

Graham Gems. The old method is to make a thin batter of graham flour, with sour milk and soda, sometimes shortening, salt (and an egg to one dozen gems); put it into hot, well-greased patty-pans, and bake in a quick oven for about 20 minutes. But—

Another: The standard kind among the modern "Hygienists" is made as follows: Take freshly ground graham flour (made from sound white wheat and ground soon after the millstones have been sharpened, as the hulls are much finer cut, is the best); sift through a very coarse sieve, which will remove only what whole hulls there may be in the flour; mix the graham flour with sweet milk to a batter a little stiffer than for griddle-cakes, but which will quickly pour from the spoon, and smooth on the surface; stir till all is well mixed and no need of more stirring; bake in cast-iron gem pans; put the pans on top of the stove, and grease well with a little mop; heat them as hot as they will bear without burning off the grease; fill them quickly with the batter, dropped from the spoon, and put them into a hot oven, much hotter than for fine-flour biscuits, and have it the hottest when the gems go into the oven, and let the heat gradually diminish toward the last of the baking; the sudden heat crusts them slightly, and the confined gas lightens them; the heat should be as nearly equal above and below as possible, and cold drafts of air from opening the oven door should be avoided. Let them bake about 20 minutes, or until they become a nice brown; if the crusts seem hard upon taking them up, put them on a plate and turn a tin pan over them a few minutes, which will soften the crusts. They may be eaten hot without disturbing the most delicate stomach. They would be just as light mixed with water instead of milk, but not quite so tender; part of each does very well, and a little fine corn meal and sweet cream are an improvement. Any one who will follow these directions strictly and practice a few times will find they have such delicious gems that all the family will prefer them to any other kind of bread.

Oatmeal Gems. Mix a cup and a half of oatmeal, half a cup of corn meal and a cup of flour with two cups of sour milk; add a tablespoonful of shortening, two of sugar, a teaspoonful of salt, and a teaspoonful of soda dissolved in a tablespoonful of boiling water; heat the muffin tins and bake in a hot oven.

Rye and Indian, or Brown Bread. For each good-sized loaf being made take one and a half pints corn meal, and pour boiling water upon it to scald it properly; let it stand until only blood warm; then put about one quart of rye flour upon the meal, and pour in a good bowl of emptyings, with a little saleratus dissolved in a gill of water, kneading in more flour, to make of the consistence of common bread. If you raise it with yeast, put a little salt in the meal, but if you raise it with salt risings, or emptyings, no more salt is needed. Form into loaves, and let them set an hour and a half, or until light—in a cool place in summer, and on the hearth or under the stove in winter—then bake about two hours. Make the dough fully as stiff as for wheat bread, or a little harder, for if made too soft it does not rise well. The old style was to use only one-third rye flour, but it does not wear if made that way; or in other words, most persons get tired of it when mostly corn meal.

Steamed Brown Bread. One pint of sifted corn meal, one pint of flour, one pint of buttermilk, one teaspoonful of saleratus. If preferred sweetened, one-half-cup of molasses is used. Steam two hours and serve hot.

Rye Bread. Make a sponge as you would for wheat flour. When light, stir in rye flour as stiff as you can with a paddle or large iron spoon. Put it in the baking pans, and let it get very light before baking. A little sugar improves it.

Rice Bread. Boil one pint of rice soft, add one pint of yeast, then three quarts of wheat flour; put it to rise in a tin or earthen vessel until it has risen sufficiently; divide into three parts; then bake as other bread, and you will have three large loaves.

Pumpkin Bread. Take a pumpkin and boil it in water until it is quite thick, then add flour so as to make it dough.

Corn Bread. Take one quart of sweet milk, corn meal enough to thicken, three eggs, half a cup of butter, two tablespoonfuls of brown sugar, one teaspoonful of soda and two of cream of tartar; bake in a moderate oven one and a half hours.

Southern Style. The main difference is, wet the meal and set it where it will keep warm, and it will by its own tendency to ferment become light without any yeast or saleratus. Then steam, boil or bake it, as you desire, at once, and you will have the nicest and most wholsome pone, or corn dodgers, or hoe-cake that can be made from corn meal. One thing may cause you trouble: it must be watched very closely, for it sours very quickly after it is light.

Corn Pone. Make one quart of corn meal mush in the usual way, except extra salting; take from the fire and add one quart of cold water and meal enough to make it very stiff; set in a warm place to rise, and when light bake in an oven with a tight lid. This is genuine corn pone.

Uses of Stale Bread. 1. To make dressing for meat—Crumb it fine; turn hot broth over it; season, add butter, and a well-beaten egg, or more, according to quantity. 2. Make bread pudding—Soak two hours in sweet milk; then beat eggs, sugar and spices, and bake; sometimes add fruit. 3. Make biscuit—Soak over night in sour milk;

mash fine with the hand; mix in your biscuit for breakfast, adding salt, lard and soda. They are better than without the stale bread. 4. Make pancakes or gems—Soak over night in sour milk; add well-beaten eggs, flour, corn meal or graham flour to make a batter; add soda and salt and bake on a griddle or in gem pans. 5. Crumb fine and put in the next omelet you make. 6. Toast your bread, set a pan of milk on the stove, but do not remove the cream from it; add butter and salt; dip the bread in this, and send to the table for supper or tea. 7. Crumb fine and put in your tomatoes when you are stewing them. 8. Batter bread—Take half a cup of bread crumbs soaked in a pint of milk, and two eggs; beat this to a smooth batter; add two cups of Indian meal, one teaspoonful of salt and one tablespoonful of butter; stir all together very hard, and bake in shallow tins very quickly. 9. Toast dry, and serve either dry or dipped in hot water, and eat with sauce, meat, or both

As far as possible, have pieces of bread eaten up before they become hard; spread those that are not eaten, and let them dry, to be pounded for puddings, or soaked for brewis. Brewis is made of crusts and dry pieces of bread soaked a good while in hot milk, mashed up and eaten with salt. Above all, do not let crusts accumulate in such quantities that they cannot be used. If proper care be taken there is no need of losing a particle of bread.

FRIED BREAD. Beat four eggs very light, add three tablespoonfuls of good brown sugar, a little grated nutmeg, a tablespoonful of orange or rose water, and a quart of milk. Cut into nice slices an inch thick, a stale loaf of bread; remove the crust from the sides, and cut each slice into halves. Butter your frying-pan, and when hot, lay in your bread (dipped in the custard) and brown on both sides. Lay them on a hot dish and sprinkle over them a little loaf sugar.

Another: Slices of toasted bread dipped in milk or wine and fried in honey are excellent. Then, instead of calling them "fried bread," they are *torejas*, an excellent Spanish delicacy. Please understand that there is neither butter nor lard. Simply melt the honey in a pan, and when it is very hot put in the bread, which is served hot also, after becoming nicely browned. See also Biscuit and Cakes.

Bread may be PRESERVED for long periods by cutting it into thick slices and baking it in an oven until perfectly dry. When on a journey this dried bread may be dipped an instant into hot water, re-dried and eaten with butter. The taste will be like that of toast.

Break. To "break" a horse is to reconcile him to the use of the saddle or harness, that he may be made serviceable to man. Also, a "break," a stout two-wheeled vehicle used in breaking horses. To "break" a piece of ground is to plow it up thoroughly, either from its primeval condition or after it has settled for a season.

Breast, INFLAMMATION OF. The breasts of females are sometimes inflamed, swelled, and subject to abscesses. In mothers these affections are painful, and prevent the flow of milk. A swelling in the breast may be reduced by applying spirits of camphor or the adhesive strengthening plaster. If there be chill it must be removed by perspiration. Take one teaspoonful of best rum, one teaspoonful of ginger, one-quarter teaspoonful of cayenne pepper; boil four or five minutes, and thicken with coarse flour or ground elm bark, or slippery elm; put a little oil upon the breast, then apply the poultice, and repeat three or four times. If the pain be excessive, add a small quantity of laudanum to the poultice. This generally cures. In hard swellings of the breast, rub with sweet oil, or friction with soap liniment; one dram of compound tincture of iodine to each ounce will render it more effectual. The bowels should be kept gently open to subdue the fever. When matter has formed, it is best to let it break and discharge spontaneously; or it may be punctured with a lancet. An abscess in the breast will discharge for a long time. The diet, therefore, should be nutritious, light and strengthening. A warm bread poultice is good for an abscess; it should be changed every four or five hours, and covered with oiled silk. When the discharge has nearly ceased, simple warm-water dressings may be substituted. Or, boil a handful of chamomile and as much mallows in milk and water. Foment with it between two flannels, as hot as can be borne, every twelve hours. This also dissolves any knot or swelling in any part. Or, take one-half dram of powdered gum arabic, ten grains of borax and one dram of tincture of myrrh. To hard breasts some apply roasted turnips, mashed and mixed with a little oil of roses.

Any disease of the breast is a delicate matter to experiment with, and it is generally safer to consult a physician than to run the risk of letting the disease gain a foothold.

Breast Pang. Take a warm-water emetic, abstain from food, rub the chest and remain composed as possible.

Breast Wheel. A water wheel, where the current is delivered upon it about one-half or two-thirds its height, which distinguishes it from "overshot" and "undershot" wheels.

Breath, IMPURE. There are few things more offensive than a foul or fetid breath, not only as a source of annoyance to the person himself, but a positive nuisance to all who have the misfortune to approach him. Impure breath, except in cases of illness, and when the patient is under a course of

mercury, proceeds from two causes—a neglected state of the stomach and bowels, or from decayed teeth and an unclean mouth; and as in either case the remedy is easy, it must be owing to an innate disregard for others' comfort, and neglect of his own, that any person allows so noxious an offense to continue. To counteract such exhalations, almost the only substance that should be admitted at the toilet is the concentrated solution of chloride of soda; from five to ten drops of it in a wine-glass of pure spring water, taken immediately after the operations of the morning are completed. In some cases the odor arising from carious teeth is combined with that of the stomach. If the mouth is well rinsed with a teaspoonful of the solution of the chloride in a tumbler of water, the bad odor of the teeth will be removed. See also Teeth and Hygiene.

For breath tainted by ONIONS, it is said that eating leaves of parsley with vinegar is a good thing.

Breath, SHORTNESS OF. Take of vitriolated spirits of ether one ounce, and of camphor twelve grains. Make a solution, of which take a teaspoonful during the paroxysm. This is usually found to afford instantaneous relief in difficult breathing, depending on internal disease and other causes, where the patient, from a quick and very laborious breathing, is obliged to be in an erect posture. Or, take one-quarter ounce of powder of elecampane root, one-half ounce of powder of licorice, as much flour of brimstone and powder of anise-seed, and two ounces of sugar-candy powdered. Make all into pills, with a sufficient quantity of tar; take four large pills when going to rest. This is an incomparable medicine for asthma, and should be taken for some time.

Breech, OF A GUN, is the butt of the stock, which in firing is placed against the shoulder. A "breech-loading" gun is one which is loaded at the juncture of the breech with the barrel. "Breech wool" is the coarse, short wool which is taken from the hinder quarters, or breech, of common sheep.

Breeching, that part of the harness which extends around the breech, or hind quarters, of an animal, enabling him to push backward the vehicle to which he is attached.

Breeding, in a pastoral sense, is the propagation of animals; also, in a more restricted sense, the propagation of good breeds, on scientific principles, for the improvement of the stock.

All breeding is founded on the principle that like begets like. This is, however, liable to some exceptions, and is much more generally true when breeding down than when breeding up. If two animals which can never be exactly similar in all respects are requisite to the perpetuation of the species, it necessarily results that the progeny must differ in a more or less degree from each parent. With wild animals and such of the domestic as are allowed to propagate without the interference of art, and whose habits, treatment and food are nearly similar to their natural condition, the change through successive generations is scarcely perceptible. It is only when we attempt to improve their good qualities that it is essential carefully to determine and rigidly to apply what are adopted as the present scientific principles of breeding. We cannot believe that we have penetrated beyond the mere threshold of the art. Unless, then, we launch into experiments, which are necessarily attended with uncertainty, our duty will be to take for our guide the most successful practice of modern times, until further discoveries enable us to modify or add to such as are already known and adopted. We may lay down, then, as the present rules for this art: Therefore,—

1. That the animals selected for breed should unite in themselves all the good qualities we wish to perpetuate in the offspring.

2. These qualities, technically called "points," should be inbred in the animals, as far as practicable, by a long line of descent from parents similarly constituted. The necessity for this rule is evident from the fact that in mixing different species, and especially mongrels, with a long-established breed, the latter will most strongly stamp the issue with its own peculiarities. This is forcibly illustrated in the case of the foreign cattle of ancient races, whose color, form and characteristics are strikingly perpetuated, sometimes to the sixth or even a later generation. So far is this principle carried by many experienced breeders that they will use an animal of different external appearance, but of approved descent (blood), in preference to a decidedly superior one, whose pedigree is imperfect.

3. All the conditions of soil, situation, climate, treatment and food should be favorable to the object sought.

4. Perfect health and sound constitution in the breeding animals, and freedom from blemish, either inherent or chronic.

5. As a general rule, the female should be relatively larger than the male. This gives ample room for the perfect development of the fœtus, easy parturition, and a large supply of milk for the offspring, at a period in its existence when food has a greater influence in perfecting character and form than at any subsequent time.

6. Exceptions to this rule may be made when greater size is required than can be obtained from the female, and especially when more vigor and hardiness of constitution are desirable. For this purpose, strong, masculine development in the sire is proper, and, if otherwise unattainable, something of coarseness may be admitted, as this may be

afterward corrected; but nothing will atone for want of constitution and strength.

7. Pairing should be with strict reference to correcting the imperfections of one animal by a corresponding excellence in the other.

8. Breeding in-and-in, or propagating from animals very nearly allied, may be tolerated under certain circumstances. When the animal possesses much stamina and peculiar merit, which it is desired to perpetuate in the breed, it may be done either in the ascending or descending line, as in breeding the son to the parent or the parent to his own progeny. This has been practiced with decided advantage, and in some cases has been continued successively as low as the sixth generation with good results.

9. Yet, with inexperienced breeders, it is usually better to avoid close relationship, by the selection of equally meritorious stock-getters of the same breed from other sources, unless the breeder be a perfect master of the art of close breeding. It requires the soundest judgment and long experience to long follow in-and-in breeding with entire success.

10. Wholesome, nutritious food, at all times sufficient to keep the animals steadily advancing, should be provided, but they should never be allowed to get fat. Of the two evils, starving is preferable to surfeit. Careful treatment and the absence of disease must be always fully considered.

11. Animals should never be allowed to breed too early or too late in life. These periods cannot be arbitrarily laid down, but must depend on the time of maturity, the longevity of the breed and the stamina of the individual.

12. No violent cross or mixing of distinct breeds should ever be admitted for the purpose of perpetuation, as of cattle of diverse sizes; horses of unlike characters; the Merino and long-wools, or even the long or short and the middle-wool sheep. For carcass and constitution, the last-named crosses are unexceptionable, and it is a practice common in this country, and well enough, where the whole produce is destined for the shambles; but when the progeny are designed for breeders, the practice tends to a total uncertainty in fixed character and quality.

If an animal is capable of transmitting any characteristic to its young, it must, of course, possess that characteristic itself, although now and then qualities may predominate in the offspring which were almost or quite latent or hidden in the parent, but were manifest in some of the ancestry. Now, if any characteristic quality becomes hereditary in an animal, it must correspond with a similar quality inherent in the parent from which it descended. But if we breed from a female of certain qualities by a male of an opposite character, so far as these peculiar qualities are concerned, we cannot expect to perpetuate in the offspring both characteristics. We should obtain a result which might appear to contradict the maxim that "like produces like." And here we come at once upon one of the leading principles in the breeding of all stock—that though "like produces like," and can produce nothing else, when the two parents possess opposing or unlike qualities, the one which possesses the strongest hereditary qualities, or the strongest power of transmitting his qualities, will gain a preponderating influence over the offspring. Take, for instance, a cow with some special peculiarity of form, and put her to a bull having points of form quite opposite in this respect, and the calf will take the character, so far as this peculiarity of form is concerned, of the parent which possesses the greatest hereditary power, or the greatest purity and unity of influence—what we may call fixity of type. And these hereditary powers are very largely under our control, to be increased or diminished by our own course of action, and at our pleasure.

If we take two animals to breed together, both possessing a strong similarity of type, the result we shall have will be an offspring possessing the like character, but in a higher degree. The result of putting together two animals of a strong similarity of characteristics is not only to perpetuate their corresponding peculiarities, but to intensify them in the offspring; that is, if the parents actually possess a striking similarity of type in any given point, each successive generation which they produce receives an increase of hereditary force, or an increase of power in transmitting its peculiar stamp upon its young. It is a cumulative power. But if this hereditary power accumulates, and becomes stronger and stronger, with a strong similarity in the parents to start from, it absolutely and invariably diminishes, if the parents, instead of possessing similarity of character, really possess an opposite or antagonistic character.

It reminds one of the familiar and well-known principle of mathematics, that two plus or positive quantities multiplied together will produce a far larger plus or positive quantity as the product; while if we multiply two unlike quantities, a plus and a minus, for instance, the result will be a minus, or negative quantity. Suppose, for example, we have a well-bred ram, that, by long and careful breeding through several generations, has acquired certain strong and valuable hereditary powers; and suppose these powers, for the sake of illustration, are equal to 100, if they could be expressed in figures. Now, suppose we put this ram to a ewe of a different character, one that has been cross-bred, or bred without any care or system—very much as our native sheep or our common cattle have been bred. She has, of course, far less hereditary power; far less fixity of type and strength of blood, as we say. Her hereditary power may be represented, we will suppose, by 60

The result would be a lamb possessing very much the same characteristics as the ram, because we have seen the ram possessed a greatly superior hereditary power. To the eye he may look very like his father; but the hereditary capacity of this lamb will be greatly reduced, and his power of transmitting his peculiar characteristics will be represented by 100—60=40. He may still look to the eye about as good as his father; but he will possess less than half of his father's hereditary power, and less even than that of his mother. In other words, he may have all the perfection of form and marked characteristics, but his power of transmitting these peculiarities will be only in the proportion of 40 to 100, and for a breeding animal to get stock from he will be worth less than half as much as his sire.

In other words, if you select animals of a similarity of type, that is, if the likeness is strongly marked and well developed in both parents, the young will not only possess the same character as the parents, but it will possess an increased or multiplied power of hereditary transmission of these characteristics. But opposite characteristics mutually weaken each other's influence, and the offspring will have the power of hereditary transmission only in a greatly reduced degree. The exact proportion of this reduction of the power of transmission, or hereditary power, may not be precisely like that stated above, but it will correspond with it in the main, and sufficiently for illustration.

These are a few general and well-established principles which have been arrived at by the most skillful and scientific breeders during the last half or three-quarters of a century; and it would be idle to dispute them or to deny their force.

We are to bear in mind, also, that capability of transmitting the qualities or characteristics from the parent to the offspring is not limited to any one peculiarity of the animal—like the secretion of milk, the disposition to take on fat, the strength of constitution, the likeness of figure, or the habit of growth —but extends to all the characteristic points of the parent animal. All the peculiarities of the system, physical and constitutional, are very largely within our control; and the character which results will be governed by the tendencies of the parents we select to breed from, and will depend on the adjustment of the balance of qualities, sometimes inclining to the side of one parent and sometimes to the other, according to the respective power of transmission which has been spoken of.

If this power largely preponderates in one parent, owing to the length of time in which it has been carefully bred, or the number of generations through which it has become fixed and intensified, while it has been broken and weakened in the other by cross or promiscuous breeding, the character of the offspring will be governed almost exclusively by the parent that has the stronger blood; while the other will have but slight influence over the qualities of the offspring. But if there is a more even adjustment of this power of transmission on the part of the parents—that is, if they are nearly or quite equally well bred—the dam will succeed in imparting some peculiarities, and the sire will communicate others. The dam may impart the general form of the body, for instance, but be unable to control or overcome the stronger power of the sire over certain points of the body. The dam, for example, might have slightly deficient hind quarters, and the sire a strong tendency to impart a good hind quarter; and in this respect she would be compelled to yield to the superior strength of influence. In those points of character or features where they correspond, or were similar, both being good or both being bad, the result would be to increase and intensify such points, and to reproduce them in a still stronger form. In some particulars the influence of the male will predominate; in others, that of the dam. So we see the hereditary qualities of long and carefully bred stock will represent the maximum of good qualities and the minimum of undesirable ones.

The first and most obvious rule is to *breed only from the best*—not merely the best-looking, the animal that strikes and fills the eye the most completely, but from the one that has the hereditary power, the capacity to transmit his good qualities in the highest degree to his offspring; and the strongest evidence of this power will be the length and perfection of his pedigree, showing the qualities of his ancestors for some generations back, unless, indeed, some of his stock can be seen to tell as plain a story to the practiced eye of a judge of stock.

We have often heard practical men, intelligent men, who profess to know something about stock, and who ought to know better, say: "I don't care anything about your pedigree; let me see the animal, and I can tell whether I want to breed from him or not." Let us not deceive ourselves by any such assumption, from whatever source it may happen to come. It will be sure to lead to frequent disappointment; for, as we have shown, an animal may possess an almost faultless form, and strike the eye of even the most experienced judge as possessing remarkably fine qualities, and, indeed, really possess them, and yet have no fixity of type, no great hereditary power; when, if put to a low or ill-bred female, he will be more likely than not to get poor stock, or, at any rate, there will be no reasonable certainty of transmitting his own qualities.

The importance of the greatest care in the selection of the male will be apparent from the fact that his influence extends to a far more numerous

progeny. He should not only possess in the highest degree the good qualities sought after in the class of animals to which he belongs, but he should possess the power of transmitting them in the highest degree; and as this power is latent or hidden, and does not appear to the eye, it is to be judged either from the stock already got, or more commonly from the qualities of his ancestors through several generations. And here, again, the quality of the pedigree—that is, the quality of the ancestry—is more important than its length. It is of little use or satisfaction to trace a pedigree back through inferior or ill-bred stock, except as a warning against the use of the male at the end of it.

At the same time, the longer it is the better, provided it shows a high character in the ancestry; for we have seen that the hereditary power, or capacity for transmission, is cumulative; that is, it becomes stronger, and more intense and fixed, from generation to generation, where the respective parents possess similarity of characteristics, as is commonly the case in our well-established breeds.

We have said that the choice of the male to breed from is of special importance, because of the great extent of his influence; that is, the very large number of his offspring in proportion to that of the female, among our domestic animals. But it is well established now that the influence of the male imparts vigor of body, and the general conformation of the system, especially of the forward parts, and that he transmits to his progeny the qualities of the mother by which he was born. A well-bred bull dropped by a first-rate dairy cow will produce a calf that will make, if a heifer, another good dairy cow. He will transmit to his daughter the qualities of his mother, if he have well fixed in his constitution the hereditary power of which we have spoken. In breeding dairy stock, therefore, it is of the utmost importance to study and to know the quality of the stock from which the male has descended.

The animal in a wild state, or in a state of nature, has stronger reproductive powers, greater energy of the system and constitution, than one long under the influence of domestication. The natural laws are to some extent interfered with by the efforts we have to make to establish and perpetuate certain peculiarities of the animal system, the extraordinary development of which is unnatural and artificial, but which development may be essential to our interests. The tendency to secrete milk is a natural one, found in all animals that suckle their young; but the extraordinary development of milking powers is artificial. In the wild state the cow yields milk for only a short time, and that only in sufficient quantities, probably, to nourish her young. As we recede from this wild condition by domestication, and subject the animal to a variety of circumstances which modify her form and system, we do it at the expense of certain qualities, for the sake of gaining other qualities better calculated to promote our immediate interest. The reproductive powers become weaker; the vitality and vigor of constitution lessened; but the formation of fat, or the tendency to produce meat, and the profitable production of milk, may be largely increased. That high breeding has this tendency to diminish the vital force and strength of constitution is apparent enough when we consider how utterly absurd it would be to attempt to pit an improved Short-horn bull against a rough and ill-bred bull in a Spanish arena. He would have the improvement knocked out of him before he had time to turn around.

Good dairy qualities, therefore, being artificial to a great extent, there will always be a natural tendency to revert to the natural state; and hence the necessity of constant and unremitting care to preserve and improve by the methods already intimated what we have already gained—that is, by the most careful selection of the animals from which we propose to raise dairy stock, especially to have the male from a family remarkable for milk.

It is a fact well known among farmers that in all classes of stock, as cows, ewes, sows, etc., a strong disposition to accumulate fat in the system is commonly attended by a marked deficiency in the secretion of milk; and there can be no doubt that the general structure of the animal exercises an important control over the quantity and richness of the product in milk.

This must be evident from the fact that the first process which the food taken into the system is made to undergo after digestion is the separation and preparation of the fatty and nutritive parts, so as to introduce them into the circulation of the blood. In some animals this process apparently goes on with less loss than in others; but the rapidity with which the elements of food pass on into the circulation of the blood is plainly seen in the shortness of time it takes to show itself in the various secretions of the body. Thus certain plants or other substances taken into the stomach half an hour previous to milking will perceptibly affect the taste and quality of the milk. If you administer a dose of aloes to a horse in the form of a ball wrapped up in paper, and within twenty or twenty-five minutes after put a bullet through his head, and dissect him, you will find the paper left in an undigested mass in the stomach; but you will find traces of the aloes far along at the very mouth of the large intestine. It has dissolved and entered with wonderful rapidity into the circulation of the system. This has been tried time and time again. It is related, also, that an ox going to the butcher

caught up an onion and ate it. In a very short time he was knocked in the head, when it was found that the onion had tainted the whole body.

Juicy food causes the milk to be thin and watery as well as abundant, showing that there must be a diffusion of water directly from the blood. It is incredible that such great quantities of water could be obtained from the decomposition of the gland-cells; and, as water constitutes by far the largest part of milk, it is practically correct to describe it as a secretion from the blood, even if we admit that the milk solids have their origin in the decomposition of the mammary glands.

Now, if the blood is poor, thin and watery, if it is but slightly charged with the fatty elements which have been taken up in the food, the quality of the milk secreted from this blood must of necessity be poor, because the quality of richness of milk is supposed to depend on the amount or proportion of fatty constituents, or what is more commonly known as cream and butter. And you will generally find that the quality bears an intimate relation to the quantity produced.

The second step in the process of assimilation is, therefore, the separation of a larger or smaller proportion of these fatty elements in the blood, in the form of milk, the richness of which will be governed very materially by the food and by the perfection, the completeness, with which the fatty elements have been separated from the food, and enter into the circulation of the blood.

The economical preparation of the raw material of the food is equally important for the fat in the blood, whatever may be the ultimate form into which the animal system is to convert it; and the internal structure which accomplishes this process differs widely in different individuals, so that one animal will effect this separation, preparation or elimination completely, with the least possible loss or waste of food, while another will fail to extract the fatty elements of the food, and allow them to pass on to be excreted with the other cast-off wastes of the body; and we see, also, that animals best formed for fattening are also best formed to fulfill the first condition essential for the production of rich milk.

The object in breeding stock for the dairy, therefore, is to stimulate the mammary glands to the greatest possible activity, to increase their natural energy and power of secretion, and to prolong their period of activity. Now, they are so largely subject to hereditary influence that great progress has been made in increasing their power to perform their natural functions, as we see in the establishment of various breeds of cattle remarkable for milking qualities; while a neglect to develop and encourage the functions of these glands has in some breeds so far reduced their energy and activity that whole classes of animals—like the Herefords, the Devons, and, to some extent, the Short-horns—have ceased to yield milk in quantities to be profitable upon the dairy farm.

In those breeds where the tendency to produce meat has been encouraged, where the yield of milk has been overlooked and sacrificed to early maturity, we could, no doubt, by judicious management, bring the condition of the mammary system to its required standard of efficiency, and even elevate this standard to a high degree; but we should probably injure or reduce the tendency to the economical supply of meat. We should impair the value of certain very important qualities which have been highly developed for specific purposes, and should get only what we find already highly developed in other breeds, viz., a tendency to the largest production of milk. Not that the two qualities are irreconcilable or incompatible in the same animal, but that they have not as yet been combined with any degree of success in the meat-producing breeds. We find generally in practice that a cow that produces a large amount of rich butter will, when the secretion of milk falls off, feed most properly for the butcher, unless there are other counteracting or objectionable peculiarities.

The second object we have in breeding stock is the production of meat; and while upon the general principles of breeding, let us allude to the difference between breeding for the production of milk and for the production of meat. For the latter a large part of the success to be expected will depend upon management and attention to feeding. It is absolutely essential to keep the animal in a thriving condition from its birth; but still we can exert a powerful influence over the natural predisposition of the animal. We are to choose a female that yields an abundant supply of milk. An animal—a cow, for instance—that yields a liberal supply of milk will nourish the *fœtus in utero* more completely, and bring larger calves; her offspring will be fatter, finer and in far better condition at birth than that of a poor milker. A cow that has a strong predisposition to form fat, and secretes little milk, will almost invariably bring a puny calf, and one out of all proportion to the size and condition of its dam. The cows of the breeds most noted for the production of beef, pure and high-bred Short-horns for instance, are far from being the best for raising calves designed especially for the most economical production of veal. A well-formed grade or common cow (if in sound health, and capable of nourishing its young), put to a carefully-bred Short-horn bull whose ancestry through some generations had possessed a strong disposition toward the production of fat and meat, will bring forth a larger calf than a high-bred Short-horn. The bull from such a parentage will possess hereditary powers so strong as to transmit all his essential characteristics to his offspring with as great certainty as if that offspring came from a

too finely bred cow. This, of course, supposes her to be large and roomy, and well proportioned in size to the bull. But the bull must have the advantage of a good pedigree or careful breeding.

But it would be a fatal mistake to adopt the opposite course, and to put a high-bred pure Short-horn cow to a low-bred or scrub male; for, though the cow would succeed in stamping her character upon the calf, she could not nourish it so well; she would be less hardy in constitution, and not so certain as a breeder. It is far better to impart through the male in breeding the qualities we want for the production of meat; and, in the economical conversion of vegetable into animal matter, purity of blood is not essential in the offspring.

For the breeding of stock for the most economical production of beef, take, therefore, good, fair dairy cows of good size, and put them to a bull of first-rate pedigree, either Short-horn, Devon or Hereford.

With respect to breeding for purity of blood, the object is to create and preserve a fixity of type, and we must select animals possessing the same characteristics in order that we may invariably reproduce the good characteristics with greater certainty, and in an improved form, in the offspring. If the individual animals be well selected, we shall in every generation gain stronger and stronger hereditary powers and permanence of qualities. We shall concentrate the peculiarities of the race or breed. But we must avoid, as far as possible, any opposing influences in the parents, as tending to weaken the hereditary tendency in the young. We are to avoid anything like crossing, with the strictest care.

With respect to the practice of breeding in-and-in, as it is termed, which comes naturally in this connection, many conflicting opinions have been expressed; and the general conclusion arrived at is, that it is safe only within certain narrow limits, and then only under the hands of the skillful breeder.

Breeding in-and-in is commonly understood as an indefinite term applying to any near relationship; but its legitimate and proper application is to designate animals of the same blood, as own brother and sister. But a son is only half the blood of his mother, and a daughter is only half the blood of her father. You may breed such relationship together to a certain extent without injury; that is, you may put a bull to his mother or to his daughter, and greatly concentrate the hereditary power in the offspring. But even this course is to be followed with care and judgment, and not pursued too far. After reaping the first advantages to be derived from it, the breeder will do well to stop and consider. Breeding in-and-in, *i. e.*, own brothers and sisters, will give a more perfect form; but, if carried beyond one generation, it will be at a certain sacrifice of size, and perhaps of the strength of constitution. It greatly weakens the reproductive powers, and often leads to other and still more serious evils. Bear in mind that we refer to own brothers and sisters. More distant relationship can be put together with less risk, of course, and, if carefully watched to discover the least injury to the vigor of constitution, this course may be adopted to some extent where the design is to bring up a pure herd having certain highly important qualities which it is desirable to concentrate and perpetuate. At the same time it should be borne in mind that pure-bred animals have now become so common and so numerous that it will not be difficult to change the strain of blood sufficiently often to avoid any necessity of breeding from too near relationships. The necessity of breeding from close affinities will rarely exist, except for the purpose of trying to build up a new breed, where, in some instances, it may be unavoidable.

Cross-breeding is the coupling of two animals of different and distinct breeds. Where it is practiced for the sake of getting size and early maturity for the butcher, it is often expedient; but where it is the object to produce animals to breed from, it is never judicious. The use of a pure-bred male upon a mongrel or grade female is not a case of crossing; but the term is often used as between two strains of blood or two families of the same breed. Crossing with the purpose of procuring animals for the butcher offers many important advantages in individual cases; but it is seldom the object upon New England farms. There are few sections in the East where, in the case of cattle, it is thought desirable to breed especially for the butcher. But the use of a pure-bred male upon a low-bred female will almost invariably succeed, and produce good results.

In breeding for the dairy, we bring the heifers in at two years old; for the reason that, at that age, the organs of secretion, like all parts of the body, are in a more pliant condition than they will be at a later period, and they are consequently more readily influenced. The secretion of milk is well calculated to develop them and to enlarge them to their utmost capacity. If the animal is to become a large milker when she arrives at maturity, she must have abundant room to lay away large supplies of milk; and the capacity for holding these supplies must be created while her system is pliant, elastic and easily influenced.

Let the heifer take the bull toward the end of July, in August or early in September, if she will, and you bring the parturition in the following spring, at a time very favorable for the production of milk. In spring the grasses are green, abundant and tender, full of rich milk-producing juices,

which cause the largest development of the milk-forming organs.

If, on the other hand, the first parturition of the young heifer takes place in winter, the distension of the udder on dry forage is slight, and the product in milk corresponds. The milky glands will have but slight development. Soon this habit will become a second nature, so to speak, which no amount of feeding can wholly correct. The external signs of a good milker may be there, but the yield does not come up to the production which they indicate; and this fact will often explain an apparent exception to the established rules. A heifer coming in in May or June, and properly treated, will be worth a great deal more as a dairy cow than one coming in with her first calf at any other season of the year.

A heifer coming in at two years old, if properly fed, carefully milked, forced up, if you please, to her utmost capacity of production, and made to hold out almost till the new milk springs for a second calf, will invariably make a better milker than one coming in at three years old. Of course this supposes that the animal, as a calf, has been well fed, and kept in a thriving condition up to the age of a year or fifteen months, when she will go to the bull. She should have a fair development and good growth; and it is better that she should go to a small rather than a large bull. The draft on her system for the nourishment of the fœtus will be less severe than if she is fecundated by a large, overgrown bull.

To offset these great and manifest advantages, there is the liability to some check in her growth and size, owing to the strain upon her system before it has reached its full development. This may be guarded against and counteracted by liberal and judicious feeding; and with this there will be no appreciable difference in size and thrift between such an animal and one brought in at three years old, when they reach the age of four or five.

As to the age of the bull when put to service, our theory and practice are widely different; for, while most intelligent farmers are ready to admit that one year is too young, that the system is not mature, that the animal is not developed, and ought not to be used, they do, in fact, use yearling bulls far more commonly than older ones. If well fed and thrifty, we should not object to a limited use of a bull at fifteen months, and from eighteen months and onward more freely, in getting dairy stock and stock for beef. For getting working cattle, or animals for labor, the bull should be at least two years or two years and a half old. The bull is better to be worked; and if it were our custom to use all our bulls more or less in the yoke, they would undoubtedly be all the better for it.

As to controlling the sex of progeny, the sex of the most vigorous parent will be generally the sex of the offspring.

With respect to the period during what is called the "heat," at which the cow should be put to the bull, no rule can be laid down upon any rational grounds. Perhaps we have too few facts in regard to the effect or influence of a service early or late in the heat. Some farmers think conception is much more likely to take place if the copulation is deferred till near the end of the term; and this is a fact very generally accepted by physiologists.

There is no fixed time during which the "heat," or desire for the bull, continues in the cow; it varies according to condition, age, and many other circumstances. It may last two, three or four days; but sometimes it ceases in 24 hours. In very rare cases it continues 10 to 15 days, and in some cows not more than four, five or six hours. In some cows the length of its duration diminishes with age to such a degree that it has been known to last only an hour. Conception always causes it to cease, and not infrequently a copulation that is not fruitful will prevent its recurrence; but usually, if the cow does not conceive, the period of heat will return in 20 or 21 days.

Mental impressions received by the female during the period of the œstrum, or heat, affect the offspring, often to a very remarkable degree.

Now, this peculiar, excited state of the cow is the moment indicated by nature for connection with the bull; and it is generally better to follow nature, and put her to the bull as soon after it appears as practicable.

Some cows will come in heat nearly every month, and it is quite difficult to get them with calf. This often occurs among high-bred cows, or cows kept too fat; but with other cows it indicates an internal scrofulous disease, commonly phthisis, or pneumonia. It is better to fat and kill or sell such obstinate cases. To stimulate heat in the cows, as well as in the bull, there is nothing better than more abundant or more nutritive feeding, with some grain, bean, or especially pea meal. Salt stimulates the appetite, and facilitates digestion; and exercise and moderate labor will also ex-excite sexual desire. The better a cow or heifer is fed, the more intense and frequent will be the "heat" till conception takes place. If the "heat" is allowed to pass several times without satisfaction, the fecundity of the animal is injured.

Never countenance the absurd and ridiculous practices in some neighborhoods, of running a cow after copulation, or giving her a cold bath. Never cut off the end of her tail to make her "stick." All these practices are utterly absurd—as absurd as sticking a plug of garget-root into the dewlap to cure garget in the udder.

Breeding Calendar. The following table gives the dates of delivery for the animals named, the date of "covering" being as in the first column. If served Jan. 1, the mare will drop her colt about

Dec. 6; the cow her calf Oct. 12; the ewe her lamb June 3; and the sow her pigs April 30. In the table five days intervene between each date of service given, to save space; therefore, in making your calculations, add the omitted days to those given.

BREEDING CALENDAR FOR HORSES, CATTLE, SHEEP AND HOGS.

DATE OF COVERING.	MARES. 340 Days.	COWS. 285 Days.	EWES. 154 Days.	SOWS. 130 Days.
Jan. 1	Dec. 6	Oct. 12	June 3	April 30
Jan 6	Dec. 11	Oct. 17	June 8	May 5
Jan. 11	Dec. 16	Oct. 22	June 13	May 10
Jan. 16	Dec. 21	Oct. 27	June 18	May 15
Jan. 21	Dec. 26	Nov. 1	June 23	May 20
Jan. 26	Dec. 31	Nov. 6	June 28	May 25
Jan. 31	Jan. 5	Nov. 11	July 3	May 30
Feb. 5	Jan. 10	Nov. 16	July 8	June 4
Feb. 10	Jan. 15	Nov. 21	July 13	June 9
Feb. 15	Jan 20	Nov. 26	July 18	June 14
Feb. 20	Jan. 25	Dec. 1	July 23	June 19
Feb. 25	Jan. 30	Dec. 6	July 28	June 24
March 2	Feb. 4	Dec. 11	Aug. 2	June 29
March 7	Feb. 9	Dec. 16	Aug. 7	July 4
March 12	Feb. 14	Dec. 21	Aug. 12	July 9
March 17	Feb. 19	Dec. 26	Aug. 17	July 14
March 22	Feb. 24	Dec. 31	Aug 22	July 19
March 27	March 1	Jan. 5	Aug. 27	July 24
April 1	March 6	Jan. 10	Sept. 1	July 29
April 6	March 11	Jan 15	Sept. 6	Aug. 3
April 11	March 16	Jan. 20	Sept. 11	Aug. 8
April 16	March 21	Jan. 25	Sept. 16	Aug. 13
April 21	March 26	Jan. 30	Sept. 21	Aug. 18
April 26	March 31	Feb. 4	Sept. 26	Aug. 23
May 1	April 5	Feb. 9	Oct. 1	Aug. 28
May 6	April 10	Feb. 14	Oct. 6	Sept. 2
May 11	April 15	Feb. 19	Oct. 11	Sept. 7
May 16	April 20	Feb. 24	Oct. 16	Sept. 12
May 21	April 25	March 1	Oct. 21	Sept. 17
May 26	April 30	March 6	Oct. 26	Sept. 22
May 31	May 5	March 11	Oct. 31	Sept. 27
June 5	May 10	March 16	Nov. 5	Oct. 2
June 10	May 15	March 21	Nov. 10	Oct. 7
June 15	May 20	March 26	Nov. 15	Oct. 12
June 20	May 25	March 31	Nov. 20	Oct. 17
June 25	May 30	April 5	Nov. 25	Oct. 22
June 30	June 4	April 10	Nov. 30	Oct. 27
July 5	June 9	April 15	Dec. 5	Nov. 1
July 10	June 14	April 20	Dec. 10	Nov. 6
July 15	June 19	April 25	Dec. 15	Nov. 11
July 20	June 24	April 30	Dec. 20	Nov. 16
July 25	June 29	May 5	Dec. 25	Nov. 21
July 30	July 4	May 10	Dec. 30	Nov. 26
Aug. 4	July 9	May 15	Jan. 4	Dec. 1
Aug. 9	July 14	May 20	Jan. 9	Dec. 6
Aug. 14	July 19	May 25	Jan. 14	Dec. 11
Aug. 19	July 24	May 30	Jan. 19	Dec. 16
Aug. 24	July 29	June 4	Jan. 24	Dec. 21
Aug. 29	Aug 3	June 9	Jan. 29	Dec. 26
Sept. 3	Aug. 8	June 14	Feb. 3	Dec. 31
Sept. 8	Aug. 13	June 19	Feb. 8	Jan. 5
Sept. 13	Aug. 18	June 24	Feb. 13	Jan. 10
Sept. 18	Aug. 23	June 29	Feb. 18	Jan. 15
Sept. 23	Aug. 28	July 4	Feb. 23	Jan. 20
Sept. 28	Sept. 2	July 9	Feb. 28	Jan. 25
Oct. 3	Sept. 7	July 14	March 5	Jan. 30
Oct. 8	Sept. 12	July 19	March 10	Feb. 4
Oct. 13	Sept. 17	July 24	March 15	Feb. 9
Oct. 18	Sept. 22	July 29	March 20	Feb. 14
Oct. 23	Sept. 27	Aug. 3	March 25	Feb 19
Oct. 28	Oct. 2	Aug. 8	March 30	Feb. 24
Nov. 2	Oct. 7	Aug. 13	April 4	March 1
Nov. 7	Oct. 12	Aug. 18	April 9	March 6
Nov. 12	Oct. 17	Aug. 23	April 14	March 11
Nov. 17	Oct. 22	Aug. 28	April 19	March 16
Nov. 22	Oct. 27	Sept. 2	April 24	March 21
Nov. 27	Nov. 1	Sept. 7	April 29	March 26
Dec. 2	Nov. 6	Sept. 12	May 4	March 31
Dec. 7	Nov. 11	Sept. 17	May 9	April 5
Dec. 12	Nov. 16	Sept. 22	May 14	April 10
Dec. 17	Nov. 21	Sept. 27	May 19	April 15
Dec. 22	Nov. 26	Oct. 2	May 24	April 20
Dec. 27	Dec. 1	Oct. 7	May 29	April 25
Dec. 31	Dec. 5	Oct. 11	June 2	April 30

Brewing. Cleanliness and care are the principal things to be observed in brewing. It consists of five operations, namely: mashing, boiling, cooling, fermenting and cleaning. The first process is simply to obtain an infusion of the malt. In the second this infusion is further impregnated with the flavor of the hops in boiling, which is necessary for preserving the beer. In the third the decoction is cooled to the requisite temperature for fermentation, and is excited with yeast, filling it with carbonic gas, giving to the liquor that lively and pungent taste for which it is esteemed.

The utensils necessary for brewing on a small scale (say for a hogshead, or fifty-four gallons of beer) will consist of a copper vessel containing seventy gallons; a mash-tub with a false bottom about three inches above the other bottom, bored full of small holes to prevent the malt stopping up the hole of the faucet. For the sake of economy two pieces of wood can be nailed together, bored full of holes and fitted to the side of the tub so as to cover the hole of the faucet. This is to prevent the malt or grain from flowing out with the wort, which would spoil its transparency. The tub should hold ten or twelve bushels of malt, with plenty of room for mashing or stirring. An underback to receive the wort from the mash-tub, an oar or rudder to stir up the malt in the mash-tub, and two or three coolers should be provided. The latter must be broad and flat that the wort may cool quickly; for if the wort is too long cooling it is likely to become sour in the coolers. These should be raised at one end, that the wort may run off at the lower end without being disturbed or shaken; and also that the sediment that falls down may not again be mixed with the wort. Further, there must be a fermenting tub, the mash-tub, when emptied of grain, also serving this purpose, casks, and oak stands for the casks and tubs to be placed on. These articles, the vessel just mentioned, must be of proportionate size with the copper vessel, which contains seventy gallons.

The object of mashing is to convert into sugar as much as possible of the flour of malt, so that the extract drawn from it may contain the greatest amount of saccharine matter it is capable of giving. To do this perfectly, care must be taken as to the heat of the water used in mashing, whether hard or soft, or of good quality, the perfect mixing of malt with water, and the time of their remaining together.

High-dried malt does not produce as much saccharine matter as pale malt. The goodness, flavor and clearness of the extract depend on the temperature of the liquor used. When near the boiling point the flour of the malt will be set, forming a kind of paste or starch, and the extract obtained will be little better than water. If the temperature be too low the wort will be poor and devoid of strength. For pale malt the heat of the water

must be higher than for the brown. Thus for the pale malt the heat of the water for the first mash should be 178° Fahr.; for the second, 182°. Pale and amber mixed, or pale malt approaching amber, 172° for the first mash; second, 178°. All amber, first, 170°; second, 176°. For very brown, or brown malt, such as is used for porter, 154° for the first; second, 164°. When hard water is used the heat in each case should be about 2° less. An equal portion of pale amber and brown, or half pale and half brown, first, 160°; second, 166°. The time for the standing of the mash is from an hour and a half to two hours. Heat the water in the copper to the required degree by Fahrenheit's thermometer. In reducing the heat in the copper add cold liquor, but be careful to stir the hot and cold well together, and mix. Stir in the malt gradually, and mix thoroughly by means of the oar, and leave no lumps or clots. The remainder of the liquor may be added by degrees, as the mash becomes too stiff to stir, until the whole is used. Reserve about one-half bushel of the malt to throw over the top when the mashing is finished. Cover the tub with malt sacks or cloths to keep in the heat, and let it stand the required time. Turn the tap partially, to allow the wort to run off slowly, and draw off some in a pail or bucket. The first running will not be clear, and the liquor should be turned carefully back into the tub. Repeated trials should be made until it runs clear, then draw off into the underback. As the wort runs out more slowly the tap should be opened wider, until the whole has run out, and the bed of the grain looks dry; then turn the tap to prevent any more running off. While the mash is standing, heat water for the second mash; this should be ready by the time the first wort is drawn off; then with a bowl or ladle pour over the grains, gently, about half as much water as for the first; cover the tub; let it remain ten minutes, and draw off as before. The wort from the first is always the best. The proportion of wort to be obtained from each bushel of malt depends entirely on the proposed strength of the liquor required. To ale or beer of a superior kind the produce of the first mashing only should be used. For ordinary drinking ale, take the produce of the first and second mashings; mix them well, and ascertain the gravity by a saccharometer, if you have one.

As soon as the water is taken from the boiler for table beer, damp the fire and put in the wort. For every bushel of malt used, allow one pound of hops previously soaked in water taken from the first mash at 160° of heat. Add half the hops at first, and the other half after the wort has boiled half an hour. Two pounds of hops by this method are considered equal to three pounds used in the ordinary way. The water in which they are steeped is strained off and put into the tub, instead of the copper, which preserves the flavor of the hops. Boil the wort as quickly as possible. Try it occasionally in a glass to see if it has separated into large flakes; if it has not, boil a little longer; when nearly ready it will appear broken into fine particles. The extremes of under and over boiling must be avoided.

In drawing off into the coolers the hops should be well stirred to prevent their being burned on the bottom. Strain through a hair sieve to extract the hops. The coolers should be as shallow as possible, that the wort may not be too long in cooling. When the first wort is drawn off, return the hops again into the boiler, with the wort for the table beer, and let it boil quickly for one hour and a half. When the wort has been cooled down to 75° or 80°, draw it off into the fermenting tub without disturbing the sediment at the bottom, for that gives the ale or beer a disagreeable taste.

To ferment, it will require about three pints of good white, fresh yeast to work a hogshead of beer. Mix the yeast with a gallon or two of the wort, and a handful or two of bean or wheat flour, in the fermenting tub. As soon as the wort is at the proper degree of temperature run it into the tub, reserving out some of the ferment to feed the beer as occasion may require. When it becomes languid, or there is sufficient yeast in it, it can be left out altogether. The fermentation should be gradual at first, for if it goes on too quickly the beer is liable to become "foxed," that is, have a rank and disagreeable taste. The next morning the beer should have a thin, white, creamy head; then with a bowl or ladle rouse it and mix it well together. If the fermentation has not been favorable, add some of the ferment; and if rather cold, wrap some sacks or old carpet round the tub and place a covering on the top; also keep the doors and windows closed, and let the fermentation go on till it is sufficient.

To cleanse beer or ale the yeast should be skimmed from the top, and the liquor drawn off gently, so as not to disturb the bottom. The casks should be plugged a little on one side, that the yeast may work and discharge itself at the bung-hole. A tub or pan must be placed underneath to receive the yeast as it works over. The greatest attention should be paid to filling up the casks with the wort that is left, which should be done every half-hour at first, and as the working becomes slow, every three or four hours, that the yeast may continue to discharge itself. When the yeast has ceased to discharge itself, plug the casks upright, mix a round of the best hops with the best old ale or beer, and scald them over the fire. Mix it well into the cask by means of a long stick and bung the cask close; make a spile hole near the bung, and put in a spile, rather loosely at first, and after two or three days knock it in firmly.

Brewis, bread soaked in gravy, or prepared in water and butter. See Bread.

Brick. The best brick and fire clay is free from stones and gravel, and when cut with a knife it presents a uniform, greasy-looking surface, free from the appearance of coarse sand. When it is bruised in a mortar and mixed with water, and the water, after remaining in the mortar five minutes, is poured off with the finely divided matters suspended in it, and the washing is repeated so long as the water, after five minutes of rest, carries away any suspended matter, there should remain in the mortar not more than 5 or 10 per cent. of sand. The greater the proportion of alumina in the clay the more plastic it is, and the "fatter" it is; it is more tenacious than "poor" clay. The coloring matter of the common clays is due to oxyd of iron, a little oxyd rendering it yellow, and more of the oxy making it red, or reddish. The alumina or silica of the clay are infusible; the fluxes are, oxyd of iron, lime, magnesia, potash, and soda. The more flux and sand there is in the clay, the more will it fuse and vitrify. that is, glaze, or become glass; therefore, too much of both these classes of elements should not be in the clay at the same time. When there is lime present, forming nodules, the clay should be screened, and this should be done before it is "puddled." When rich clays dry slowly and crack in the kiln, they may advantageously be mixed with a portion of fine silicious sand. The tenacity of clays containing coarse gravel or stones may be increased by screening or washing, so as to separate the clay from sand and stones. When clays run in the kiln, the defect may be corrected by adding to them some silicious sand. When rich clays are found costly to burn, the expense of fuel may be lessened by a proper addition of chalk or lime.

A good brick machine can now-a-days be obtained for $40, and most farmers can find time in August and September to make a lot of brick, which will be sure to net them some money. A machine will last several years. (See Tile and Brick Machine.) Experiment a little with the clay to see that all is right, and if not, make it so by the addition of sand, clay, or lime, as indicated above. As the brick are taken from the machine, pile them up in a smooth yard as openly as possible, and under a shed to dry. They should also be screened from the wind, as too great exposure to it will crack and warp the brick. The burning and cooling must be done with a great deal of care, commencing with a moderate fire for a day or two, to expel the remaining moisture; when there appears no longer any whiteness in the smoke, the moisture is all out, and the fire may be increased until the arches attain a white heat. Then allow the fire to abate in some degree, to prevent vitrification; it is alternately raised and lowered until the brick are sufficiently burned, which will be in six or seven days. The exact point of burning can be ascertained at the top of the kiln. The cooling should be slowly effected, by closing the arches and sides and the top of the kiln with moist clay, and letting it remain until cool. The manner of piling up the brick in a kiln can be best learned by visiting some good brick yard. A kiln 13 feet long, 10 feet 6 inches wide, and 12 feet high, the walls being perpendicular on the inside and piled full, deducting the arch openings, will contain about 25,000 brick.

Good brick exhibits a fine, compact, uniform texture when broken across, gives a clear, ringing sound when struck, and is of a cherry-red or brownish color. Three varieties are found in the kiln: arch brick, which are more or less vitrified, being glassy at one end. They are very hard, but brittle and of inferior strength, and set badly with mortar. They are good for walling wells. Those from the interior of the kiln, usually called "red" or "hard" brick, are of the best quality. Those from near the top and sides, which are generally under-burnt, are called "salmon" brick; they are too soft for outside work, but are good, when pounded up, to make filters.

Brick-work is generally measured by the thousand, sometimes by the cubic yard or foot, including labor, mortar and scaffolding. In measuring walls faced with stock or pressed brick, take the area of such facing as for common work, and add eight inches in breadth and four inches in height on each opening, and four inches at each corner for the workmanship only, and deduct the openings. In many sections, however, it is customary to measure one-half of all openings five feet or less in width. A superficial foot of facing fronts will take seven and a half bricks to the square foot. In measuring for the length of partition walls, take the dimensions clear of the outside walls, no deductions to be made for plates and bond timbers, sills, lintels, etc., but two inches in height to be allowed for bedding plates where no brick work is over them. In plain wall just 17 times as many brick will be required to the foot as there are inches in the thickness of the wall. Chimneys are measured solid, to allow for the trouble of forming and plastering the flues. In chimney breasts, take the width of the face on each floor, and multiply by the height and by the thickness projecting into the room, the fire-places not deducted. In chimney tops, take the width and multiply it by the height above the roof, and by the thickness or number of bricks thick. When projections on the top exceed two courses of brick, two courses are to be added to the height. All chimney stacks, whether of square, circular or octagon shafts, are measured solid.

Five courses of brick will lay one foot in height on a chimney; six bricks in a course will lay a flue four inches wide and 12 inches long, or a flue eight inches square; and eight bricks in a course, a flue eight inches wide and 16 inches long.

A cubic foot of brick-work weighs from 100 to 125 pounds. A 9-inch wall requires 15 bricks, and a 13-inch wall 22½ bricks. One bushel of hydraulic cement will, where mixed with two bushels of cheap sand, serve to lay 150 bricks. Mortar, when made up, should not be disturbed for several days, and during the period of its consumption should be broken down and "tempered" in no larger quantities than may be required for use from day to day.

Brick Earth, any stiff clay containing 50 to 70 per cent. of real clay and the rest sand.

Brick Ovens, How to Make. A good brick oven separate from the dwelling is worth more than all the stoves and ranges that one could store in his kitchen. In such an oven everything will be baked just right, and free from danger. In its construction, lay the foundation as a simple pavement, until of proper height, and on this lay two courses of hard brick for the bottom of the oven; then build the mouth and part of the sides, until it is high enough to draw the sides inward; then sand or mellow earth may be placed on the foundation, and the surface smoothed off and pressed down to the desired form of the oven; then let the brick-work be built over this form of sand; let two courses of hard brick be laid over the form with the best mortar; and after the last brick is laid, the sand may be removed. The brick should be soaked for several hours previous to being laid, so that it will not absorb the moisture until it has set. A smoke-stack a few feet high at one end of the furnace will finish the structure. In using such an oven, heat it all through for several hours before placing in it the article to be baked, and then withdraw the fire, as the baking is commenced.

Brick, Red Wash For. To remove the green that gathers on bricks, pour over it boiling water in which any vegetables, not greasy, have been boiled: do this for a few days, and the moss will disappear. For the red wash, melt 1 ounce of glue in a gallon of water; while hot, put in a piece of alum the size of an egg, ½ pound of Venetian red and 1 pound of Spanish brown. Try a little on the brick, let it dry, and if too light, add more red and brown, and if too dark add more water.

Bridges. As road and bridge overseers are often incompetent or derelict, we take the opportunity here to offer a few suggestions, which may do some good. Such officers are responsible to the township or county, and the township or county is responsible to any party injured by the carelessness of the officers.

As wooden bridges are fast being replaced by iron structures, it becomes a matter of some importance, financially as well as for safety, that only first-class bridges are built. Too often, on country roads and in smaller towns, this is not the case, and taxpayers will find to their sorrow before many years have elapsed that they have been most shamefully swindled. A bridge should be capable of sustaining a load of about 65 lbs. per square foot of floor surface, over the whole or any part of the same, or should pass a log cart carrying 15,000 lbs. on two wheels, in addition to the weight of the bridge, without straining any piece to exceed 10,000 lbs. per square inch, or one-fifth of its ultimate strength, and when fully loaded the bridge should not deflect more than 1-1200 of its length, and when the load is removed should return to its original camber.

No bridge should be planned except by a competent engineer, and the execution of the plan should be under his immediate supervision, or, at least, under the supervision of a responsible mechanic. For large structures, there are competent bridge manufacturers, builders and contractors, who exclusively follow their respective lines of business; but responsible parties will scarcely ever put in a bid at a bridge-letting where they see that the commissioner is likely to let the contract to the lowest bidder irrespective of quality of work. Small wooden bridges are easily planned, but large iron ones should have no guess work in their designs.

In bridging a stream, care should be exercised not to narrow the channel, but rather widen it a little, that the water of freshets do not become dammed up and carry away the bridge. Also the abutments should be laid deeper than they generally are. Stone abutments, especially, require a solid foundation. In laying plank upon a bridge, a common error is to use wide oak plank, which, when exposed to the weather, will invariably warp, draw out their spikes, get loose, and so become an intolerable source of danger and vexation. Oak plank is probably the best flooring for bridges, but it should be in narrow strips and firmly spiked or bolted down.

Another very common failure is in the narrow, unwalled or unprotected approaches to the bridge. The embankments soon wash down and become as great a nuisance as the slovenly made bridge itself. It is next to impossible to make a narrow embankment safe, especially if it has steep sides. The embankment should be wide, and its sides sloping enough for the formation of a good turf by grass, willow, etc., upon its sides. Nor should approaches be so steep as they often are, as they make teaming up their declivity unnecessarily hard, and down it extremely hazardous.

Bridle. An apparatus of straps of leather and pieces of metal for keeping a horse in subjection and controlling his motion. The several parts of a bridle, as they are generally made, are the bit; the headstall, or leather piece from the top of the head to the rings of the bit; the fillet, over the forehead and under the foretop; the throat-latch, buckling from the head-band under the throat; the nose-bands, going through the loops at the back of the headstall, and buckled under the cheeks; and the reins, attached to the rings of the bit. To some bridles are attached blinds or blinkers. These are leather plates permanently fixed to the sides of the bridle, and so adjusted as to prevent the horse from seeing objects on either side without obstructing his vision in front.

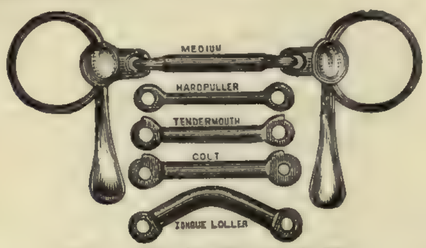


FIG. 1.—*The Doughty Magic Bits.*

BITS. The essential part of the bridle is the bit, which is of different shapes and with various attachments, according to the purposes intended. The "gag-bit" has a semi-circular curve in the middle, for the purpose of giving better control over a "hard-mouthed" or unmanageable animal. Fig. 1 represents a new style of bits (five examples, all on the same principle), which is represented to work wonders in giving a rider or driver control of vicious horses. The "World's Wonder Bridle-Bit," represented by Fig. 2, is constructed on humane principles. It is claimed for it that it stops side-pullers, cures vicious pullers, toughens tender mouths, prevents lolling of the tongue, and does not press the lips against the teeth.

FIG. 2.—*World's Wonder Bridle-Bit.*

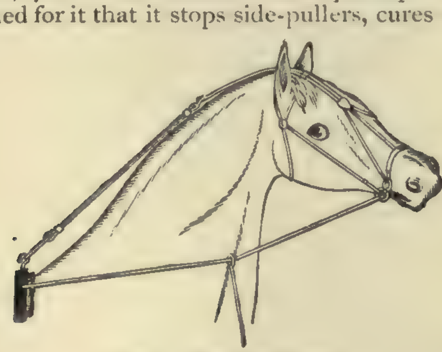


FIG. 3.—*Upper-Jaw Check..*

CHECK REIN. Fig. 3 represents Sherman's upper-jaw check rein, a late invention for the natural, graceful and easy carriage of the horse's head, and comfort and pleasure of the driver. It holds the check bit to the upper-jaw so that it does not come in contact with the driving bit, does not in the least cramp the muscles of the neck or the windpipe, and is somewhat ornamental as a part of the outfit.

FIG. 4.—*Emmert's Check Ease.*

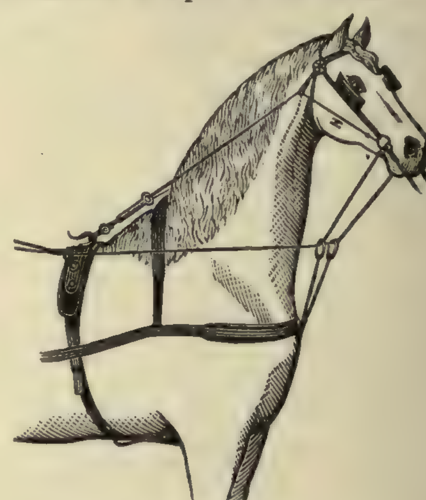


FIG. 5.—*Side Check.*

CHECK EASE. Figs. 4, 5 and 6 illustrate the form and use of Emmert's spiral-spring, cylinder-tube check ease. It can be attached to any style of check rein, over check, side check, double or single. It is ornamental, durable and humane. The spiral spring yields to the motion of the horse's head, thereby preventing sore mouth, sore

FIG. 6.—*Over-draw Check.*

tails and sore backs, enabling him to move freely, and consequently trot faster. They save, in case of stumbling, breaking the check rein, check hook or back strap.

They are a neat tube within a tube, containing a steel spiral spring, two eyes (i, i), one for the check to pass through, the other for the leather (k) that attaches to the check hook. This device is three and one-half inches long; will expand and contract two inches; is durable and ornamental. They are good for breaking colts, as they give with the motion of the head, preventing the neck becoming tired and bearing down or lugging on the bit, invariably giving a sore mouth and bad habits that will last through life. It also prevents sore backs by expanding with the motion of the horse's head, thereby preventing the rocking motion of the back-saddle which we get from an ordinary check, and which causes sore backs in hot weather. It also prevents sore tails, by expanding and taking the strain off the back-strap. Horses can trot faster and steadier than it is possible for them to do without it.

After all, viewed from the standpoint of humanity, the check rein is a relic of barbarism. It holds the horse's head in a stiff, constrained position, spoiling all chance for fine driving. A simple bridle rein which does not pass through the loops of the throat lash is better, though with a horse of any natural spirit neither is necessary.

The riding bridle should be of white or russet leather, of good quality, and it will be more satisfactory if its buckles are of polished steel or nickel and detachable (that they may be easily cleaned), rather than covered with leather and sewed fast to the bridle. Covered buckles are usually so weak as to easily get out of order. The bridle should be, for elegance, as plain as possible, and it may have either single or double head-straps according to the sort of bit which has to be used.

Bridle, OF A PLOW-BEAM, is the iron on the fore end which holds the clevis.

Bright's Disease: see Kidneys.

Brining Grain, the practice of steeping it in pickle (the strongest brine), in order to prevent smut and other diseases.

Britannia Metal, an alloy of equal parts of tin, plate brass, bismuth and antimony. So far, therefore, as it oxidizes it yields a substance that is poisonous. To clean Britannia ware, first wash it with a woolen cloth and sweet oil, then in suds, and lastly with soft leather and whiting. Or, first wash with hot suds, then rub with a mixture of rotten stone (powdered very fine and sifted), soft soap and turpentine, of the consistency of stiff putty; finally, rub off briskly with a dry, clean rag or leather.

Broadcast Sowing, the scattering of seed upon the surface of the ground. This is generally done by hand, but several little machines have been invented to do the work more perfectly, one of which is represented by the annexed engraving. It is the "Michigan Wheelbarrow Seeder," made by M. Gibbs, Homer, Mich.

Wheelbarrow Seeder.

This seeder, it is claimed, relieves the farmer of much of the trouble attending the seeding of land with clover or grass seed. But few men can sow clover or timothy seed by hand, even on a still day; but a common laborer can do the work with this machine. It will sow as well on a windy day as on a still day, and any amount per acre from two to twelve quarts. It will sow clover or timothy seed, mixed or separate. The seeder has an index, by which the machine can be set for any amount per acre desired. It consists of a light hopper, 14 feet long, mounted on a wheel-barrow, made as light as possible, consistent with strength and durability.

Broadcast sowing will be practiced "as long as the world stands." The seed thus sown is either brushed or harrowed in, or left to take care of itself, according to circumstances. Grass seed sown just before a rain does not require harrowing in; the larger seed do require it. To sow evenly by hand requires some practice and skill, and windy days interfere with even the most skilled work. It is an old adage that "whatever should be done at all should be done well;" but it always depends upon circumstances how much pains should be taken with a given task.

Brocade (bro-cade′), silk stuff, variegated with gold and silver, or raised and enriched with flowers, foliage and other ornaments. Also applied to other stuffs wrought and enriched in like manner.

Broccoli (brock′o-ly), almost exactly like the cauliflower, only it is more generally planted late, for winter use. Cultivation the same. The best varieties are Walcheren White, Large White Early French, Knight's Protecting, which is dwarf, very hardy, with very large heads, Purple Cape, Early Purple, Elletson's Mammoth, Carter's Summer and Southampton.

Brogan (bro′gan or bro-gan′), a stout, coarse shoe.

Broken-backed HORSE, one having his spinal ligaments hardened into bone.

Broken Wind, a disease of horses, affecting the lungs and air passages. It is often accompanied with enlargement of the lungs and heart, which disables the animal from bearing fatigue.

Brome Grass, cheat or chess, and one or two other kindred species.

Bronchitis (brong-ki'tis), a disease affecting the respiratory organs, generally accompanied with a cough, and is very difficult to cure. Avoid exposure to cold or damp air, and refrain from reading aloud, public speaking, singing, or blowing instruments; keep clear of stimulants, and use a diet of milk and vegetables; take some soothing sirup to allay the irritation; wear no cravat or other bandage about the neck—a light ribbon is sufficient; let the neck have plenty of fresh air, and apply cold water to it every morning when you wash.

Bronzed articles should be oiled and wiped with a cloth every day or two, to keep them bright.

Broom, besides being the name of several plants, is the name also of a well-known household necessity. Good brooms are furnished by the regular manufacturers so cheaply at the present day that no farmer cares to make them. If brooms are wetted in boiling suds once a week, they will become very tough, will not cut a carpet, will last much longer, and always sweep like a "new broom."

Broom-Corn. The raising of broom-corn is a prominent industry in the West, the soil being particularly adapted to it. It is doubtful whether it will ever be superseded as a material for brooms. In its early growth and general appearance it resembles Indian corn. It stands upright to a height of eight feet or more, with a stalk of nearly uniform size its entire length, from which an occasional leaf appears; and at the top a long, compact bunch of slender, graceful stems is thrown out, familiarly termed "the brush," which bears the seed. There is a dwarf variety latterly introduced.

Any soil that will grow Indian corn will produce broom-corn. It should be rich, warm land, and not subject to unseasonable frosts. Spring frosts injure broom-corn more than maize, as the roots do not strike so deep; nor has it the power to recover from the effects of frost equal to the latter. Clay lands are not suitable for this crop. It, like corn, can be grown on the same soil for years in succession, but rotation is better. Excellent crops are usually raised on a green-sward, turned over as late as possible in the fall, so as to kill the worms. Barn-yard, hog-pen and sheep manure, well rotted, are good for broom-corn. If the land is in good condition, three cords, or eight loads, is sufficient. The manure is usually placed in the hills or in drills. Land plaster, lime and ashes, separately, or mixed, are often used. Any fertilizer that promotes the growth of corn is good for broom-corn. Poudrette, at the rate of a gill in each hill, if the African, or two-thirds the quantity if the Peruvian is used, mixed into a compost with ten times its quantity of good soil, is an excellent application, especially if the land is not in good heart. To repeat either of the latter around the hill after each hoeing or cultivating will hasten the maturity of the crop.

Broom-corn is planted in both hills and drills. If in hills it should be three feet between the hills and four feet between the rows; if in drills, three feet and a half, north and south, that the sun may shine alike on all the plants. If the seed is good 12 or 15 seeds should be placed in a hill. Sown in drills, the seeds should be dropped two inches apart, or three to ten are dropped at intervals of 15 to 18 inches. Fine, thick, tough brush is the result of thick planting, but if the plants are too close the stalks will be unprofitably slender. The seed should be covered from three-fourths to one and one-half inches deep. Plant as early as possible and at the same time escape the spring frosts.

As soon as the plants are visible run a cultivator between the rows, and if the soil is full of weeds, follow with a hoe. If the crop is kept clean until it gets a good start, in the West, where there are no obstructions, and the farmer has a modern cultivator, the weeds can easily be kept down without resort to the hoe. Where the plants are in hills they should be check-rowed so as to admit the cultivator both ways. At the first cultivating or hoeing, thin out the plants to two or three inches apart in the drills, or five or six plants to the hill.

Lopping the brush or breaking the tops becomes necessary when standard varieties are grown, and when the season is liable to be too short for the corn to mature. This consists in going through the field and bending each top at a point 12 to 18 inches below the brush, allowing the latter to hang down against the stalk. Lopping hastens the ripening, and protects the brush from injury by rain. It also secures straight brush, which is an important item.

Tabling consists in breaking down the stalks of two rows, so they will cross each other diagonally. The bend is usually made about two and a half feet from the ground. Cutting may be done without tabling if the brush can be reached. The time to cut is when the blossoms begin to fall. Cut off not more than eight inches from the brush, using a knife. Place in convenient bundles, and then take to the barn or shed for curing. The stalks remaining on the ground may be cut close, or pulled up and buried in the furrows for manure, or burned, and thus be restored to the earth to enrich it; or they may be carried to the barnyard to mix in a compost, or with the droppings of the cattle.

Broom-corn should be cured under cover, for exposure makes it brittle. A roof and free circulation of air is all that is necessary. The brush is cleaned by hand, by passing it through a kind of hatchel, made by setting upright knives near enough together, or it may be cleaned by a long-toothed curry-comb. In the first method none of the little branches are broken, and the brush makes a finer and better broom. Horse-power machines are frequently used for cleaning seed, which they do with great rapidity. The average yield is about 500 pounds of brush to the acre. It varies according to the season and soil, from 300 to 1,000 pounds. The price also varies materially, depending on the extent of the crop and the demand. When well matured the seed will average three to five pounds to every pound of the brush.

Assorting the brush is merely keeping the crooked and otherwise defective heads from the straight and perfect. This may be done in the field, at the time of hatcheling, or after curing. But it must be done, and the two qualities must be kept separate.

Prices obtained for broom-corn depend much on the appearance of the bale. The usual size of the bale is: Length, 3 feet 10 inches; width, 2 feet, and height, 2½ feet. They weigh from 150 to 450 pounds, according to weight applied in pressing. The hay, cotton, or hop press can be used, or the farmer can devise one himself. No. 9 fence wire is generally used for binding. Each bale should be made true and even at the ends. Bale the crooked brush by itself, and sell it for second quality.

The uses of broom-corn are limited to the manufacture of brooms from the brush, and the consumption of the seed when grown and mixed with other grain, in feeding to fattening or working cattle, sheep and swine, and occasionally to horses. Brooms manufactured from it have superseded every other kind for general use in the United States, and within a few years they have become an article of extensive export to England and other countries. The brush, and wood for the handles, are imported by foreign dealers, to avoid the payment of duties, and then put together. The cultivation of broom-corn was once almost exclusively confined to the Eastern States, but it is now largely raised in the corn-growing regions of the Northwest.

When it is desired to grow broom-corn on a large scale, some capital must be invested, and special preparation for curing, etc., must be made. A revolving scraper must be provided, with horse, water, and steam-power to run it. This machine is sometimes made with two cylinders revolving in opposite directions. A box made in the form of a saw-buck, with the sides and one end boarded up, should stand where the operator can deposit the brush as it is cleaned. From this box it is bound and taken to the dry house. The dry house is usually built for the purpose, though a tobacco house may serve. For 50 acres a building 20 by 40 feet, 16 feet high, with a shed at one side 10 feet wide and 8 feet high, will be required. Put on a shingle roof, and cover the sides with boards, battened. Hang every fifth board on hinges, with a button fastener, that they may be opened to admit the air, and be securely closed during storms.

Drying-racks must be provided by taking two poles or light scantlings, 12 feet long; to these nail narrow strips or laths six inches apart. Fasten at top and bottom the length of a lath apart, if laths are to be used. Lay other laths across the strips, and place upon them the brush, not more than two or three inches thick. Here it remains until thoroughly dry. Give it all the air possible, and the least amount of dampness. Make as many racks as your building will accommodate.

It is said that broom-corn seed makes very fair breadstuff, especially palatable to some people.

Brougham (broo′am or broom), a kind of carriage, two or four-wheeled, to carry two or four persons.

Brown, a dusty, dark brick color, like that of dead foliage. In all species of domestic animals, some individuals are found of this color, and a large portion have the legs, feet, tail, neck, head, or back of some shade of brown. It is not a beautiful color to have prevailing on all parts of any individual, and should be therefore avoided by the management of breeding. The most beautiful brown horses are those which are also finely dappled.

To "brown" an article of food for the table is to bake it until it is slightly scorched, or brown, over the surface, as potatoes, parsnips, etc.

Brown Stout, strong, brown beer, brewed from high-dried malt.

Browse, to eat or nibble off, as the ends of branches of trees, shrubs, etc., by cattle or deer; to feed upon twigs, scattering grass, etc.; also, the food thus eaten.

Bruise. It is amusing to see how many salves and poultices, ointments and liniments, compounds and compositions, decoctions and infusions, embrocations and macerations are recommended for bruises, when the common bread-and-milk poultice is always as good as any or all of them.

Brushes. At the present day brushes are manufactured for every specific purpose, and are made of bristles, hair, feathers, broom-corn, grass, wire, wood, etc. Broom brushes for clothing are called "whisks," though this latter term literally includes

a variety of brushes. Hair brushes should be cleaned with an ammonia solution, and not soap, and dried in the sun. Do not expose the mahoganized or other delicately finished wooden back of the brush to the solution. Feather brushes for greasing pans and brushing eggs over tarts and pastry are made by boiling the wing feathers of a turkey or chicken for five or ten minutes, rinsing them in tepid water, drying, and tying up in bunches.

Brush-wheel, one which is turned by the surface of another wheel, without cogs or bands.

Brussels Sprouts, a garden vegetable of the cabbage family, having small heads crowded along a tall stem. It grows from two to four feet high, and is cultivated like cabbage. Where winter is not very severe, the plants can be left out, and sprouts gathered as wanted for the table; otherwise, store as cabbage. The cooking, of course, is also the same as for that vegetable. The best varieties are Dwarf Improved, Dalmeny Sprouts, a hybrid between Drum-head Savoy and Brussels Sprouts, and Scrymger's Giant Dwarf, a new variety with a close and compact head.

Buck, to rear and plunge, in order to throw off the rider: said of horses.

Buck-bean, a bitter, three-leaved herb, growing in swamps. The leaves are sometimes used as hops, and medicinally they are a tonic. Abundant as far west as Lake Michigan.

Buck-thorn, a thorny shrub, sometimes grown as a hedge. The berries are cathartic and griping.

Buckwheat. This is the only cultivated "grain" which does not belong to the grass family of plants. It belongs to the order of knot-weeds and "goosegrass." It is one of the honey plants, growing freely on light soils, but yielding a remunerative crop only on those which are fertile. Sandy loams are its favorite soils, especially such as have been long in pasture; and these should be well plowed and harrowed. Fresh manure is injurious to buckwheat. It may be sown from May 1 to August 10, but always early enough to ripen before frost. It is sown broadcast, at the rate of two to four pecks to the acre, and harvested when the earliest seed is fully ripe. It often continues to flower after this, but when, as is sometimes the case, the early seed is blighted, the crop may be permitted to remain until the later yield of grain is ripe. As it is liable to heat, it should, after cutting, be put into little stooks about two feet high over the field, and as soon as dry, taken in and threshed out. The straw will be eaten with avidity by sheep and young horses. A serious objection to the raising of buckwheat is its tendency to take possession of the soil as a weed.

Buckwheat Cakes. One quart buckwheat flour, four tablespoonfuls yeast, one teaspoonful salt, one handful Indian meal, two tablespoonfuls molasses (not sirup), warm water enough to make a thin batter; beat very well and set to rise in a warm place; if the batter is in the least sour in the morning, stir in a very little soda dissolved in hot water; mix in an earthen crock, and leave some in the bottom each morning—a cupful or so—to serve as sponge for the next night, instead of getting fresh yeast; in cold weather this plan can be successfully pursued for a week or ten days without setting a new supply; add the usual quantity of flour, etc., every night, and beat up well; do not make the cakes too small; they should be of generous size. Some put two-thirds buckwheat and one-third oatmeal, omitting the corn meal.

Buckwheat Short-Cake. Take three or four cups of nice sour milk, one teaspoon of soda or saleratus dissolved in the milk; if the milk is very sour, you must use saleratus in proportion, with a little salt; mix up a dough with buckwheat flour, *thicker* than you would mix the same for griddle-cakes, say quite stiff; put into a buttered tin, and put directly into the stove oven and bake about thirty minutes, or as you would a short-cake from common flour. It takes the place of the griddle-cake, also of the short-cake, in every sense of the word; nice with meat, butter, honey, molasses, etc. No shortening is used, and no need of setting your dish of batter over night. Wet the top a little, and warm it up at next meal, if any is left; it is just as good as when first made, while griddle-cakes have to be thrown away. It is also very good cold.

Self-raising buckwheat flour is now furnished through the groceries, and the cakes from it are very palatable and rich; but, like all things compounded for the market, we should suspect dirt and adulteration, and do all our own compounding at home.

Buckwheat diet is suspected of producing an itch, sometimes called the "scratches;" but it is not yet determined how much of the disease may be due to the extraordinary amount of burnt grease and alkaline substances eaten in the buckwheat-cake season. About the only treatment for this trouble is to abstain from the use of buckwheat altogether.

Budding. This process of propagating a variety of fruit consists in the insertion of the bud of the variety to be propagated into a stock. There are various modes of performing the work, and however well they may be described in a book, it is advised that every beginner visit a good nurseryman or amateur fruit-grower in his neighborhood, and witness the operation. Both the stock and graft or bud should be in a healthy, vigorous state. The time for budding the several fruits is indicated under the headings of those fruits respectively.

Budding is real grafting, and differs from what is ordinarily called grafting only in that the bud is used instead of the twig. Cuttings of buds for budding may be made at any time when the tree has formed its terminal buds of growth for the year and the buds are ripe.


Fig. 1.

American shield budding requires that a piece of wood be left at the base of the bud, which is neatly cut into a kind of thin shaving so as to form a foot, as it were, to be inserted under the bark of the stock (Figs. 1 and 3). The bark on the north side of the stock is just cut through by the incision (Fig. 3); the first is horizontal from one-sixteenth to one-eight of an inch long, and the other perpendicularly down from that a half an inch or more, according to the size of the bud; the bud is then cut from its cion as before directed, and slipped in place and bound there with strips of bass bark. This work is generally performed with a budding knife, one end of the handle being of ivory or bone, and so smoothly shaped that in using it to elevate the bark no injury will be done. The bass bark may be taken from Russia matting, or from the bass-wood trees in the spring, and tempered into strips by keeping it in water for a time. In tying in the bud, commence at the lower end of the incision and wrap the strip of bark around and around upward until the bud is reached, where it is then tied (Fig. 4). The pressure should be just sufficient to keep the inserted portion closely to the stock but not such as to crush or bruise the bark. Woolen yarn, however, or soft strips of old cotton cloth can be used in place of the bark, but they are not quite so good. In about ten days or two weeks after insertion has been made, the strips or bandages will require to be loosened, and at the expiration of three weeks removed altogether.

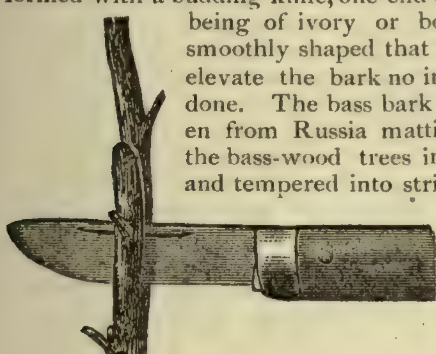


Fig. 2.


Fig. 3.

The ensuing spring, as soon as the buds begin to swell strongly, cut off the stock about six inches above the bud, and as the shoot of the bud grows, tie it with any soft material to the piece of the stock above its insertion until about midsummer, or when it has made two feet of growth, when the stock should be cut away above the bud. Never insert the buds in water. Cut away the leaf, to prevent too great evaporation, whereby its vitality would be exhausted or injured. Buds, having the leaf removed, may be kept fresh and full of vitality for a number of days, if placed in a cool room wrapped in damp moss or cloths. In sending them by mail or otherwise shipping them, they should have damp moss wrapped around them and be enveloped in oiled silk or linen.


Fig. 4.

Annular or ring budding is another style adapted to hard-wood trees, but it is questionable whether it is as good as side grafting (see Grafting). In performing this a ring of bark is taken from a limb or stock, and one of corresponding size, containing the bud, is put in its place. Trees that have been girdled by mice or rabbits during the winter may be restored by the process of putting in live bark from a tree of its kind.

In all the processes of budding or grafting, especially if above ground, the wound should be covered with a grafting composition of some kind (for the best composition see Grafting); but a great many other mixtures are good, particularly if well put on. By using a greater proportion of tallow or lard, or less of rosin, the wax or taffy will be softer, and can be spread upon rags like butter, and these rags be used on the grafts with the greatest convenience.

Buffalo, the name of a wild animal, in Asia and Africa, of the ox genus, and, also, despite the dictionaries, the popular name of the American bison.

Bug, any beetle or beetle-like insect; more strictly, a fly which has the mouth parts in the form of a slender, horny beak, consisting of a horny sheath, containing three stiff and intensely sharp bristles, and whose wing covers are thick in their basal portion, and lying flat on the back, the thin portions crossing each other.

Buggy: see Carriage.

Buhr-Stone (bur′stone), a flinty, quartzose, cellular stone used in grist mills. Most of these mill-stones come from Paris, but quarries of the same material are now discovered in several sections of the United States, especially in Georgia.

Buildings: see Residence, Barns, etc.

Bulb, a spheroidal body growing from a plant just above the roots and usually just below the surface of the ground, which is strictly a bud, its scales being large and fleshy. These scales, the second year, develop into stems and leaves. Lilies, tulips, onions, etc., are familiar examples.

Bull, the male of the ox genus. The general structural characteristics of a good bull are common with those of any other neat cattle, with only the difference that the bull must possess all the admirable points in their fullest development, combined with the highest vigor of masculine qualities. The bull selected should, if possible, be pure in blood, of whatever breed may be adopted. He should be masculine in appearance, strong, vigorous, but not coarse. He should be fine in bone, his skin, and the flesh under it, elastic to the touch, with good, thick, woolly hair. The color should be true to its breed. His flesh should be well laid on in the best parts for beef, according to the models of the best breeds. He should be well fed and cared for, but should not be forced either to grow lean or fatten. It is bad to keep a bull half starved, and bad to keep one stuffed with food. He ought to grow up naturally, and be developed at the time and in the manner nature indicates. He should be used little for breeding till he is two years old; he then can safely serve from 50 to 80 cows during the season. If kept in the stable he should be led around the yard for exercise, each day. He should never be turned into the common pasture with the cows. During his first year a copper ring should be put in his nose, with which to master and lead him. He should be led by a light, strong stick, seven or eight feet long, with two links of a chain, and a snap at the end may be used in leading him. This method is much safer than to use a rope, the stick serving the purpose of a pike to fend off the animal in case he becomes infuriated. Sometimes a bull, usually kind and docile, will have a fit of frenzy, and if unprepared the keeper may be seriously injured or even killed; and such cases are not rare. Some bulls are made cross by violent treatment. From a calf the bull should be treated kindly, but always handled with a firm hand. If he is not cross, and is a good stock-getter, he may be kept until he begins to fail from age—at ten or twelve years old. When a bull is regularly serving many cows, the food should be increased. See also Cattle, and for castration see article Calves.

Bull, in commerce, the party who endeavors to raise prices. See Bear.

Bullion, uncoined gold or silver, in the mass.

Bull's Eye, besides denoting several things in nautical science, etc., is also the name of a policeman's lantern (or "dark" lantern), which emits light at only one side, through a glass of the shape of a bull's eye. Also, certain watches, from their general shape and appearance, have been denominated "bull's eye."

Bung-Hole Borer. This is a very convenient tool to have in the farm workshop. The one represented in this connection has some advantages over the ordinary ones. It has inserted in the end

Enterprise Bung-Hole Borer.

of the stock or reamer an auger or bit for boring the hole. It bores a complete round hole, regular taper, and holds its own chips, preventing them from entering the cask.

Bunion. An inflamed and painful swelling of the sac containing the oil of the joint, chiefly situated on the outside of the great toe. This disease, if not remedied in time, is certain to lead to a permanent enlargement and disfigurement of the toe. The exciting cause is generally a long-continued pressure from a tight boot or shoe. Treatment: This should commence with a warm bran poultice, continued for one or two hours, so as to soften the cuticle of the part; a piece of lint, wetted in the extract of lead, is then to be applied, cold, round the toe, and the lint moistened from time to time with more of the extract. In a few hours all inflammation will have subsided, and if care be taken not to repeat the pressure, but use a large boot, the bunion will be cured. Or, treat as for corns. The cure will be more tedious.

Buns, very light, small, sweet cakes. To make them, take one quart of flour, one pint of warm milk, two ounces of butter and a gill of yeast; mix these and set it to rise three or four hours. Then beat up two eggs, one-fourth pound sugar and a few currants; mix this into the dough, and set it to rise again two hours. When very light, make the dough into buns, quite small, set them very close together on tins, and let them rise. When all of a sponge, brush the top with a little milk and molasses mixed. Bake in a quick oven, fifteen or twenty minutes.

BUNS WITHOUT EGGS. Three cups of warm milk, one cup of sugar, one cup of yeast; make a batter of this with flour, and when it has risen very light, add a cup of butter, a cup of sugar, a cup of

currants and a little nutmeg; work in flour enough to roll out, and let it rise very light. Make it into cakes, and let them stand in the tins awhile before baking.

EASTER BUNS. Boil a little saffron in a small quantity of water, strain and cool it; make a sponge of a quart of flour and warm milk, making it yellow with the saffron decoction; add a gill of yeast or a small cake of compressed yeast dissolved; set it to rise in a warm place, covered; when very light, beat into it a half pound of granulated sugar and ¼ pound of butter, rubbed to a cream; four eggs beaten very light, a tablespoonful of salt, and half a nutmeg grated; mold into a soft dough and let it rise again; when as light as possible roll out in a middling thick sheet, and cut into round cakes with a cutter; bake on flat tins, well buttered; they must be permitted to stand until very light, after they are cut out, before putting them into the oven; while hot, wash over with milk, in which is a little sugar. Make an icing with the white of an egg and white sugar, and with it form a large E in the center of the bun. For variety, a few currants may sometimes be sprinkled into the dough.

From the above standard recipes a cook can vary to suit her tastes and fancies without much difficulty. These recipes often appear in print, with little variation, under different names.

Bunting, a bird of several species; also, a thin woolen stuff, of which the colors or flags and signals of ships are made.

Burdock, a common weed, with leaves as large as those of pie-plant, and similar in shape. The root has been popular as a "blood-purifier." The name also has been applied to the cockle-bur, a common plant of poisonous odor and bearing thorny burs.

Burnet, a plant the leaves of which are used as salads, put into soups, etc. When slightly bruised they smell like cucumber, and they have a somewhat warm taste. But little cultivated.

Burns and Scalds. The best application for a burn or scald we believe to be common wheat flour. This is always at hand, and while it requires no skill in using, it produces most astonishing effects. The moisture produced upon the surface of a slight or deep burn is at once absorbed by the flour, and forms a paste which shuts out the air. As long as the fluid matters continue flowing, they are absorbed and prevented from producing irritation, as they would do if kept from passing off by oily or resinous applications, while the greater the amount of those absorbed by the flour the thicker the protective covering. Another advantage of the flour covering is, that next to the surface it is kept moist and flexible. It can also be readily washed off without further irritation in removing. It may occasionally be washed off very carefully when it has become matted and dry, and a new covering sprinkled on. The next best method is to plunge the part in cold water, or apply cold water to it, until the pain is considerably reduced, then spread on any alkaline poultice, as a cloth or cotton batting saturated with sweet or linseed oil and lime-water, chalk, or a solution of saleratus or cooking soda. When the burn is so severe as to take the skin off, put on sweet cream or milk. In serious cases, use no strong drug until a physician is called and he advises it. It would be safe, however, to use the following, which is very efficient: Take equal parts of turpentine, sweet oil and beeswax; melt the oil and wax together, and when a little cool add the turpentine and stir until cold, which keeps them evenly mixed. Apply by spreading upon thin cloth: linen is the best.

BODY IN FLAMES. Lay the person down on the floor of the room, and throw the table-cloth, rug, or other large cloth over him, and roll him on the floor.

Burst, sometimes used in the sense of Rupture, which see.

Bush, in mechanics, a perforated piece of metal, as hard brass, let into certain parts of machinery to receive the wear of pivots, journals and the like, as in the pivot-holes of a clock, the hub of a cart-wheel, etc. Also, any similar lining of a hole with metal, as the vent of a gun. In the larger machines, such a piece is called a "box." Bush metal is an alloy of copper and tin, used for journals, the lining of pivot-holes, etc.

Bushel. A standard bushel is eight inches deep and 18½ inches inside diameter, containing 2,150.42 cubic inches. The heaped bushel requires the middle to be six inches higher than the circumference, and contains 2,748 cubic inches in all. The half bushel measure, correspondingly, should be heaped up about four inches in the middle. To find the number of bushels, struck measure, any box will hold, multiply the length, width and height together, in feet, divide by 56 and multiply by 45.

The table on the next page covers every article whose weight per bushel is regulated by law in each of the States and Territories. Where blanks occur in the table it is because there is no law governing the subject. In several of the States no laws fixing standard bushels have ever been passed. In such States the standard fixed by Congress is adopted; but, with a few exceptions, Congress has fixed no such standards. The revenue officers, in fixing the amount of duties upon imported grain, are directed to allow 60 pounds per bushel for wheat, 56 for corn and rye, 48 for barley, 32 for oats, 60 for peas, and 42 for buckwheat.

WEIGHT OF THE BUSHEL OF AGRICULTURAL PRODUCE, ETC., AS ESTABLISHED BY LAW IN THE UNITED STATES AND TERRITORIES, COMPARED WITH THE MOST RECENT ENACTMENTS.

	California.	Connecticut.	Dakota.	Delaware.	Illinois.	Indiana.	Iowa.	Kansas.	Kentucky.	Louisiana.	Maine.	Maryland.	Massachusetts.	Michigan.	Minnesota.	Missouri.	Nebraska.	Nevada.	New Hampshire.	New Jersey.	New York.	Ohio.	Oregon.	Pennsylvania.	Rhode Island.	Vermont.	Washington Ter.	Wisconsin.
Apples																							45				45	
Barley	50	48	48		48	48	48	48	48	32	48		48	48	48	48	48	50		48	48	48	46	47		48	45	48
Bran					20		20	20	20							20	20											
Broom-Corn Seed							30		30																			
Buckwheat	40	48	42		52	50	52	50	52		48		48	48	42	52	52	40		50	48	50	42	48		46	42	42
Carrots		55									50														50		50	
Castor Beans					46	46	46	46						46		46	46											
Coal, Mineral					80	80*	80	80						80		80	80					80†						
Corn, Shelled	52	56	56	56	56	56	56	56	56	56	56		56	56	56	56	56	52	56	56	58	56	56	56		56	56	56
Corn, in Ear			72		70	68	70	70						70			70					70						
Corn Meal		50			48	50			50				50	50			50		50			50			50			
Cranberries														40														
Dried Apples					24	25	24	24						22	28	24	24					25	28				28	28
Dried Peaches					33	33	33	33						28	28	33	33					33	28				28	28
Dried Plums														28														
Flax Seed					56		56	56	56					56		56	56			55	55	56						56
Grass Seed, Blue					14	14	14		14					14		14	14											
Grass Seed, Clover			60		60	60	60	60	60					60	60	60	60			64	60	62	60	62		60	60	60
Grass Seed, Hungarian							45							50			60					50						
Grass Seed, Millet							45							50			85					50						
Grass Seed, Orchard														14														
Grass Seed, Red Top														14														
Grass Seed, Timothy			42		45	45	45	45	45					45		45	45				44	45				42	40	46
Hair, Plastering					8												8											
Hemp Seed					44	44	44	44	44					44		44	44					44						
Lime, Unslacked					80		80										80											
Malt					38												30					34						
Mangel-Wurzel		60									60														50			
Oats	32	32	32		32		33	32	33½	32	30		32	32	32	35	34	32	30	30	32	33	36	30		30	35	32
Onions		50			57	46	57	57	57		52		52	54		57	57								50		50	
Onions, Top																	25											
Osage-Orange Seed							32							33			32											
Parsnip		45																	60			60			50			
Pears																							45				45	
Peas		60									60			60			60				60					60	60	
Potatoes, Irish		60	60		60	60	60	60	56			56	60	60		60	60		60	60	60	60	60	56	60		60	60
Potatoes, Sweet					55		46							56			50					50						
Ruta-Baga		60									60														50		50	
Rye	54	56	56		56	56	56	56	56	32	56		56	56	56	56	56	54	56	56	56	56	56	56		56	56	56
Salt, Coarse																								85				
Salt, Fine					55																			62				
Salt, Ground																								70				
Sand							130																					
Sugar Beets		60									60														50		50	
Turnips		50			55						50			58			55								50		50	
Wheat	60	60	60	60	60	60	60	60	60	60	60		60	60	60	60	60	60	60	60	60	60	60	60		60	60	60
White Beans		60	60		60	60	60	60	60		64			60		60	60		60		62	60				60	60	

"Salt" in Illinois, Indiana, Iowa, Kansas, Kentucky, Missouri and Nebraska is 50 pounds to the bushel. In Michigan, "Michigan Salt" is 56 pounds to the bushel. In Massachusetts, "Salt" is 70 pounds to the bushel.

Coal in Kentucky is 76 pounds per bushel, *except* Wheeling coal, which is 84, and Kentucky River, which is 78 pounds per bushel, and Adrian Branch, or Cumberland River coal, which is 72 pounds per bushel. Cotton seed is 33 pounds to the bushel in Missouri.

Sorghum seed is 30 pounds to the bushel in Iowa and Nebraska. Strained honey is 12 pounds to the gallon in Nebraska.

* Mined within the State, 70 pounds; without the State, 80 pounds.

† Bituminous,—Cannel Coal, 70 pounds.

Bushing, a ring, tube or lining placed in a hole and sometimes acting as a journal-box; a thimble; also, the operation of fitting bushes into holes or places where wear is to be received, or friction diminished, as pivot-holes, etc.

Business Forms: see Legal and Business Forms.

Business Laws. Ignorance of law excuses no one.

It is a fraud to conceal a fraud.

The law compels no one to do impossibilities.

An agreement without consideration is void.

Signatures made with a lead pencil are good in law.

A receipt for money paid is not legally conclusive.

The acts of one partner bind all the others.

Contracts made on Sunday cannot be enforced.

A contract made with a minor or a lunatic is void.

Contracts for advertisements in Sunday newspapers are invalid.

Principals are responsible for the acts of their agents.

Agents are responsible to their principals for errors.

Each individual in a partnership is responsible for the whole amount of the debts of the firm, except in cases of special partnership.

A note given by a minor is voidable.

Notes bear interest before maturity only when so stated.

It is not legally necessary to say on a note, "for value received."

A note drawn on Sunday is void.

A note obtained by fraud, or from a person in a state of intoxication, cannot be collected.

If a note be lost or stolen, it does not release the maker; he must pay it.

An endorser of a note is exempt from liability if not served with notice of its dishonor within 24 hours of its non-payment.

The maker of an "accommodation" bill or note is not bound to the person accommodated, but is bound to all other parties precisely as if there was a good consideration. An "accommodation" bill or note is one for which the maker has received no consideration, he having lent his name or credit for the accommodation of the holder.

No consideration is sufficient in law if it be illegal in its nature.

Checks or drafts must be presented for payment without unreasonable delay.

Checks or drafts should be presented during business hours.

If the drawee of a check or draft has changed his residence, the holder must use due or reasonable diligence to find him.

If one who holds a check, as payee or otherwise, transfers it to another, he has a right to insist that the check be presented that day, or at the farthest, on the day following.

A note indorsed in blank (the name of indorser only written) is transferable by delivery, the same as if made payable to bearer.

If time of payment of note is not named, it is payable on demand.

The time of payment of a note must not depend upon a contingency. The promise must be absolute.

A bill may be written upon any kind of paper, either with ink or pencil.

The payee should be named in a note, unless it is payable to bearer.

An indorsee has a right of action against all whose names were on the bill when he received it.

If the letter containing a protest of non-payment be put into the post-office, any miscarriage does not affect the party giving notice. Notice of protest may be sent either to the place of business or of residence of the party notified.

The holder of a note may give notice of protest either to all the previous indorsers or only to one of them; in case of the latter he must select the last indorser, and the last must give notice to the last before him, and so on. Each indorser must send notice the same day or the day following. Neither Sunday nor any legal holiday is counted in reckoning time in which notice is to be given.

The loss of a note is not sufficient excuse for not giving notice of protest.

If two or more persons, as partners, are jointly liable on a note or bill, due notice to one of them is sufficient.

If a note or bill is transferred as security, or even as payment of a pre-existing debt, the debt revives if the note or bill be dishonored.

An indorsement may be written on the face or back.

An indorser may prevent his own liability to be sued by writing "without recourse," or similar words.

An oral agreement must be proved by evidence. A written agreement proves itself. The law prefers written to oral evidence, because of its precision.

No evidence can be introduced to contradict or vary a written contract; but it may be received in order to explain it, when such explanation is needed.

Written instruments are to be construed and interpreted by the law according to the simple, customary and natural meaning of the words used.

The finder of negotiable paper, as of all other property, must make reasonable efforts to find the owner, before he is entitled to appropriate it for his own purposes. If the finder conceal it, he is liable to the charge of larceny or theft.

Joint payees of a bill or note, who are not partners, must all join in an indorsement.

One may make a note payable to his own order, and indorse it in blank. He must write his name across its back or face the same as any other indorser.

After the death of a holder of a bill or note, his executor or administrator may transfer it by his indorsement.

The husband who acquires a right to a bill or note which is given to the wife, either before or after marriage, may indorse it.

"Acceptance" applies to bills and not to notes. It is an engagement on the part of the person on whom the bill is drawn to pay it according to its tenor. The usual way is to write across the face of the bill the word "Accepted."

Business Maxims. Caution is the father of security.

He who pays beforehand is served behindhand.

If you would know the value of a dollar, try to borrow one.

Be silent when a fool talks.

Never speak boastingly of your business.

An hour of triumph comes at last to those who watch and wait.

Word by word Webster's big dictionary was made.

Speak well of your friends—of your enemies say nothing.

Never take back a discharged servant.

If you post your servants upon your affairs, they will one day rend you.

Do not waste time in useless regrets over losses.

Systematize your business, and keep an eye on little expenses. Small leaks sink great ships.

Never fail to take a receipt for money paid, and keep copies of your letters.

Do your business promptly, and bore not a business man with long visits.

Law is a trade in which the lawyers eat the oysters and leave the clients the shells.

Have nothing to do with an unlucky man.

Be both cautious and bold.

Make your bargains with but few words.

Reduce all important contracts and agreements to writing, leaving no merely verbal conditions or understandings to be remembered. In most cases there should be two or three copies of the agreement, to be held by as many parties.

Do not tell the secrets of your business to any one except those to whom it is necessary.

Short (frequent) settlements make long friends.

Learn your business thoroughly.

Keep at one thing.

Observe system and order in all you do and undertake.

Be self-reliant, after consulting friends.

Earn your money before you spend it.

Never buy anything because it is cheap.

Make few promises, and be sure to fulfill promptly all you do make.

Keep yourself informed on the discoveries, doings and reforms of the age.

Learn how to be silent.

Do not abandon the superintendency of a work because you have employed a man to execute it.

In collecting debts, never give the idea that you are in need of the money; that you called because you happened to be in the neighborhood; never think you have done wrong because your debtor gets angry; never leave a debtor without his setting a time when he thinks he can pay, and never fail to be on hand at the time set; shame the debtor into an arrangement to pay by installments, or something every week or month; drop into his favorite haunts, and, without dunning him, make him uneasy.

Never "fool" in business matters.

If you have a place of business be found there when wanted.

A man of honor respects his word as he does his bond.

In all thy quarrels, leave the door open to reconciliation.

Do not allow idleness to deceive you, for while you give it to-day it steals from you to-morrow.

Butter, an oily substance obtained from milk or cream by churning. The amount of butter matter contained in pure milk usually varies from two and a half to six and a half per cent. It is already formed in the udder of the cow, and churning merely separates it from the cheese and whey. In all good milk of the cow it is enclosed in little round globules held in suspension or floating in other substances. As soon as the milk is set at rest after leaving the udder, these particles, being lighter than the other components of the milk, work their way to the surface, the largest rising first. The smaller the particles the more they are clogged with other parts of the milk on reaching the surface. Consequently, the richest cream and the best butter are obtained by the skimming of milk which has stood only a few hours. Suppose three skimmings to have been made, at 6, 12 and 18 hours, the last will give the poorest cream and butter; the first the richest, and the second a medium quality. For reasons stated under the head of Milk, the last milk given by the cow will produce richer and more fragrant butter than the first. The difficulty of separating the butter particles from the milk increases in proportion to its thickness and richness. This is the reason why, in winter, when the cows are dry fed, and the milk is thicker and richer, the cream rises much more slowly than in summer. This difficulty is met by raising the temperature of the milk, or by mixing a little warm water with it when it is set. The

quantity of butter obtained from milk treated in this way will be greater, but the quality will be somewhat poorer. Although the best butter is made from cream which has stood about 12 hours, the poorness of the subsequent product induces most dairymen to make their butter from all the cream obtained at one setting. This course secures the best market butter. Everything relating to the treatment of Milk and Cream has been treated under those heads. It is necessary here simply to call the attention of the dairyman to the incalculable importance of the strictest cleanliness in every step of the process of butter-making. It is impossible to lay too much stress upon this point. Cleanliness contributes perhaps more than anything else to the production of good butter. The known absence of this requisite in any dairy is sufficient to lessen the market value of its product, for there are few articles of food about which the public is more fastidious than about butter, or for absolute purity and sweetness in which it is willing to pay a higher price. A slight taint in meat is no great bar to its sale; a much slighter taint in butter would either render it unmarketable or salable only at such a price as would be ruinous to the dairyman. Milk and cream are exceedingly sensitive to even the slightest taint in the air, and any want of sweetness produced in them by foul odors or want of cleanliness in handling will infallibly betray itself in the butter. From this the butter-maker will at once see that the greatest attention must be paid to the milk and dairy room.

Where possible, the butter dairy should be a separate building. It should be at such a distance from the yard as to be free from all the impurities of the latter's air, and still not too distant. Especially should it be removed from all damp, low places subject to noxious exhalations. It should be constantly kept sweet and clean by the copious use of pure water, and in case any milk be spilled, even if it is but a single drop, it should be immediately washed up with fresh water. Taints in the air imperceptible to our senses are quite sufficient to injure things so sensitive as milk and cream. Where necessity compels the dairyman to use a room in the house, it should, in warm seasons, be on the *north* side, and used for nothing else. If a cellar be used, it should be properly prepared: it should be large and dry, and have an uncemented bottom of gravel or loam. No articles of any description, except such as are needed for the purposes of the dairy, should be kept in it. The temperature should be kept uniform and at about 50 degrees. The cows' udders should be washed and wiped dry before milking, as well as the hands of the milker, and all the vessels into which the milk is drawn, or in which it is placed to set, should be carefully scalded with *boiling* water and cleaned. Milk, if intended to be used for butter-making, should never be placed on the bottom of the cellar. Shelves at a height of from six to eight feet from the bottom, with a free circulation of pure air from the windows, will be found most advantageous. Cream will rise here in 12 hours which it would take 24 hours to produce on the bottom of the cellar. A very simple milk-stand may be made by fixing an upright working on a pivot in any convenient portion of the milk-house, and fixing to it circular or octagonal shelves. If possible, the dairy house should be constructed over or near a spring of clear running water, and this allowed to circulate constantly under the milk-stand. Milk-pans are usually either of tin or earthenware, the main objection to the latter being that they are too liable to break. There are several contrivances designed to obviate the necessity of skimming the milk. These are described under the head of Milk-strainers. There is some diversity of opinion as to the best depth of pan. Some use a shallow pan not more than two inches in depth. Others maintain that deep-setting vessels are preferable, inasmuch as they entail much less labor, save the expense of a large number of pans and the greater labor of cleaning, make it possible to secure a larger amount of cream, and expose much less of the milk surface to the action of the air. If there is plenty of cold spring water in which to set such cans, the improvement is said to be still more marked. These cans will be found described under the proper heading. Their advocates claim that with these cans, properly used, much better butter is produced than by the open pan process, and that perfect uniformity of product is attained, this latter being a point the importance of which is clear to every thinking dairyman. Further, they contend that good butter may be made in August with quite as much certainty as in June, and, as the milk is not allowed to ferment in the least, the skim milk is much more valuable as food for calves and pigs.

The quality of the butter, as every farmer and dairyman knows, is greatly affected by the food. Carrots, clover, turnips, blue-grass, etc., will each give a very different flavor to the milk and butter. The farmers or dairymen should see that when their cows are at pasture they are kept away from stagnant pools as well as from sour, marshy land. Upland pasturage produces a much better quality of milk than bottom-land. When fed dry, he should take care that the cows get no moldy or otherwise objectionable food. They should have access to pure spring water. Where possible, it is well to have the milk-house so arranged as to allow a stream of pure, cold water to run through troughs, in which the cans may be so placed that the water will be a little above the level of the cans. The temperature, as before stated, should be about 56 degrees.

In this way the milk can be kept sweet thirty-six hours. Some let their milk stand this long; others say that twenty-four hours is sufficient. The cream must not be allowed to become either too cold or too warm. In either of these cases the butter is proportionately longer in coming. The temperature should range from 55° in warm weather to 64° in winter. In order to make this certain, a thermometer, such as is made specially for the dairy, should be used in every milk-room. Should the cream be too warm, it ought either to be put in the refrigerator or the vessel containing it placed in another containing cold water. This is in every way preferable to putting ice in the cream. In winter it may be warmed by placing it in a warm room in a *closely covered* vessel. Everything thus being ready it is placed in the churn, of which the various kinds will be found described in the proper place. The churn should be kept scrupulously clean, for which purpose *boiling* water should be used, and constant airing. Never keep the churn, or indeed *any* wooden vessel, closed when not in use.

Churning. The temperature of the cream and the velocity of the churn are very important elements in the process of churning. There seems to be a certain amount of agitation needed to produce the butter at a normal temperature, which we place at 60°, Fahr., and this requisite agitation is effected by making sixty revolutions or strokes of the churn for twenty to thirty minutes. The effect upon the cream of this amount of agitation and aeration seems to be precisely that which is required to produce the best quality of butter from cream that has undergone the necessary amount of ripening. This ripening process is effected by keeping the cream for forty-eight hours on the average, that is to say, if the cream has been seventy-two hours, or three days, in collecting, or there have been three skimmings, its condition will be equivalent to that of cream of one skimming which has been kept forty-eight hours. The cream should have been gathered from milk that has been set no longer than thirty-six hours. If cream in a small dairy cannot be churned twice a week, being kept only three days, it should be kept at a lower temperature, not exceeding 45°, until twenty-four hours before churning, when it should be raised to a temperature of 60° for a whole day and night before it is put into the churn. As this point is very important it may be well to repeat the rule in this case, viz.: Cream should be skimmed after the milk has been set thirty-six hours; it should be kept forty-eight hours before churning at a temperature of 55° to 60°; it should go into the churn at 60°; it should be churned at least twenty minutes, and not more than thirty, the churn moving about sixty strokes or turns in a minute.

This rule is subject to such changes only as will equalize the effect; for instance, if the temperature is lower than 55° to 60°, the cream may be kept longer; if the cream is churned at a higher temperature than 60°, the churn may be moved more slowly; and if the cream is colder, the motion may be more rapid. Even when there is cream enough for daily churning of six pounds only, it is better to churn daily, and for this reason: when the conditions are always the same the butter will always be of the same quality. There are two good qualifications for a dairyman: One is to be able to make good butter, the other is to make good butter always, and to have no variance in the quality at any time or season. When the butter appears in the churn in small grains or pellets, the churning should stop. One can very soon learn to recognize the sound made by the churn when the butter has come. Over-churning has the effect of injuring the texture of the butter and changing the waxy, almost crystalline, appearance into a soft, greasy one. When the butter is in the best condition after churning it appears as a mass of small granules loosely adhering together, but which easily fall apart when floated in cold water. These granules are no larger than the capsules of beet-seed, and many of them are not more than half or quarter as large; and when some cold water is poured into the churn to harden them they are kept separate, and do not cohere in a mass.

Butter of this form is better made in a rectangular or other dashless churn than in those with dashers, because the granules are not crushed, pressed or rubbed when there is no dasher used. (See Churns.) The advantage of this form of butter is that it can be completely freed from buttermilk and can be washed, salted and packed into pails or tubs, or made into cakes without any working.

Working. When the buttermilk is drawn off a small hand-strainer should be used to catch any of the small fragments that may run off with the milk. After the milk is run off, cold water is put into the churn until the butter floats; the churn is slightly moved to bring the water into contact with all the butter, and the water is drawn off. This is repeated until the water comes off perfectly clear, when the butter is ready for salting. This may be done in a rectangular churn without removing the butter, as the butter and salt may be thoroughly mixed by giving a few turns to the churn. When other churns are used, butter is lifted out with a ladle—it should never be touched by hand—into the bowl or butter-worker and mixed with salt, in the usual manner. If the butter is worked at all it should be done at once, as unless separated from the milk, which is mixed with it, butter soon

spoils. In working the butter the usual course is to wash it in pure, cold water. In doing this the hand should never be allowed to touch the butter, even the least amount of perspiration being liable to injure the quality. A spatula or ladle (Fig. 4) made

FIG. 1.—*Butter-Worker.*

for the purpose, and a wooden bowl or tray should be used where the quantity of butter is not too large. In the latter case butter-workers may be employed. The one manufactured by the Vermont Machine Company, at Bellows Falls, Vt. (Fig. 1), is sim-

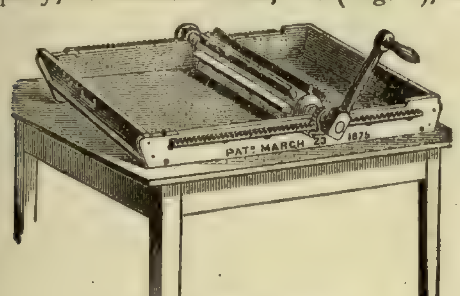


FIG. 2.—*Butter-Worker.*

ple and efficient, and gives about the right motion, not grinding the butter into a salvy mass. Fig. 2 represents a nice machine, manufactured by A. H. Reid, of Philadelphia.

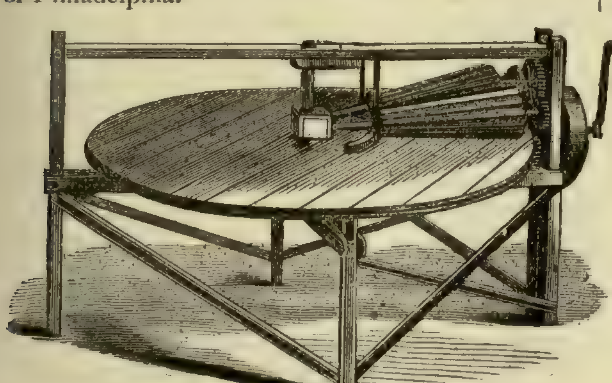


FIG. 3.—*Power Butter Worker.*

The power butter worker is to the creamery what the harvester and self-binder is to the field. Fig. 3 represents Mason's Worker, as supplied by Chas. P. Willard & Co., Chicago, Ill. It will work hard or soft butter with equal facility. Owing to the revolving table and fluted roller, there is no sliding or rubbing motion, and the grain of the butter is not injured. Its work is so uniform that the butter needs less working than by ordinary methods. As a large mass of butter is worked at one time, and in a few minutes, the table, being on an incline, allows the buttermilk or brine to run off as fast as worked out. This machine is designed to be operated by steam power, but can also be operated by hand. In large creameries it will save the labor of one man.

LADLE. Among the many useful articles in butter-making is the ladle. One, as represented in Fig. 4, costs but little, and should be had by every housewife.

FIG. 4.—*Butter Ladle.*

TRAY. The butter tray illustrated by Fig. 5 is designed to hold the butter when taken from the churn to be re-worked and packed for market. The oval cover, which increases the capacity of the tray one-third, is made to fit tight, to exclude bad air and dust. They are strong and durable, and made in nests of three.

FIG. 5.—*Butter Tray.*

It used to be considered that butter required to be worked over, cut, squeezed and pressed, worked even with the hands at one time, almost in the manner in which a brick-maker works his clay to fit it for the mold, and make it tough and plastic; or, more recently, with butter-workers, which have almost the same effect. Working butter, if it is at all necessary, is a necessary evil; because it is an injurious operation required to avoid the more injurious presence of easily decomposed material (milk) in the butter. But there is no necessity for working butter at all. When it is made so as to come out of the churn in small grains it may be washed perfectly free from the buttermilk with the greatest ease, and the salt may be mixed in with it in the most even and intimate manner without disturbing the texture in the least, by the slightest degree of working.

It is a mistake to suppose that washing butter injures the flavor. It cannot; but it does wash away most of the foreign ingredients, the taste of which, as they decompose, some persons, on ac-

count of association, prefer should remain. Butter is an oil or fat, totally insoluble in water, and all its flavors are component parts of the fat, which cannot possibly be separated from it by contact with water. In washing granular butter it is necessary to use cold water, which sets or hardens the granular atoms and prevents them combining in a mass. When butter is taken from the churn in masses, the water should not be so cold as to harden these, otherwise the milk cannot be removed easily, and then the butter will not keep for any length of time, in spite of all precautions. In such a case the butter placed in the bowl is to be worked down with the ladle in thin slices, so as to provide outlets for the buttermilk to escape. The milk which escapes and flows to the bottom of the bowl should be poured off, and the butter washed with clear, pure water; the butter is then turned in the bowl and sliced in the opposite direction and again washed, and if the work has been skillfully done this is all the working that is necessary. The main point to be observed in working butter is to avoid plastering it with the implement used, whether it be the hand, the ladle, or a lever or a rotary crusher. The butter may be squeezed with impunity, to a considerable extent, but if it is plastered, or the implement is drawn over it with a sliding motion, it is seriously damaged, and the texture destroyed.

Butter is salted as a means of preservation. Some persons prefer it unsalted when it can be procured fresh. In this condition are preserved all the most delicate flavors which are lost when the salt is added. In the domestic dairy, butter may be sent to the market in this way, or even direct from the churn without washing, and with all its native buttermilk adhering, as an unusual delicacy. But for ordinary purposes about six per cent. of salt is added to the butter; this is equal to one ounce to the pound. The salt is sprinkled evenly over the butter at the last of the working, when it is sliced or gashed. The butter is then loosely gathered together and it is set away in the dairy for 24 hours. During this time some milky water usually escapes from it, and this is poured off at the final working. This is done in the same manner as before, and is continued until any streakiness in the butter is removed, and the whole is brought to an even and regular color and consistence. Some persons color their butter when working it, but this is not to be advised, for the color cannot be made even, and the butter will be streaky and patchy in spite of the most prolonged and injurious mixing. Some frightful examples of such butter are often seen at rural hotels and railroad restaurants. Coloring should always be done in the churn by mixing the proper quantity of prepared color in with the cream. The usual quantity is one teaspoonful to three gallons of cream. This is sufficient with the best Jersey and Ayrshire cream; but each dairyman should test that matter for himself, as the natural color of the cream varies with the cows, the feed, and the manner of keeping the milk and cream.

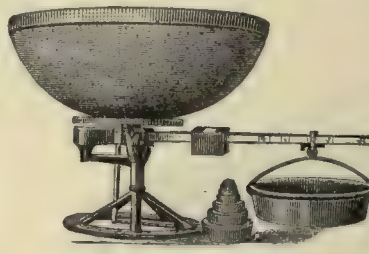


FIG. 6.—*Butter-Salting Scale.*

By the use of a salting scale (Fig. 6), dairymen cannot fail to salt butter uniformly. Every dairy-woman knows the difficulty of doing this by guess-work, or by the old method of weighing. This scale will salt from three-quarters of an ounce to one ounce and a quarter of salt to the pound of butter in weight.

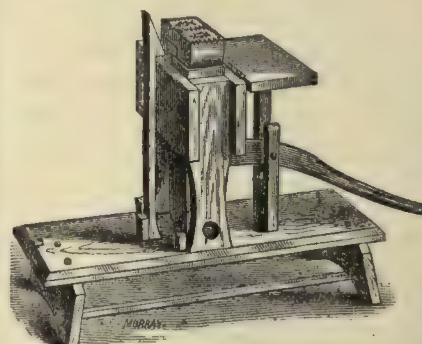


FIG. 7.—*The Nesbit Butter-Print Machine.*

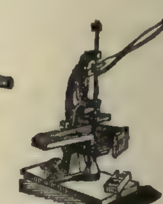


FIG. 8. *Reid's Butter Printer.*

For a family dairy a desirable manner of putting up the butter is in quarter, half or whole pound cakes pressed in a mold, as shown in the cuts. This is turned out of beech, birch, or soft maple wood, and made of different sizes.

The butter is now ready for PACKING. If to be kept long, or sent considerable distances, it is packed in jars or tubs. If to be used at home, stone jars are best; otherwise tubs, for fear of breaking. The tubs, or firkins, should be of white oak. They should be filled with boiling water and allowed to soak twenty-four hours. A pound of soda, placed in a thirty-two pound box or firkin, with boiling water poured upon it, dissolved, well stirred, and allowed to stand over night, is a cheap and easy method of frequently avoiding great loss. New pine-wood should never be used for butter-boxes or firkins. After scalding, the tubs should be filled with strong brine and stand two or three days. This should then be turned out, the tubs rinsed with pure, cold water and the sides rubbed with fine salt. They are then nearly filled with butter, a piece of clean muslin cloth is laid on the top, a strong brine is poured through the plug-hole so as to fill up all interstices and exclude the

air, the plug is put in and the butter kept in a clean, well-ventilated cellar. The firkins or jars should be kept absolutely free from the presence of all kinds of decaying vegetables, soap and everything which could impart an unpleasant odor to this most sensitive product. If the butter is to be kept long, the brine should be changed at least every two months. Another highly recommended method is to make a muslin bag, a little smaller than the tub, so that when filled there will be a space of one inch all round it, above and below. The butter, when ready, is packed in this muslin bag and placed in the tub; the head is put in with a 1½-inch hole in it. The space around the bag is filled with a strong brine and a plug put in reaching one inch below, so as to prevent the bag of butter from coming to the top. The sack will float in the brine and the air be absolutely excluded. The Irish method of packing is as follows: Take one part of fine sugar, one of nitre, and two parts of the best Spanish great salt: rub into a fine powder. This is mixed with the butter as soon as the latter is freed from the milk, in the proportion of one to sixteen. The butter is then pressed tight into the firkins, allowed to stand a fortnight: it then has a rich, marrowy flavor. Until the middle of May butter should, according to the advice of some, be packed in quarter firkins or tubs, with white-oak covers, and sent directly to market as fresh butter. From this time until the fall frost there is but little change in the product of the same dairy, either in color or flavor, and it may be packed in whole firkins and kept in a cool place.

The MARKETING of butter is an important part of the dairyman's business. A good deal of money is lost by mistakes in this respect. Good butter is thrown away when put up in ill-looking, frowsy, unsavory and repulsive packages. A good package will often sell butter of doubtful quality. Buyers are very much impressed with the sight of what they buy. To judge of butter requires a delicate sense of taste and smell, and but few persons are so expert in this way as to decide about the quality of what is shown to them, on the instant they touch a sample to their palate. But if any hesitation or doubt is felt, the sight of an unexceptionable package will help to determine this in favor of the butter. It is very much in this respect as a person is judged by his clothes: a well-dressed man and one with an agreeable presence is treated with more consideration by a stranger than one that comes in shabby dress or unclean person. The dairyman who is desirous of opening new outlets for his product must be very particular as to his packages, so that the first impression created by his goods may lead to a closer examination.

The package, too, has much to do with the preservation of the butter. If it is ill-made, of timber with a bad odor, or worm-eaten, so that the moisture of the butter will soon dry out and air get in, the butter will soon spoil and become rancid. In the family dairy the package is to be considered as much as in the business dairy, because there are times when a surplus product needs to be put away for use when the supply falls off or is suspended altogether for a time.

COLORING. The best method of coloring butter is to supply the cow with such food as will, both in winter and summer, naturally impart a good color to the product of the churn. In summer the cow usually gets such food as gives a fine natural color to the butter. In winter carrots are frequently fed, in which case care must be taken not to feed them in such quantities as to affect the flavor of the butter. If it be found desirable to color the butter artificially, care must be taken not to use the butter-colors of trade, of which the base is lard-oil and the coloring matter yellow aniline. A combination of annatto and curcuma or turmeric, when properly used, seems to be the most harmless and effective coloring matter. Put four ounces of annatto and one ounce of curcuma or turmeric in a jar with one pound of sal soda; put in a quart of hot water, and stir often. Keep in a warm place. After two days add three quarts more hot water. When dissolved strain through toweling. If any sediment remains dissolve in more soda and water. Two or three spoonfuls may be added to the gallon of cream when the churning begins. Some persons grate orange carrots in sweet milk, strain the milk, and add to the cream before churning. This method, it is contended by others, is injurious to the keeping qualities of the butter.

The following are the best recipes: Take of lard, butter or olive oil, 10 ounces; annatto, 10 drachms; turmeric, 1½ drachms; salt, 1 ounce; nitre, 1⅜ drachms; bromo-chloralum, 5½ drachms, and a sufficient quantity of water. The lard, butter or oil is put into a pan and heated in a water bath; the annatto and turmeric are then stirred into a thin paste with water, and this is gradually added to the fatty or oily matters, kept at a temperature of about 110° Fahr. The salt and nitre are next stirred in and the mixture heated to boiling, which is continued twelve to twenty-four hours, or until the color of the mixture becomes dark enough; the bromo-chloralum is then introduced, and the mass is agitated until cold, when it is put up in sealed cans. Or, annattoine, 8 ounces; pulverized turmeric, 10 drachms; saffron, 1½ drachms; lard oil, ½ gill; and butter, ½ pound. The butter is first melted in a pan over a water bath and strained through a fine linen cloth; the saffron is made into a tincture and, together with the turmeric and annattoine, is gradually stirred into

the hot butter and oil, and boiled and stirred for about 15 minutes. It is then strained through a cloth as before and stirred until cool.

Dake's butter coloring is prepared by heating a quantity of fresh butter for some time with annatto, by which means the coloring matter is extracted, straining the colored oil and stirring it until cool.

To improve RANCID butter: Put the rancid butter into an iron vessel, and suspend that into another iron vessel containing water, after the fashion of a glue-pot. Put the whole over the fire until the butter is melted. By continuing the heat for some time, at about 190°, the cheesy matter will settle at the bottom, leaving the butter pure and transparent, like oil. When it is nearly cold take the pure butter off from the dregs that have settled, let it get cold and solid, and salt and pack it up in the same manner as ordinary butter. The use of the double vessel is to prevent the butter from getting a burnt taste.

Imitation butter, called "butterine," "oleomargarine," etc., has recently become very abundant in the cities, being furnished at a little more than half the price of good creamery butter. The ingredients consist of tallow or lard, for the body, cocoanut, olive and palm oils and salt for flavoring, and the usual annatto for coloring. If this imitation butter had nothing in it except these articles, and all these fresh and clean, it would be as healthful as genuine butter; but we may depend upon it that everything which is secretly compounded in a factory to be put clandestinely upon the market, is drugged and dirty. It is so with cheese, honey, sausage, soap, etc. The imitation butters are all sold, of course, as genuine, but one can distinguish them by their uniform and slightly granular appearance, like ice-cream, while genuine butter looks a little more greasy, fibrous or mottled, cellular, etc.

MELTED butter, to serve with certain dishes at table, is thus prepared: Put about two or two and a half ounces of butter into a very clean saucepan, with two tablespoonfuls of water; dredge in a little flour, and shake it over a clear fire, *one way*, until it boils. Then pour it into your tureen, and serve.

Butter, from the fruits and melons, consists of their fine pulp, obtained by filtering, evaporated down in a surplus quantity of their own juices, and sometimes spiced: see Apple Butter, Plum Butter, Pumpkin Butter, Muskmelon Butter, etc. Fruit butters at the grocery are generally adulterated.

Butterfly, the winged or "perfect" form of certain caterpillars, many of which are injurious to vegetation. They fly around in the daytime, while moths, the winged form of other classes of caterpillars, are nocturnal in their flights. All of any importance are described under the various fruits and vegetables which they infest.

Butter Scotch: see Candy.

Butternut, or White Walnut, a well-known nut-bearing tree, of great utility in wooden-ware, veneering, etc. See Forestry.

Buttonwood: see Sycamore, in article Forestry.

Butts, the short ridges made by the plow in the corners of irregular fields.

Buzzard, a large bird of the hawk family, more common South, feeding principally upon small animals, and often trespassing upon the poultry yard.

C

CAB, a kind of covered carriage, with either two or four wheels, drawn by one horse.

Cabbage. To grow a good crop of cabbage a rich soil is necessary, and concentrated manures can be used to advantage. Horse manure from horses fed largely on grain, hog manure, sheep manure and hen manure are all well adapted to the purpose. A good superphosphate, highly nitrogenized, is also an efficient fertilizer for cabbage. The ground should be plowed deep and made fine and mellow with the best pulverizers, and then it will be well to roll it down smooth, crushing the lumps and somewhat compacting the surface. When properly prepared the ground should be marked straight with a light marker both ways, about two feet nine inches apart, for ordinary improved Flat Dutch variety, and a moist, cloudy day selected for transplanting. The plants should have room in growing, so as to be of stocky growth and have numerous fine roots. In transplanting them it will pay to have a broad, shallow vessel containing a thin mud, and to immerse the feet of the plants in the mud and keep them there until ready to transfer them to the earth. Everything considered, a well-made dibber shod with an iron point is the best implement with which to plant them. One thrust into the earth will make a suitable hole for receiving the plant, and another made obliquely, so that the point of the dibber shall strike near the points of the roots, and then pressing toward the plant, so that the earth will be compressed against the entire root, will fasten the plant. The root should be fastened so firmly that it will break rather than pull up. Transplanting may be done any time between the middle of June and the Fourth of July, for fall and winter use, but for early cabbage transplant as early as possible after the ground gets into good condition. Sowing the seed must therefore be done in hot-beds or cold frame for early cabbage, and later in the season for later crops. After the plants have been set for a few days they should be hoed and all vacancies filled. A few will probably die from setting, and a few more be taken by the cut-worm, but no vacant spots should be tolerated. After one hoeing a horse and cultivator will take care of the plantation, and you need entertain no fear that you will stir the surface too much. In time of drouth, water thoroughly. When cold weather comes on in the fall, if there is a ready demand for good hard heads at $3, or over, a hundred, either without the roots for "*sauer kraut*," or with the roots for winter's use, take the hardened heads to market, and put the soft ones in the barn cellar for feeding. If the demand be poor and prices very low, bury in trenches or in a cheap outdoor cellar for selling in winter or spring.

The usual method of keeping cabbages over winter is to lay them on dry ground, roots up, close together, in three rows, the third on top of the other two, and cover them with earth eight to sixteen inches deep. They generally freeze through in December, and if a subsequent winter thaw threatens to spoil them, the heap or ridge is covered with straw, cornstalks or something of the kind. This ought always to be done in cold weather, so no warm spell will commence to thaw them out. Once thawing out, when in frozen earth, does not injure cabbage immediately, but the leaves soon afterward will commence to decay, and, if the weather be warm enough, the stem will commence its second growth, to seed.

Another method is to make a deep furrow in a dry position convenient to the buildings. In this the cabbage are planted, roots downward, and if the furrow is not deep enough, at an oblique angle or inclination; the plants or heads are placed in close contact with each other, and thus the work advances till the furrow is occupied from end to end; another furrow is then drawn as before, immediately alongside and parallel, and the process is repeated until a bed is formed four feet in width —confined to that width for convenience of access to cut the heads during winter. As many such beds are formed as may be necessary to hold the crop. Thus the cabbage remains till toward Christmas, when a covering of straw, hay, or other light material is spread over the whole. Some families place the head downward in the furrow, the root upward; where deep snows prevail this is a good plan, as the head is well preserved, and the root above indicates its position. Cabbage should never be kept in the cellar, as they are apt to decay there and generate a very foul and unhealthful atmosphere to be diffused throughout the house.

INSECTS. For cabbage lice and most other vermin, hot water, of the temperature of 140° to 150° Fahr., dashed over the leaves is sufficient. It will

not injure the cabbage. To make the work more thorough, drench the under side of the leaves also with a syringe. Many other remedies, consisting of some drug dissolved in hot water, are prescribed by persons not knowing that it is the hot water that kills, and generally not the drug. The old remedies are salt, lime, ashes, plaster, sulphur, whale-oil soap, and decoctions of tobacco, black walnut leaves, China tree, etc.; but the most efficient drug for most cabbage pests is pyrethrum, an insect powder to be had at the drug stores. Mix half a tablespoonful of this powder with a gallon of water, and with this syringe the cabbage all over and under the leaves. Dusting with pyrethrum and flour, in similar proportions, is about as good, but more tedious.

Among the larger insects by far the greatest pest is the cabbage-worm, bred from small yellowish-green eggs on the under side of the leaf, and when hatched out consume the leaf. Fig. 1 is the male butterfly from this "worm." Remedies: Have the children capture the butterflies, especially the spring brood; kill the worms; plant early; select the firmest-headed varieties, and keep the plants as vigorous as possible. See Cut-Worm.


Fig. 1.—*Cabbage Butterfly: male.*

A parasite of the cabbage-worm has recently been imported, the propagation of which is encouraged by our economical entomologists. Its presence may be known by the livid, discolored and diseased appearance of the chrysalids of the worm, and at this time no sweeping remedies for the destruction of insects should be employed. To increase their numbers more rapidly on their first introduction, place the infested caterpillars or chrysalids in a box, which keep in a dry place until the parasites grow up and make their escape. No rubbish of any kind should be allowed in or about a garden, as it harbors and helps to multiply noxious insects. To raise a crop in spite of the pests, sometimes thick sowing or planting is resorted to; sometimes planting in a new place, not infested. But the chief care should be to keep the plants vigorous by proper cultivation, so that they can protect themselves against all insects and diseases.


Fig. 2. *Landreth's Earliest.*

VARIETIES. *First Early: English Early York.* An old standard, but rather small, and does not stand the heat of summer well.

English Large York. Larger than the above and a little later.

Landreth's Earliest is an improvement on the last.

French Ox-Heart. Of the same type as the preceding, but not so robust.

Early Jersey Wakefield. Resembles Ox-heart; a standard early cabbage.

Early Sugar Loaf. Good for home use. Well known.

Second Early: Winningstadt. Standard; a little better South; head large, solid and cone-shaped, *Early Schweinfurth.* Very large. *Early Bleichfield Giant.* One of the very best. *Bloomsdale Early Market.* Hardy and of excellent quality. From Landreth & Sons, Philadelphia.


Fig. 3. *Bloomsdale Late Flat Dutch.*

Newark Early Flat Dutch. One of the best.

Early Ulm Savoy. One of the earliest, and unsurpassed in quality for family use.


Fig. 4. *Large Flat Dutch.*

Third Early: Bloomsdale Brunswick, and *Fottler's Improved Early Brunswick* and the *Bloomsdale Early Drumhead* are the earliest of the large Drumheads; heads not very hard, but remarkably tender and rich.

Filderkraut. Solid and good.

Other varieties of some worth are the Early Curled Silesian, Valmorin's Early Flat Dutch, Henderson's Early Summer, Crane's Early, Early Wyman, Little Pixie, Bloomsdale Bullock Heart, Dutch Butterhead, Early Red Erfurth, Cannon-Ball (having an exceedingly solid head), etc.

Late: Bloomsdale Late Flat Dutch. Probably the best; includes the "Premium Flat Dutch." *Imperial,* or *White.* Excellent. *Marblehead Mammoth Drumhead.* The largest in the world. Better for cattle. *Marblehead Dutch.* Good.


Fig. 5. *Drumhead Savoy.*

Red Drumhead. Large; good for pickling; heads round, and under high cultivation very hard; reliable for heading.

Large Late Drumhead. Best for sauer kraut.

Drumhead Savoy. Large and curled.

Green Curled Savoy. The verv finest type of winter cabbage.

Improved American Savoy, Extra Curled. One of the best for winter; very finely curled; reliable for heading.

St. Dennis. A large late Drumhead with a solid head; popular in Canada.

Bergen Drumhead, Stone-Mason Drumhead, Red Dutch and a few other varieties are good, but quarter of what we have already given would be sufficient for any purpose.

Cabbage, To Prepare for the Table: Boiled. Take off the outer leaves, cut the head in quarters, and boil in a large quantity of water, until done. Drain and press out the water, chop fine and season. Boil three-quarters of an hour, or till tender. The water can be drained off when they are half done, and fresh water added if desired.

Another: Before cooking, cut the head in half and pour boiling water on it to prevent the disagreeable odor which arises from cooking. Cabbage is best boiled with the broth from salt meat, and is a nice accompaniment to corned beef. It requires an hour slow simmering, and must be skimmed constantly while cooking. If not cooked with salt meat broth, put some salt in the water.

Stewed. Shred the cabbage coarsely and parboil in fast boiling water for five minutes, then drain and add rich milk enough to cover. Cook until tender and season with butter rolled in flour, salt, and white or red pepper.

Cold Slaw. Shave the cabbage fine; scald half pint of vinegar, mix one small teaspoonful of corn-starch in two-thirds cupful of cream (or condensed milk a very little thinner), with one egg well beaten, and a little salt; pour the scalded vinegar on the mixture very slowly, so as not to break the egg, then boil until thick; pour hot on the cabbage; a few capers and olives will improve the slaw for those who are fond of such things. The above is a very nice dish to eat either with fried or scalloped oysters.

French Slaw. To one head of cabbage take eight hard-boiled eggs, rub the yolks with three-quarters cup melted butter, one and one-half tablespoonfuls of strong mustard, one-half tablespoonful of salt, same of black pepper, one teaspoonful of sugar. Cut cabbage as fine as you can on a cutter, then cut across with a knife; cut whites of eggs very fine, mix with the yolks, and add vinegar to moisten, like chicken salad.

Nice Dressing for Cabbage. Beat the yolks of two eggs, add one teaspoonful pure mustard, one teaspoonful salt, one tablespoonful butter, two tablespoonfuls cream, two tablespoonfuls white sugar, two-thirds cup of vinegar. Let it come to a boil, then pour over the slaw, lettuce or celery. Cut the cabbage fine; serve hot or cold. It will keep. Use one head of cabbage for above.

To Pickle Cabbage, or make "sauer kraut." Take nice sound cabbage, and chop it very fine in a wooden bowl with a chopping-knife; then put a thin layer of salt and black pepper (ground) in the bottom of a stone jar, then a layer of the chopped cabbage about one and one-half inches deep, then a little salt and pepper, alternating with the cabbage, until the jar is full; then cover with good strong vinegar; cover and keep in a cool place. It is very nice with meat and vegetables. It does not require much salt, and will keep for weeks.

Cabriolet (cab-ri-o-let′), a one-horse pleasure carriage with two seats, having a calash top and a covering for the legs and lap.

Cacao (ca-ca′o, or ca′co), the chocolate tree, growing in South America and the West Indies. Chocolate is made from its seeds.

Cache (cash), a hole in the ground, or hiding-place, for concealing and preserving provisions which it is inconvenient to carry.

Cactus, a juicy, herbaceous plant, generally without leaves, and thorny. The prickly pear is the most familiar example. The cactus has many grotesque forms, and some have gorgeous, lily-like flowers. Common as house plants.

They are very easy of cultivation, as the most of them may be regarded as half hardy in the Northern States. They are generally grown in pots, and are exposed to the out-door atmosphere, except in frosty weather. The night-blooming cereus is a homely twiner, which requires more care. Its value consists altogether in the singular large flower which it puts forth during an evening, to remain open but a few hours. These flowers are a source of a fine perfumery, to be had at the drug stores. The fruit of the prickly pear is liked by some as pickles, but has never been very popular. It grows wild in most sandy regions west of Indiana. A kind with smaller flowers and edible berries grows along the Atlantic coast.

Caddice, Caddis, Cadew, or **Cade-worm**, a kind of worm which is a favorite fish-bait.

Cafe (caf′ay), a coffee-house.

Caisson (ca′sn), a wooden box or frame of strong timbers, used for laying the foundations of a bridge in situations where the coffer dam cannot be employed. The word has also other meanings. The coffer dam is a water-tight enclosure or box of timber placed in the bed of a river, or some like position, for the purpose of excluding the water during the progress of some work, such as a wharf, or an abutment, or a pier. The water is pumped out of the enclosed space, leaving the bottom dry.

Cakes. A "cake," in general, consists of flour, sugar, butter, eggs, with yeast or milk and soda, and salt and spicing to taste. The thousands of recipes published for cakes amount only to the foregoing, with slight variations as to proportion; and it would seem that any person of ordinary judgment could make a cake to suit himself with no further directions than the mention of the above ingredients. To begin with, milk and sugar and egg constitute a rich dish of themselves, in all proportions. But, in order to secure fancy flavors and general success, many desire recipes, and we give many of them, alphabetically arranged as nearly as practicable.

General Directions. An oven to bake well should have a regular heat throughout, but particularly at the bottom, without which bread or cakes will not rise or bake well. An earthen basin is best for beating eggs, or cake mixture. Cake should be beaten with a wooden spoon or spatula; butter may be beaten with the same. Eggs should be beaten with rods or a broad fork; a silver fork, or one made of iron wire, is best, as it is broadest. Eggs should be clear and fresh for a cake. It is well, as a general rule in cake-making, to beat the butter and sugar (which must be made fine) to a light cream; indeed, in the making of pound cake, the lightness of the article depends as much upon this as upon the eggs being well beaten; then beat the eggs and put them to the butter, and gradually add the flour and other ingredients, beating it all the time. A pound of pulverized sugar is three cupfuls; a pound of sifted flour five cupfuls. In common cakes, where only a few eggs are used, beat them until you can take a spoonful up clear from the strings.

In receipts in which milk is used as one ingredient, either sweet or sour may be used, but not a mixture of both. Sour milk makes a spongy, light cake; sweet milk makes a cake which cuts like pound cake. To blanch almonds, which are used in many cakes, pour boiling water on them and let them remain in it until their skins may be taken off; then throw the almonds into cold water to whiten them; drain the water from them, but do not wipe them; the moisture will prevent their oiling.

In making cakes, if you wish them to be pleasing to the palate, use double-refined sugar, although light brown sugar makes a very good cake. For icing cakes, the sugar must be rolled and sifted, or pounded in a mortar. To ascertain whether a cake is baked enough, if a small one, take a very fine splint of wood and run it through the thickest part; if not done enough, some of the dough, or unbaked cake, will be found sticking to it; if done, it will come out clean. If the cake is large, pass a small knife blade through it instead of the splint. Cakes to be kept fresh should be placed in a tin box, tightly covered, in a cool, dark place.

Filling (to put between cakes). One egg, half-pint milk, half-cup sugar, one tablespoonful corn starch; scald together; make thick with grated cocoanut, or two-thirds cup of dessicated cocoanut soaked in the milk.

Frosting for Cake. Whites of eight eggs; two pounds of loaf sugar; half an ounce each of white starch and gum arabic, beaten till it looks white and thick; dry it in a cool oven. Or, take one cup of white sugar, add a very little water, and boil until it becomes a thick sirup. Just before it is done enough, beat the white of one egg to a froth, and pour the boiling sirup into it, beating it all the time. Continue to beat until it becomes very white and thick. Icing made in this way is very nice, and will not crackle or turn yellow.

Another: For one large cake use a pound of pulverized white sugar and the whites of two eggs; stir the sugar gradually into the whites; squeeze in the juice of half a lemon; stir well; put on one layer; let stand half an hour, then put on another. This makes a hard frosting.

Gelatine Frosting: One teaspoonful gelatine, two table spoonfuls of cold water; when the gelatine is soft, one tablespoonful of hot water. When entirely dissolved, add one cup of powdered sugar, and beat it while it is yet warm, until white and light; lemon to taste. This frosts one sheet of cake.

Almond Cake. Take one cup of butter, one cup and a half of sugar, three eggs, half a cup of milk, two teaspoonfuls of baking powder, about two cups of flour; flavor with a little almond extract; blanch one pound of almonds; lay aside enough to cover the top of the cake when they are cut in halves; chop the rest and put into the cake. After the cake is in the tin, lay the split ones over the top of the cake; they will rise and brown as the cake bakes.

Another: Two cups sugar, one cup butter, one cup sweet milk, four cups flour, three eggs, three teaspoonfuls of baking powder; bake in layers as for jelly cake. Instead of jelly, use one coffee cup of thick sour jam, one tablespoonful extract vanilla, one pound almonds, blanched and chopped fine. Sugar to taste. Make rather sweet.

Dried-Apple Cake. Stew two cups dried apples so as just to cut easily, and chop them fine as raisins, and boil them in two cups of molasses till preserved through. Then for the cake: drain the molasses from the apples and add to it one cup butter, two eggs, one cup sour milk, two teaspoons soda, four cups flour, and spice of all kinds; lastly, add the preserved apples.

Black Cake. Two pounds of currants, two pounds of raisins (after washing both currants and raisins; when they are dry, dredge with flour), one large spoonful of ground cinnamon, one large spoonful of ground mace, four nutmegs, one gill of

molasses, one gill of brandy, one gill of rose water, if you choose; sift one pound of flour into one pan, and one pound of sugar into another; add to the sugar three quarters of a pound of butter and stir to a cream; beat six eggs light and stir into the butter and sugar alternately with the flour, then add by degrees fruit, spice and liquors, and stir hard. Bake in a moderate oven about four hours; let it remain in the oven to cool.

Bread Cake. Three large teacups light dough, one teacup sugar, one-half cup butter, one egg, a small teaspoonful of saleratus dissolved in as little water as possible; spice to taste; have in a pan, and mix with the hand, as it cannot be done with a spoon; grease the pan or pans, leaving room to rise, and when very light, bake. If you wish the cake richer, add butter and sugar. Do not use the dough until light enough to bake.

Another: When you mold your bread in loaves reserve a small loaf, to which add one cup of raisins, one of fryings, one pint of sugar, one cup sour cream, three eggs, five teaspoons soda, one of cloves, one of cinnamon; mix well; add half a cup cold coffee, one nutmeg, and enough flour to mold in loaves. Set in warm place to rise, and bake one hour.

Breakfast Cakes, for warm weather. Take one cup of molasses, one cup of brown sugar, nearly one cup of butter, or lard and butter mixed, one cup of sour milk, four cups of flour, four teaspoonfuls of soda, not heaping but even full, one teaspoonful each of cinnamon, salt and ginger; one egg; bake in gem tins. These will keep well for a week.

Another: Take enough bread sponge to make, when risen and baked, a cake two inches thick; knead into it a piece of butter about the size of half an egg; after it is in the tin put on the top little lumps of butter and then cover it with fine white sugar and ground cinnamon; when baked there will be a sort of crust over the cake. This is very nice with coffee.

Bride Cake. Beat two cups of sugar and three-fourths of a cup of butter to a cream. Beat three eggs, whites and yellows separately. Add the beaten yolks to the butter and sugar; beat well and then add three-fourths of a cup sweet milk; add the beaten whites; two teaspoonfuls baking powder mixed in three and a half cups of flour; add this to the other and mix well; beat very little; one teaspoonful soda, if sour milk is used in place of baking powder.

Chocolate Cake. Two cups of sugar, one-half cup of butter, whites of three eggs, one cup of milk, two and three-fourths cups of flour, three teaspoonfuls of baking powder; bake on jelly-tins. To the whites of two eggs, well beaten, with not quite a cup of pulverized sugar, add six tablespoonfuls of grated German sweet chocolate, and two teaspoonfuls of vanilla; spread on the cakes.

Cocoanut Cake. Four cups of flour, three of sugar, one cup of milk, five eggs, beaten separately (save the whites of three for icing), one cup of butter, two teaspoonfuls of cream of tartar, one teaspoonful of soda, the half of a cocoanut grated and put into the cake, the other half put with the whites of three eggs and half a cup of powdered sugar, with a little orange water or lemon juice for the icing; bake the cake in jelly-pans; when done spread the icing between and on top; put in the oven for a few minutes.

Another: Three eggs, two cups sugar; one cup milk, two tablespoonfuls melted butter; mix together; three cups flour, two teaspoonfuls baking powder. Bake in sheets.

Cocoanut Cookies. Two cups of sugar, one of butter, two eggs, half a grated cocoanut, with flour; roll thin and bake.

Cocoanut Dulcies. Grate half of a medium-sized fresh cocoanut, and add to this a quarter of a pound of pulverized sugar. Beat the whites of three eggs to a froth, and mix. If a little thin, add a dust or so of corn starch. Take a piece of writing paper, butter it and lay it in a pan. Take a spoonful of the mixture, and pour it around on the paper. Oven must not be too hot. Time to cook the dulcies, eight to ten minutes.

Coffee Cake, or "Kaffee Kuchen," requires one pound of risen dough ready for the oven, quarter pound of sugar, three ounces of butter, one egg. Cream the butter and beat it well with sugar and egg; add the dough and mix thoroughly with the hand and leave it in a warm place to rise. When light pour it in thinly over a pan (when baked it must not be more than two inches thick) and let it stand to rise for about ten or fifteen minutes in a warm place, then put it in the oven, and while it is baking prepare the icing. Have ready two dozen almonds previously blanched. Beat the whites of two eggs with enough fine sugar to stiffen them, putting the sugar in very gradually. Shred the almonds and stir them with the icing; spread all out over the loaf of cake, and leave it to dry in the mouth of the oven. If the almonds brown a little, it improves the icing. Cut for the cake plate in oblong slices.

Another: One cup sugar, two-thirds cup butter, one cup molasses, one cup raisins, one egg, one teaspoonful soda (level full) in one cup coffee to be added the last thing: add citron and currants and flour to make the right stiffness.

Another: One cup brown sugar, one cup molasses, one-half cup each butter and lard, one cup cold coffee, two eggs, one tablespoonful cinnamon, and one of cloves, one grated nutmeg, one teaspoonful soda, flour, one pound each of currants and raisins.

Cookies. Rub to a cream three-quarters of a pound of butter and a pound of sugar; add three

well-beaten eggs, two spoonfuls of caraway seed, a grated nutmeg and a pint of flour; stir in a teaspoonful of saleratus dissolved in a teacup of milk, and strained into half a teacup of cider; add flour to make the cookies stiff enough to roll out. As soon as cut into cakes, bake in a quick oven till of a light brown.

Another: Three eggs, two and a half cups sugar, one heaping cup of butter, not quite a cup of sour milk, a little nutmeg, one teaspoon soda, and one of baking powder, sifted in the flour.

Another: One cup of butter, two of sugar, two eggs, well beaten, one-half teaspoonful of soda in three tablespoonfuls of sweet milk; nutmeg to taste, and flour enough to roll out without sticking; roll thin and bake in a quick oven. Made in this way they will almost melt in your mouth. Some think cookies are best when ten days old, but can never keep them that long.

GINGER COOKIES. One cup of sugar, one cup molasses, one cup of lard, two-thirds cup of boiling water, one egg, one teaspoonful cream of tartar, one tablespoonful ginger, one teaspoonful soda, one teaspoonful salt.

MOLASSES COOKIES. Take two cups of molasses, one cup of sugar, two cups of butter, four teaspoonfuls of alum, put in two cups of boiling water, four teaspoonfuls of soda and flour enough to roll out.

COMPOSITION CAKE. One pound of flour, one cup of sugar, half a pound of butter, seven eggs, half a pint of cream.

CORN-STARCH CAKE. Half pound corn starch, half pound wheat flour, six eggs, half pound butter, one pound sugar, one small cup sweet milk, two teaspoonfuls baking powder.

CREAM CAKE. One cup sugar, two eggs, four tablespoonfuls boiling water, one scant rounding teaspoonful baking powder, one cup and a half of sifted flour. Beat sugar and eggs together, mix baking powder with the flour, and stir slowly in, putting the boiling water in last, a spoonful at a time. Bake in two or three tins. The cream for same is one-half pint milk, one-half teacup sugar, small piece of butter, one heaping tablespoonful of corn starch, one egg or none. Cook thoroughly. If egg is used, stir in just before taking from the fire. When nearly cold flavor with vanilla or lemon to taste and put between the layers.

Another: Two eggs, one and a quarter cups white sugar, eight tablespoons cold water, flour to make rather stiff, in which put two teaspoons baking powder. Bake in two pie pans. Cream for cake: Place two-thirds cup sweet milk in skillet on stove, to which add the following: two eggs, two-thirds cup sugar, one and one-half tablespoons of corn starch wet with a little milk; boil until thick, stirring all the time; empty into a bowl, add one tablespoonful of butter, one teaspoon extract of vanilla; split open your cakes, place the cream on them, and put the top back again.

Another: Three cups sugar, one of butter, and one of sweet cream, five eggs, four cups flour, two teaspoonfuls baking powder; beat well.

Another: Boil together half a pint of water and two-thirds of a cup of butter; while boiling stir in one and a half cups of flour thoroughly; let it then cool sufficiently not to cook the eggs, five of which are to be well beaten, and the whole mixed together; drop on tins a spoonful in a place, and bake in a very hot oven twenty or thirty minutes. It will make two dozen. For the cream boil a pint of new milk, stirring in beaten together two eggs with one cup of sugar, and not quite a cup of flour; boil a little, stirring briskly; when cool, flavor with lemon; open the cakes at the side with a sharp knife and pour in the cream.

CUP CAKE. Nine cups of flour, four of sugar, two of butter, half a cup of milk, two spoonfuls of saleratus, eight eggs; spice to your liking.

CURRANT CAKE. Put a pound of flour into a bowl, and with it a pinch of salt, and a large heaped teaspoonful of baking powder. Mix thoroughly. Rub in a quarter of a pound of good beef dripping, and add half a pound of currants picked and dried, a quarter of a pound of sugar, one ounce of citron peel thinly cut, and half a teaspoonful of grated lemon-rind. Make into a stiff paste with milk, and bake in a good oven.

WHITE DELICATE CAKE. Three cups of sifted flour, one and a half cups of sugar, whites of seven eggs, one teacup of sweet milk, two tablespoonfuls of butter, two heaping teaspoonfuls baking powder, and teaspoonful extract of vanilla, almond or lemon. Beat the butter and sugar to a cream, add to it the milk and eggs well beaten, then add the extract. Mix with this very slowly three cups of flour, in which the baking powder has been well mixed. Bake in a quick oven. It makes a delicious cake for jelly, chocolate or cocoanut layers. If the latter is used, grate a large cocoanut, removing the brown skin first; then add to it the beaten white of one egg and one coffee cup of fine sugar. Stir it all together and spread between the layers of cake, icing the upper layer. This receipt will make three layers of cake and a plateful of small frosted cakes.

DELICATE CAKE. Whites of eight eggs, one cup of butter, two cups of white sugar, three cups of flour, two teaspoonfuls baking powder. Flavor with lemon or vanilla. Stir butter and sugar to a cream, add one cup sweet milk, and then the flour, adding the beaten whites last. This is excellent.

DROP CAKES. Mix half a cup of butter, one of sugar, a quarter of a cup of milk, half a cup of flour, two eggs, and a half a teaspoonful of baking powder into a batter: flavor with vanilla and beat until light. Butter dripping pans and drop in teaspoonfuls, leaving plenty of room between each.

Bake in a quick oven; they should be brown on the bottom, crisp around the edges, almost white on top, and extremely thin.

Another: One pound of flour, one pound of sugar, eight eggs, leaving out half of the whites; rose-water, and nutmeg to your taste.

ONE-EGG CAKE. One and one-third cups of flour, one-third cup of sweet milk, one cup of sugar, one tablespoonful of melted butter, one egg and two tablespoonfuls of baking powder.

AN "EGGLESS CAKE." A recipe for eggless cake may not come amiss when eggs are twenty cents or more per dozen: Two cups sugar, one-half cup butter, two cups milk, one cup raisins, four cups flour, one teaspoonful soda; spice to taste. All young housekeepers may not know that cake is very much nicer mixed with the hands, or frosting for cake is just as nice made without beating the egg at all. Just stir it stiff with sugar, and apply to your cake with a knife wet in cold water, and wet your knife occasionally all through the process of frosting the cake.

FEATHER CAKE. Two cups of sugar, one-half cup of butter, one cup of sweet milk, three cups of flour, three eggs, beaten separately, one teaspoonful of soda, and two of cream of tartar. Flavor with the rind of a fresh lemon. Bake in jelly-tins. It is also nice if baked in a loaf and frosted.

FIG CAKE. Two cups of sugar, one of butter, one of cold water, with a teaspoonful of soda dissolved in it, three cups of raisins, chopped fine, cinnamon and nutmeg, four eggs, one pound of figs; use the figs whole, covering them well with the cake to prevent burning. Bake in layers, frosting between each layer. Make as stiff as pound cake. Cut with a very sharp knife to prevent crumbling. This receipt makes two loaves.

FISH CAKES. One pint bowl salt codfish, picked very fine; two pint bowls of whole, raw, peeled potatoes; put together in cold water and boil till the potatoes are thoroughly cooked; remove from fire and drain off all the water; mash with potato-masher; add piece of butter the size of an egg, two well-beaten eggs, and a little pepper; mix well with a wooden spoon; have a frying-pan with boiling lard or drippings, into which drop a spoonful of mixture and fry brown; do not freshen the fish before boiling with potatoes, and do not mold cakes, but drop from spoon.

FRUIT CAKE. The material should be prepared a day or two before the cake is made, and put the cake together in the morning in order to have plenty of time. Have everything ready, even to the pans lined with paper, and well buttered, that you need not stop after you commence mixing the cake. Take three pounds each of flour, sugar, butter and raisins, six of currants, one of citron, two dozen eggs, one ounce each of mace, cloves, nutmeg, cinnamon, half a pint of brandy. To mix: Stir the butter with your hand to a cream, then beat the sugar into the butter, add the yolks of the eggs well beaten, then the whites beaten to a froth; mix the fruit, spice and flour together; then beat them in gradually; add the brandy last. The usual way of testing the cake with a smooth needle or straw is the best in this as other cases.

Another: One cup molasses, one pound flour, one of sugar, three-fourths of a pound of butter, two pounds of seeded raisins, three of currants, one of citron, half a pound of blanched almonds, half an ounce of mace, one wineglassful brandy, ten eggs; cream the sugar and butter, add the eggs, beaten separately; stir in the flour, brandy, spices, and then the fruit.

Another: Two cups of flour, two of sugar, one of butter, one of molasses, five eggs, one pound of currants, one pound of raisins, one teaspoonful of saleratus, one nutmeg, one teaspoonful of all kinds of spice. A little brandy improves it.

Another: Two eggs, one cup sugar, two-thirds cup butter, one cup fruits, half teaspoonful soda.

GINGER CAKE. One pint molasses, half-pint shortening, half teacup of water with tablespoonful of soda dissolved in it, two tablespoonfuls of ginger, two eggs; knead in flour to roll out easily; cut in squares size of soda crackers; with back of knife stripe them; bake in quick oven; soon as taken out frost slightly with icing; the dough can be prepared night before.

SOFT GINGER CAKE. One cup of molasses, one heaping teaspoonful of lard, one teaspoonful of ginger, one cup of buttermilk, one teaspoonful of soda, a pinch of salt. Flour enough to make a batter, and bake in flat pans.

SOFT GINGERBREAD. One and one-half cups sorghum molasses, two eggs, one cup of sour cream, one teaspoonful of soda, one spoonful of ginger and a pinch of salt. Stir about as thick as any stirred cake.

Another: One tablespoonful butter, one tablespoonful ginger, one-half cup brown sugar, two cups molasses, two cups water or sour milk, one and a half teaspoonfuls soda; do not stir very long; bake in a moderate oven.

OLD FASHIONED GINGERBREAD. Take four quarts of sifted flour, one quart of molasses, one tablespoonful of soda; dissolve in as little water as possible; add to molasses one tablespoonful of ginger and one-half pound of butter, and last, one tablespoonful of alum dissolved in half a teacupful of boiling water; mix as soft as can be rolled, and cut in cards. It will keep for months.

GRANDMOTHER'S GINGERBREAD. Take one pint of molasses, eight tablespoonfuls of shortening, one teaspoonful of soda, a small tablespoonful of ginger, and a little salt if you do not use butter for shortening; roll it in strips four inches wide and mark it off with a knife.

Mother's Gingerbread. One cup of butter, one of brown sugar, one of sour cream, two of molasses, one tablespoonful soda dissolved in boiling water; spice to taste; flour to roll out as thin as possible.

Excellent Ginger Snaps. Put into a tin pan two cups of molasses, one cup brown sugar, two-thirds of a cup of lard, one tablespoonful ground ginger. Put the tin on the stove, and let it boil until they thicken a little, then add a heaping tablespoonful of soda, dissolved in one-half cup of tepid water; mix thoroughly before taking from the stove; then add flour enough to make pretty stiff dough. Roll very thin. Cut with a large tin (as they "shrink" a good deal), and bake in a quick oven. These are as good as you get in the bake-shop.

Another: Work a quarter of a pound of butter into a pound of fine flour, then mix it with a half pound of molasses, a quarter of a pound brown sugar, and one tablespoonful each of ginger and caraway seeds. Work it all well together, and form it into cakes not larger than a dollar piece; place them on a baking tin in a moderate oven, when they will be dry and crisp.

Another: One teacup molasses, half a cup brown sugar, two-thirds cup lard or butter, half a cup sour milk, tablespoonful ginger, two teaspoonfuls soda.

Ginger Jumbles. Molasses, three pounds; sugar, one pound; ginger, one and a half ounces; butter, half pound, rubbed in two pounds of flour; put in small lots on tins and bake.

Gingerbread Nuts. One pound of sugar, two pounds of molasses, three-quarters of a pound of butter, four pounds of flour, four ounces of ginger, one ounce of allspice, two spoonfuls of coriander seed, some candied orange peel, two spoonfuls of brandy, yolks of four eggs. Mix the sugar, molasses and butter, and melt all together, then stir in the flour, ground ginger, allspice, coriander seed, and the orange peel, cut very small. Mix all into a paste with the eggs well beaten, and the brandy, and make them into nuts or cakes.

Hickory-nut Cake. Two cups sugar, one of milk, two-thirds cup of butter, three of flour, three eggs, two teaspoonfuls baking powder, one cup nut kernels cut fine.

Ice Cake. Ten eggs, one pound sugar, half a pound of flour, two lemons. Beat whites and yolks separately; add to all the yolks and whites of seven eggs the sugar, the rind of two lemons, and juice of one. Bake as for jelly-cake. To the whites of three eggs allow a pound and a quarter of powdered sugar; beat stiff as for icing, take out enough to cover the top of the cake, and set aside. Add to the rest the juice and half the grated peel of a large orange. When the cake is nearly cold, spread this between the layers. Beat into the icing reserved for the top a little lemon juice, and, if needed, more sugar. It should be stiffer than that spread between the cakes.

Jelly Cake. Beat three eggs well, the whites and yolks separately; take a cup of fine white sugar and beat well with the yolks, and a cupful of sifted flour stirred in gently; then stir in the whites, a little at a time, a teaspoonful of baking powder and one tablespoonful of milk; pour it in three jelly-cake plates, and bake from five to ten minutes in a well-heated oven, and when cold spread with currant jelly, and place each layer on top of the other and sift powdered sugar on the top.

Roll Jelly Cake. One cup of white sugar, half a teacupful of sweet milk, two eggs, one cup of flour, one teaspoonful of cream of tartar, one-fourth teaspoonful saleratus, a pinch of salt. This will make two cakes in a square tin. Have the oven ready, put the cakes in, and while they are baking get a cloth and the jelly ready for the table. As soon as they are baked, take them out, and turn them one at a time on the cloth; spread quickly with jelly or marmalade, and roll up tightly in the cloth, and lay them where they will cool. Handle them carefully or they may fall. Cut them in slices with a sharp knife. This will be as nice jelly cake as you will want to eat, and will not taste of eggs. You can flavor them with anything you like, if you choose to do so. You can also bake one cake at a time; it will not hurt the mixture to stand.

Snow Jelly Cake. Beat two eggs in a teacup and fill up with rich, sour cream; one teacup of white sugar, one cup of flour, a little soda; not quite half a teaspoonful unless the cream is very sour. Bake in four round tins and brown as little as possible. Have a jelly prepared by soaking four tablespoonfuls of tapioca in warm water until transparent, then add more water and place your dish in boiling water on the stove and cook until a transparent jelly; flavor strong with lemon, almond, or wintergreen. Gelatine is just as nice as tapioca. This cake is not expensive and is very nice and can be eaten by dyspeptics.

Jumbles. Take four eggs, three cups of sugar, a little nutmeg, a teaspoonful of saleratus, a cup of butter. Stir in the flour till it will roll; cut it in rounds with a hole in the center. Roll them in sugar.

Lemon Cake. Three cups of sugar, five eggs, three-fourths cup butter; beat together. Add one-half cup of sweet milk, two teaspoonfuls of cream tartar, one teaspoonful of soda; dissolve in a little water; juice and rind of one lemon grated, and flour to mix. Bake slow. This makes a large cake, and enough for two layers of jelly cake.

Lemon Cheese-Cakes. Just warm a quarter of a pound of butter, stir into it a quarter of a pound of sugar pounded fine, and when dissolved mix

with it the peel of two lemons grated and the juice of one strained. Mix all well together, and pour it into patty-pans lined with puff paste. Put a few blanched almonds on the top of each.

Lemon Puffs. Beat and sift a pound and a quarter of loaf sugar, and mix with it the peel of two lemons grated; whisk the whites of three eggs to a firm froth, add it gradually to the sugar and lemon, and beat it all together for one hour. Make it up into any shape you please, place the puffs on oiled paper on a tin, put them in a moderate oven and bake.

Loaf Cake. Take two pounds of flour, half a pound of sugar, a quarter of a pound of butter, three eggs, one gill of milk, one-half teacupful of sweet yeast; cloves and nutmegs for spice.

French Loaf Cake. Two cups of white sugar, one scant cup of butter, one cup of sweet milk, three heaping cups of flour, three eggs, two teaspoonfuls cream of tartar, one teaspoonful soda. Put sugar, butter, eggs (not previously beaten), soda, and cream of tartar all together; beat to a froth; add the milk, beating well; flavor with lemon extract; add the flour gradually; pour into a cake tin lined with buttered paper; sprinkle a little powdered sugar over the cake before baking. It is well to cover it when first putting in the oven, in order not to harden the top too soon.

Chocolate Macaroons. Beat the whites of two eggs to a stiff froth. Add gradually eight tablespoonfuls of powdered sugar, and when well mixed sift in half a teaspoonful of baking powder mixed with two tablespoonfuls of corn-starch or flour, and four tablespoonfuls of grated chocolate. Drop on buttered paper and bake in a moderate oven until well done.

Marble Cake. White part: Whites of four eggs, one cup white sugar, half cup of butter, half cup of sweet milk, two teaspoonfuls of baking powder, one teaspoonful of vanilla or lemon, and two and a half cups of sifted flour. Black part: Yolks of four eggs, one cup brown sugar, half cup molasses, half cup butter, half cup sour milk, one teaspoonful cloves, one teaspoonful cinnamon, one teaspoonful mace, one nutmeg, one teaspoonful soda, and one and a half cups sifted flour. Put it in the cake dish alternately, first one part and then the other. The tin should be lined with buttered paper.

Molasses Cake. Two cupfuls of molasses, one cupful of lard, three-quarters of a cupful of water, one tablespoonful of ginger, three teaspoonfuls of saleratus dissolved, flour enough to make it as stiff as pound cake dough.

Plum Cake. One pound of dry flour, one pound of sweet butter, one pound of sugar, twelve eggs, two pounds of raisins (the Sultana raisins are the best), two pounds of currants. As much spice as you please. A glass of wine, one of brandy, and a pound of citron. Mix the butter and sugar as for pound cake. Sift the spice and beat the eggs very light. Put in the fruit last, stirring it in gradually. It should be well floured. If necessary, add more flour after the fruit is in. Butter sheets of paper, and line the inside of one large pan, or two smaller ones. Lay in some slices of citron, then a layer of the mixture, then of the citron, and so on till the pan is full. This cake requires a tolerably hot and steady oven, and will need baking four or five hours, according to its thickness. It will be better to let it cool gradually in the oven. Ice it when thoroughly cold.

Pound Cake. One pound of flour, one pound of sugar, one pound of butter, ten eggs, rose water and nutmegs.

Raised Cake. Three cups of new milk, one cup of yeast, two cups of sugar; work it into a stiff batter in flour; let it rise over night; in the morning put in one and a half cups of butter, one more cup of sugar, one teaspoonful of soda dissolved in milk; put in spices and raisins as long as you can stir it with a spoon.

Raisin Cake. Put ten ounces of flour into a bowl, and add a small pinch of salt and two teaspoonfuls of baking powder. Rub in four ounces of butter or clarified dripping, and then add two ounces of moist sugar, four ounces of Sultanas, an ounce of candied peel, a teaspoonful of grated lemon-rind, one egg, and milk to make a stiff paste.

Another: Two-thirds of a cup of butter and one and a half of sugar, two-thirds of a cup of milk, three of flour, one of chopped raisins, three eggs, a teaspoonful and a half of baking powder. Bake in sheets in a quick oven.

Rice Cake. Put half a pound of rice to soak over night; boil very soft in the morning, drain off the water, mix it with four ounces of melted butter, and set it away to cool. When cold stir it into a quart of milk, adding a little salt; then stir in, alternately, six eggs, and half a pint of sifted flour. Beat all well together, and bake on the griddle in cakes about the size of a small dessert plate. Butter and send them to the table hot. Instead of preparing the rice, cold boiled rice makes very nice cakes, mixed and cooked as the prepared.

Sand Tarts. One pound of sugar; half a pound of butter; one whole egg and the yolk of another; one pound of flour, with two teaspoonfuls of baking powder sifted with it. Make a stiff paste, roll thin and cut with a biscuit cutter; wash them with beaten white of an egg; strew over powdered sugar and cinnamon, and lay a few blanched almonds on top.

Silver Cake. Beat half a cupful of butter with a cupful of sugar; the whites of four eggs beaten to a stiff froth; half a cupful of milk; 2½ of flour, two teaspoonfuls of baking powder; flavor to taste.

SHORT CAKE. When the dough is ready to be rolled, cut it in two parts; roll one-half of it the proper size, put it in the tin and spread butter over the top, then roll out the other half and lay on. When the cake is baked, the top layer is easily lifted off, and there is no danger of its falling, as sometimes happens when a cold knife is used to cut it. Delicious shortcakes may be made with blackberries, peaches, oranges and pineapples chopped fine, as well as with the time-honored strawberry.

SNOW-BALL CAKE. Whites of three eggs, one cup white sugar, one-half cup butter, teaspoonful soda; stir thick, and bake in small tins.

SOUR-MILK CAKE. One cup of sour milk, one cup of sugar, one-half cup of butter, two cups of flour, one egg, one level teaspoonful of soda, half cup of raisins, chopped, and spiced to taste.

SPONGE CAKE. Three eggs, one cup sugar, one cup flour, one heaping teaspoonful baking powder, four tablespoonfuls boiling water. Break the eggs into the mixing dish, beat till light; stir in the sugar; sift the flour and stir the baking powder thoroughly through it, and mix gradually into the sugar and eggs, then add the boiling water, a spoonful at a time; add a little salt, flavor to taste and bake in a moderate oven. The same recipe baked in a large dripping pan and spread with jell, makes a nice roll jell cake. Turn out on a cloth and roll it with the cloth under it to keep it from breaking.

CHEAP SPONGE CAKE. Four eggs, three cups of sugar, one cup of milk, one teaspoonful of saleratus, flour enough to make a good stiff batter, a little salt and spice; quick oven. Bake it twenty minutes.

TEA CAKE. Take four cups of flour, three of sugar, one of butter, three eggs, one cup of milk, one spoonful of saleratus.

WAFERS. One pound of flour, quarter of a pound of butter, two eggs beaten, one glass preserved quince juice, and a nutmeg.

FRIED WAFERS. Two eggs, two large spoonfuls of sugar, one nutmeg, flour enough to knead up hard; roll thin.

WAFFLES. Beat carefully into one quart of flour one quart of sweet milk, one cup of melted butter, half a teaspoonful of salt, and a scant half cup of good home-made yeast. When raised, add two eggs well beaten, and let the batter rise half an hour longer. Bake as soon as light in hot, greased waffle-irons.

RICE WAFFLES. A pint bowl of cold boiled rice, thin it with cold milk, one well beaten egg, a small piece of butter, and flour to make a batter stiff enough to bake.

WEDDING CAKE. One pound of butter, one pound of sugar, nine eggs, one pound of flour, three pounds of currants, two pounds of stoned raisins, one-half teacup of wine or brandy, from one-half to three-quarters of a pound of citron, one grated nutmeg, some mace and cinnamon. Rub the butter and sugar together; when light, add first the yolks and then the whites of the eggs,—the yolks and whites of the eggs to be beaten separately,—then put in nearly all your flour, keeping out just enough to dust your raisins and cement them; cut your citron in such slices as you like, and put in as you put the cake in the pan; after mixing your fruit in the cake, grease a four-quart pan carefully, line it with clean straw paper, a little butter on the paper; put your cake in and bake, in not too quick an oven, for it burns easily. After it is baked take it out of the pan, paper and all, and let it cool. The next day, to keep it fresh and moist, put it back in the pan, or in a tin cake-box, and keep it tightly covered.

Calash, a light carriage with low wheels, having a top or hood that can be raised or lowered, seats for four inside, a separate seat for the driver, and often a movable front, so that it can be used either as an open or close carriage; also, a carriage top which can be easily thrown back.

Calcimining. To put two coats on a room 12 by 15 feet, get five pounds of Spanish whiting and one-half pound of white glue. Some prefer Paris white (zinc white). Pour a pint of boiling water on the glue, and set in a warm place, stirring frequently till it dissolves. The glue will soak in an hour, or it can be soaked over night. Mix the whiting to a cream with warm water, and add the glue, stirring well. If too thick to spread easily, thin with water. Now try a little on the wall, and if it rubs off when dry, add more dissolved glue; but the above amount will make it stick if the glue is good. Shade with any dry color. Some use one-fourth pound of blue, and it makes French gray.

To make white, put in ultramarine blue; take enough to make it about three shades on the blue; mix it well with water, then strain into your calcimine; try it on some wall, and let it dry, and see if it is the right shade. The trouble with calcimine, it is often put on too thick, causing it to scale off. To make a job, one must put on three coats. Making drab, burnt amber, dry; buff, chrome yellow; stone, raw amber and blue; peachblow, chrome yellow and red, dry; lavender, blue and red; crimson, rose-pink; mix with water and strain through fine cloth. Sweep the walls thoroughly with a stiff broom, and scrape grease spots, and fill all cracks or holes with whiting, made into putty with water, and allow time for the mending to harden. If the walls are very dirty wash them first with a half pound of glue dissolved in a gallon of water, and then apply the calcimine with a whitewash brush. Put on the ceiling first, always passing the brush in the same direction, say north and south. In putting on

the second coat, pass the brush east and west, and your ceiling will not be streaked. In doing the walls go around for the first coat and up and down for the second.

If the walls have been previously whitewashed, wash them first with solution of two ounces of white vitriol in two gallons of water. Ceilings that look rough and are inclined to peel, should be washed with a solution of one ounce of alum in one quart of water.

Calcine (cal-sine′, or cal′sin), to reduce to a powder or brittle state by heating; or, to expel some volatile matter from, as carbonic acid from limestone; to oxidize.

Calculus (cal′cu-lus) is sometimes found in the excretory canals and other reservoirs of a human or animal body. They are solid, hard concretions, like stones in appearance. The remedy consists of almost any alkaline substance, especially the popular diuretics, as soda and carbonate of potash. Thorough, scientific treatment, however, requires the services of a skillful, conscientious physician.

Calipers (cal′i-pers), or **Caliper Compasses,** are compasses with curved legs, for measuring the caliber, or diameter, of round bodies.

Call-bird. a bird taught to allure others into a snare.

Call Loan, money lent by a banker or other person, secured by the deposit of stocks, bonds or other marketable securities, to be repaid when called for. A failure to repay within 24 hours after due is regarded as authority to the lender to sell the securities in his possession.

Callous, hardened, as flesh.

Callus, new growth over the end of a cutting, in plants.

Calves. The feeding and care of calves are matters which are often left to the calves themselves and their dams. One of the essentials of beginning a good breed, however, is the proper care of young calves. When the calf is permitted to run with the cow for a few months, and then left to take its chances for food on the pastures with other cattle, a runt is often the result, and it will remain a runt, even if it be of the largest and best breed. There is no food so good as mother's milk to develop a calf, and if really excellent stock is to be raised, the calf should be allowed to run with the mother for three months at least. But now, in the older States, milk has become so valuable that few stock-raisers can afford to give up the profits of the milking season for the benefit of the calf. An artificial method of feeding has therefore to be adopted. Food should be given the calf that most resembles the mother's milk. At first warm new milk should be used, and this should be continued until the calf is fully taught to drink. The calf can be taken from the cow when it is a week or ten days old, and can be taught to drink by inserting the finger into the mouth, wetting the nose with milk, and dropping the hand into it. Thus the calf will continue to suck the finger, and gradually learn to draw in the milk and swallow it. If the calf is obstinate and impetuous, and is inclined to butt, hold its head firmly, pressing it gently into the vessel so that its nose shall constantly touch the milk, but not so deeply as to strangle the calf. A little patience will, after a day or two, do the work; but occasionally a calf is so obstinate as to render it almost impossible to teach it to drink, and some will even pine and die before they will drink anything but mother's milk. Such are not worth the trouble of raising. After the calf has been thoroughly taught to drink, skim-milk can be gradually substituted for new; this should be made more nutritious by the addition of shorts or coarse wheat flour, scalded, flax-seed meal, or oat or corn meal, treated in the same manner. Great care should be taken to keep the animal dry and warm, and it should be fed three or four times a day. When it is a month or six weeks old it can be turned out to pasture, but separated from the older cattle; but it should always be confined under shelter of nights and stormy days. Feeding twice a day will now be sufficient. When it is three months of age the calf should be taught to rely on the solid foods, and at four months the milk can be discontinued entirely, though the longer the milk is continued the thriftier will be the growth of the calf. It should be faithfully watered. Calves take readily to thickened milk in the summer months, and devour it with avidity. When they are two to three months old they are often allowed to drink whey, but this is not a valuable food for calves, and they should never be forced to live on it exclusively. The stock-raiser should constantly aim to give the growing animal all the well-adapted, nutritious food it will take with a relish, always remembering that to make stock-raising profitable the animal should be brought to the earliest possible maturity. The practice of "deaconing" calves is large at the East, where dairy products are high, and the food supply scant and hard to be obtained. "Deaconing" is killing the calf as soon as the cow's udder is sufficiently drawn down as to reduce inflammation and prevent caking. This is done so that the dairymen can have an immediate use of the cow's milk for dairy purposes or for sale, and is thought to be more profitable than raising the calves. But in the West, even in the dairy districts of Illinois, Wisconsin and Iowa, this is not much practiced, the abundance and cheapness of forage crops and grain food being such that it is thought more profitable to rear the

calves, especially those that promise to make good dairy stock. The first winter of a calf's life is its critical period. It is the time of severe weather and change of food, and a time when shiftless farmers abandon the calves to the inclemencies of the season and a make-shift way of procuring their food about stacks, among the larger cattle in the yard, and oblige them to seek shelter in the same vagrant fashion. The result is that the best calves run down in flesh, become hide-bound and grubby, and often, toward spring, die of sheer neglect. The opposite method should be practiced. First, calves in winter should be warmly housed, but with ample ventilation. Their sheds or stables should never be damp, close or stuffy, and they should be carefully cleaned each day. Besides plenty of hay they should have other food, like a mixture of corn meal, oats, oil-meal, etc.; but more essential than all is the feeding of roots during the winter. Calves, unless rightly fed, are apt to become constipated in the cold season. This can be prevented by a liberal feeding of roots. For this purpose carrots are the best, though beets, turnips and potatoes can be used. The object should always be a healthy, full feed in the treatment of young animals, and an avoidance of permitting them to run down and stop growing. In this way only can profit be secured in raising calves.

Diseases. The best medicine for the young calf is the first milk of the cow, which it should always be permitted to take. Bleeding at the navel may be safely stopped by tying a string around the cord hanging from it.

Diarrhœa is the disease most dangerous to calves. It is brought on by neglect, exposure, over and under feeding. The first thing to do is to remove the acidity of the stomach. Ounce doses of rhubarb and magnesia may be given with the milk. Two ounces of Epsom salts or two ounces of castor oil will often succeed. Follow with a light astringent. Prepared chalk, two drams, or magnesia one ounce, powdered opium ten grains, powdered catechu half a dram, tincture of capsicum two drams, essence of peppermint five drops. Mix and administer twice daily in milk or gruel.

Castration. When the bull calves are three weeks old, if in good health, they should be castrated. It should certainly be done before they are four weeks old. Many of the best stock-raisers incline to the opinion that as soon as the calf begins fairly to gain size and flesh, say at two weeks old, is the proper time. Every person who purposes to breed cattle should know how to do this. The operation is quite simple, and easily performed.

Secure the calf so it may remain standing on its feet, but cannot struggle severely. Have a knife ready with a keen-edged blade. The blade of a budding-knife is the proper shape. Seize the scrotum from behind, and with two light, swift, sharp strokes cut through and into the testicle. Separate the membrane where it unites, pull the testicle out until the cord shows from four to six inches, and cut it with a pair of nippers or rather dull shears. It will save loss of blood. So operate with the other, and the work is done. If from any cause severe bleeding ensues, inject a little tincture of muriate of iron into the cavities, and wet a soft rag with the tincture and press it well into the cavity. If these be not at hand, push a little salt and lard into the cavity. If the operation has been carefully performed, nothing will generally be required. The calf should be kept free from interference by other animals until the parts are healed, which will usually occur in a week. If they have been used to the company of other calves, they should not be deprived of it now, else they will pine. One reason why we advise early gelding is, it should be done before the calf is taken off of new milk, and it should not be deprived of the natural milk until it recovers from the shock. Care must be taken that flies do not get near, to deposit their eggs in the parts operated on. To prevent this, if there are flies, keep the calves in a pretty dark, but well ventilated, place. Most persons will find it awkward at first to geld as we have directed. A little practice, however, with tact and firmness, will render all easy, especially if one can have the advantage of seeing an expert operate once. If suppuration ensues, recourse must be had to mild palliative measures. Keep the parts washed clean, twice a day, with warm rainwater and castile soap, and inject a small quantity of tincture of aloes and myrrh. If the parts become unhealthy or ulcerated (for mere suppuration is healthy action), wash with a weak and clear solution of sal soda, or hard-wood ashes. If proud flesh should arise (a rare occurrence), burnt alum, pounded very fine, may be applied, or the parts may be touched with lunar caustic.

Calyx, the leaf-cup of the flower. The calyx of an apple or pear is the blossom end, which is opposite the stem or stalk end.

Cam, the projecting part of an eccentric or wavy wheel, to produce alternate or reciprocating motion.

Cambium, the viscid secretion between the growing wood and inner bark. It is plant nutriment, forming into new tissue, both of wood and bark.

Camphor (cam'fur), an odoriferous gum, of value in medicines, household art, etc. When one swallows too much of this drug by mistake, he will have giddiness, faintness, nausea, vomiting, stupor, and if the dose was large enough, he will finally suffer delirium and death. He should take

large emetics of warm water, tickling the throat with a feather, etc. He should also have ammonia applied to the nose, have cold water dashed over the chest, and take 40 drops of sal volatile in strong coffee every half hour, and be kept awake by two persons walking him between them constantly.

Camping. Living out of doors, with covered wagons or tents, is always characteristic of frontier life, and in the older sections of the United States, an occasional trip by covered wagon is still made, often more for pleasure and romance than for saving expenses; and camping out is and probably always will be practiced by hunters and fishermen in all parts of the country. After one has had some experience in such life, especially if he has sense and energy enough to improve in methods and conveniences, he will receive many valuable ideas. We have space here for only general directions.

For wagon cover, oiled cloth is necessary only for very long journeys or protracted life in camp. Unpainted or unoiled ducking, or even stout muslin, will sufficiently protect against most storms. Wagon bows, and indeed all the rigging about the wagon and harness, should be made very secure before starting on the journey, for breakages on the road cause most vexatious delays, annoyances, and sometimes considerable expense. The old-time feed-trough, attached to the rear of the wagon box, is particularly difficult to manage. It should be both light and strong, with hoop-iron nailed on the upper edge all around, or else there will be trouble. Suspended, as it has to be, it cannot with safety be loaded with heavy articles. When there is room inside the wagon bed for a couple of feed-boxes (being one small one for each horse), it is better to carry such boxes, and to carry them in that way, than to have a suspended feed-box on the outside. As to the essentials of good wagoning, see article Wagon.

In the care of the team, besides what may be learned from the articles Horse, Harness, Bridle, Check Ease and Rein, etc., we will add here that, as it is often difficult to obtain hay or fodder, a feed of green brush is a good substitute; and not only so, such feed should be given a horse, under all circumstances, two or three times a week,—all he will eat. Oak, hickory, bass-wood, ash, maple and beech are all proper. On the road, horses should be fed three times a day and offered water from four to six times. For nearly all long journeys the horses should be sharp shod. Watch their motion the first day's travel after shoeing, and if any limping is noticed, ascertain which shoe it is that "pinches," and have a blacksmith re-set it. In hitching the horses at night particular care is required. Never hitch to saplings except in such a manner that the animal cannot wind himself up by going around it. The sapling should be so near other trees or some other object that the horse

cannot go around it, or a cross bar from it to another tree should be nailed or tied up. It is generally unsafe to tie to dead saplings. Tying to a straight, smooth board fence is safe. In hitching to a rail fence, always select the inner corner,—that is, the corner further from you as you approach the fence.

Camping grounds on the road are generally selected from an eighth to a quarter of a mile from some occupied dwelling, if practicable, so as to be conveniently near for obtaining favors or supplies, and yet not so near as to molest the residents. At those times of the year when mosquitoes are troublesome, it is well to take along some drugged solution to rub over the hands and face, to keep them off. It is difficult to manage netting satisfactorily on such trips.

As to diet, one wants less of the condiments with him than anywhere else, as his out-door life gives him a good appetite for plain food, and condiments create a preternatural thirst and endanger the health in almost every way. Sugar and molasses had better be dispensed with almost altogether.

Apparatus for cooking is a source of much anxious thought. Coal-oil or kerosene stoves, made purposely, are a great convenience, especially in a prairie country; but, taking all things into consideration, the old-fashioned pot, the skillet or frying-pan and a coffee-pot, to be used over a common wood fire on the ground, are the most satisfactory. Glass and earthen ware should not be taken along. Folding sheet-iron stoves have been invented, and when a good one can be obtained it would be advisable to purchase one. In rainy weather the party will of course take the precaution to keep constantly on hand in the wagon dry kindling enough at least to start one fire, as they may have to stop at night where it is difficult to obtain dry wood.

A very important element of the outfit is a box with shelves or partitions in it, to serve as a cupboard and larder, and it should be kept in the hind end of the wagon, convenient of access to one who stands on the ground. In stopping for camp, the hind-gate is usually taken out and this "cupboard" box easily slid out and set on the ground. No rank, stale meat should be allowed in this box, as it would taint everything kept there. Considerable skill is required to so arrange this box and its contents that the different articles of food will not spill out.

Canada Thistle: see Thistle.

Canary Birds, to Clear of Lice: see Bird.

Cancer, a corroding ulcer, having a core which consists of a central body and branches, similar in outline to that of a crab (Latin, *cancer*): hence the name. It comes from an incurable constitutional

disease. The secret of the cancer doctor's "success" consists in his curing other sores, which are not really cancers. Said one of them to us, "confidentially," "I know a cancer when I see it; I give it some other name than cancer, and do not undertake to cure it." Good physicians, doubtless, often mitigate the sufferings of the patient and prolong his life. This is the best advice which can be given by the medical profession at the present day. Anodyne poultices, salves, liniments, etc., may be applied in home treatment, and a surgeon may extract the cancer once or twice, but all these things give but temporary relief. It is well, however, to have the case in charge of a doctor, if for nothing but to keep the patient from injuring himself by injudicious treatment.

Candles. Candle-wicking is so cheap at the present day that no farmer wants to manufacture any for home use. In order to make candles in molds, which are far better than dip candles, first secure the wicking in the center of each mold by looping one end over a stick across the larger end and tying knots just exterior to the smaller end. The end of the wick at the smaller end of the molds has to be drawn through by a hooked wire. Pour the melted tallow in, and after it has become cool, warm the mold just enough to allow the candles to slide out easily, when they all can be readily withdrawn at once.

Dip candles are made by looping a number of separate wicks over a rod and dipping them into melted tallow until the required thickness is attained, allowing the tallow which adheres after each dipping to cool before dipping again. Before the second dip, it is well to lay the wicks on a flat surface and straighten them, and fix a suitable contrivance for holding the rods while drying between the dips.

A good tallow for candles consists of about 1/3 beef and 2/3 mutton suet. If required for summer use, it will be improved by hardening, as follows: Put a little bees-wax with the tallow, especially if dark and not fit to sell; put into a suitable kettle, adding *weak* lye, and gently boil, an hour or two each day for two days, stirring and skimming well; each morning cutting it out and scraping off the bottom which is soft, adding fresh lye (be sure it is not too strong), 1, or 2, or 3 gallons, according to the amount of tallow. The third morning use water in which alum and saltpeter are dissolved, at the rate of 1 pound each for 30 pounds of tallow; then simmer, stir, and skim again; let cool, and you can take it off the water for use. They may be dipped or run in molds. For dipping, allow two pounds for each dozen candles. Or, dissolve 1 pound of alum in water, and stir in 5 pounds of tallow, and melt them together.

To make lard candles, to every 8 pounds of lard add 1 ounce of nitric acid. Weigh the lard and place it over a slow fire and just melt it; then add the acid, and it is ready to mold. A little bees-wax will improve it. Tallow can be hardened with resin, 1/2 pound of the latter to each pound of the former.

Candy, a preparation of sugar, partially crystallized and generally flavored or spiced. Dissolved sugar or molasses, boiled only to such an extent that when drawn out it forms fine threads, which crystallize and break, is said to be of "weak candy" height; boiled a little more, so that it will draw out into a larger string, and bladders can be blown through the drippings from the ladle, it is called "bloom sugar;" boiled still more, until it can be dashed off into a feathery form, it is called "feathered sugar;" still more, when a portion of it on a stick dipped into cold water will harden and crackle, it is called "crackled sugar;" and lastly, when thus dipping it into cold water it will snap like glass as soon as it strikes the water, it is "full candy" height, and is called "caramel sugar."

Instead of being unwholesome or injurious, a pure candy supplies not only a pleasant but essential element of food. It is only when it is made the vehicle for carrying into the stomachs of the young insidious poisons that its use should be condemned. Cane sugar, when absolutely pure, is one of the most wholesome dietetic articles known to biological science. The "'lasses" candy made on the farm, if made from pure cane sugar, is beneficial instead of detrimental. The best and safest articles to color with, are: for red color, cochineal, carmine and Brazil wood; for purple colors, madder purple, logwood and indigo; for blue colors, indigo and litmus; for green colors, sap green, yellow lake (or French berries) and indigo, etc.

Adulteration. "Store" candies are adulterated in a thousand different ways, many of them actually poisonous. Glucose is abundantly used for pure cane sugar, but the greatest danger is in colored candies. Not being able to determine the article by which candies are colored, it is, perhaps, the best not to permit the child to buy them; neither should the confectioner be permitted to wrap his candies in colored paper, for the child is liable to get it into the mouth and swallow it and become poisoned.

To make common sugar candy at home, to two pounds of C or common white sugar add enough water to reduce it to a sirup; add, after having dissolved it, one-half teaspoon cream tartar and lump tartaric acid size of a marrowfat pea or small bullet. Boil in a brass vessel, if convenient; if not, copper, which is better, or tin, but never use an iron vessel; be very careful not to scorch it; boil until brittle, when put in water; pour into a greased tin pan or cooler, and flavor to suit the taste. This should be immediately well

pulled, in order to give it a white, silvery-like appearance. Handle with buttered fingers. It helps the candy much to separate a batch into two parts, and, after having pulled one till white, to color the other with extract of raspberry or any harmless colored flavoring, and pull and mix, giving it a streaked appearance.

Or, take one cup of sugar and one cup of sweet cream; boil it till it is of a light brown color, then pour it into a buttered dish.

To make molasses candy, take 1 quart molasses, 1½ pounds brown sugar, the juice of a large lemon; mix the molasses and sugar together, butter the inside of a kettle and put it in. Let it boil over a moderate fire for 2 hours, then add the lemon juice and boil ½ hour; stir it often, to prevent it from burning; when thoroughly done it will cease boiling; then butter a pan and put it in to cool; if sufficiently done it will be crisp and brittle; if not it will be tough and ropy. Nuts of any kind may be added just before it is put in the pan; they must be well stirred in. The candy may be worked by keeping the hands well covered with flour, or by greasing them well with butter. The working must be done as soon as it is cool enough to handle. It may be made of molasses only—in this case it requires longer boiling—and other flavoring may be used instead of lemon.

Another Recipe for Making Molasses Candy. One quart good molasses, one half cup vinegar, one cup of sugar, butter the size of an egg, and one teaspoonful saleratus.

1st. Dissolve the sugar in the vinegar.

2d. Mix with the molasses, and boil, stirring frequently until it hardens when dropped from the spoon into cold water; then stir in the butter and soda, the latter dissolved in hot water.

3d. Flavor to your taste, give one hard final stir, and pour into buttered dishes.

4th. As it cools, cut into squares for "taffy," or, while soft enough to handle, pull white into sticks, using only the buttered tips of your fingers for that purpose.

Butter-Scotch. Sugar, 1 pound; butter, ⅓ pound; cream of tartar, ½ teaspoonful. When done, which you can determine by dropping in cold water, pour into buttered pans to cool, then cut into any shape desired.

Sugar Candy. Six cups sugar, one cup of vinegar, one cup of water, tablespoonful of butter put in at the last, with one teaspoonful of saleratus dissolved in hot water.

1st. Boil, without stirring, half an hour, or until it crisps in cold water.

2d. Pull white with the tips of your fingers.

3d. Flavor to taste.

Degrees of Boiling Sugar. In preparing sugar for candies, etc., the confectioner requires different degrees of boiling in order to bring the sugar to the proper state for the various articles he prepares.

Well clarified and perfectly transparent sirup is boiled until a skimmer dipped into it, and a portion touched between the forefinger and thumb, on opening them, is drawn into a small thread which crystallizes and breaks. This is called a *weak candy* height.

If boiled again, it will draw into a larger string, and if bladders may be blown with the mouth through the drippings from the ladle, it has acquired the second degree, and is called bloom sugar.

After still further boiling, it arrives at the state called feathered sugar. To determine this, dip the skimmer and shake it over the pan, then give it a sudden jerk, and the sugar will fly off like feathers.

The next degree is that of crackled sugar, in which state the sugar that hangs to a stick dipped into it, and put directly into cold water, is not dissolved off, but turns hard and snaps. The last stage of boiling reduces it to caramel sugar, and is proved by dipping a stick into the sugar and then into cold water, when, on the moment it touches the water, it will snap like glass. It has now arrived at a full candy height. Throughout the boiling, the fire must not be too fierce, as it will discolor the sirup. The best safeguard against this is the use of steam heat.

Color may be given to the candy by adding the coloring matter to the sirup before boiling it.

Flavoring essences must be added when the process is nearly complete.

Cane, Sugar. Most of the sugar used in the United States, especially the refined sorts, is produced from the tropical sugar cane, and Central Louisiana is as far north as it will succeed profitably. The West and the East Indies are its home. In Cuba it attains a height of twenty feet, with a diameter of one and a half inches one foot above the ground. In the Gulf States it seldom exceeds ten or twelve feet. It is propagated by layers, the canes being placed in furrows three or four feet apart; they send up a shoot at each joint, which makes the canes six or eight inches apart in the rows. Three crops are generally produced from one planting, though each succeeding crop is smaller than the preceding one, but the juice is richer in sugar. In Louisiana the planting is generally done in February, and cutting commences in October. The ripe cane, stripped of its leaves, yields 12 to 20 per cent. of its weight in sugar, on careful analysis, though the half of that amount is seldom obtained in the manufacture; and of this amount from 10 to 15 per cent. drains off as molasses. The yield of sugar in Louisiana ranges from 500 to 2,000 pounds per acre. To express the juice, expensive machinery is required, and to manufacture the same into sugar requires the skill of trained artisans.

Cane. In this article we treat only of the Northern varieties of sugar cane, namely: Sorghum, Imphee and Amber. This may be an important product to the people of the North, as it enables them to make their own sugar and molasses, and so have it pure and unadulterated. The culture of this cane and the manufacture of its juice into molasses are both pleasant and easy, and there is a kind of charm connected with the business all the way through. It is believed that it is more valuable than corn for fall and winter fodder, especially when grown thick, say from four to eight pounds of seed per acre, and that it is next to corn in its fattening qualities for swine, who feed greedily upon it through the winter. It yields 150 to 250 gallons of sirup to the acre, which, at 50 cents a gallon, would be $75 to $125, with no more outlay than raising so much wheat or corn.

Culture. In general it may be said that Sorghum and Imphee will thrive on any land that will produce a fair crop of corn or wheat. The best results, however, can be expected only from soil adapted to the special wants of these canes. Sandy, upland soil is best, and black bottom soil is the worst. New land yields good sirup; land freshly manured gives poor sirup; clay land gives good sirup, but not so large a yield. The soil, unless rich, should be well manured in the fall with vegetable or rotten stable manure; this is especially needed with clay land. A well manured crop the previous year, well cultivated, puts the ground in the best condition for the culture of cane.

Plow deep, and pulverize thoroughly by throwing into ridges; the soil will be better affected by the frost during the winter and will dry out sooner in the spring. In general, prepare the ground as for corn. In sections where the cane will be liable to frost in the fall, the planting should be done early,— as soon as the ground is thoroughly warm. In the South, early planting will give two crops from the same stand. Test the seed some time before planting, so that if found poor, there will be time to get a good lot in due season. Soak the seed a few hours in warm water, put it into a small bag, envelop it well in woolen cloths and keep it in a warm place, frequently shaking it until it begins to sprout. Some bury it in the ground. Then roll it in plaster or fine loam and plant one inch deep, rows three feet apart each way, at the rate of two pounds of seed to the acre. Plant in check rows, as for corn, so that it can be plowed both ways. Immediately after planting, throw a handful of plaster or fresh ashes on each hill. In the Eastern or older States it is well to fertilize the ground with lime, ashes, salt, guano and the phosphates generally. On the first appearance of weeds or grass, run the cultivator both ways. Experience proves that nine-tenths of the chances of success and failure lie in the first few weeks of the young plant's life, and therefore all the cultivation should be done then,—carefully, thoroughly and well; when about 30 inches high it may be left to itself, as further plowing will only damage the crop, by cutting the roots and injuring the stalks. Pull off the suckers.

Harvesting. The cane should not be cut until the seed is in the doughy state, the Imphees a week or two earlier. Some cultivators insist upon making up the cane as soon as cut, and others say it is better to delay the manufacture as long as the cane can be kept in perfect condition. Some also are in favor of stripping off the blades about the time of the first frost, and some consider that the stripping is better done just before grinding; a few do not strip at all. What is the best course to pursue may depend upon circumstances,—such circumstances as have not yet been statistically compiled, so as to determine these disputed questions. To prevent the dark color of the sirup from the Imphees, they should be stripped early. The upper third of the stalks should be cut off at the time of harvesting, bound into bundles with the blades, to be used as fodder for cattle; it is excellent for this purpose. Freezing is thought to increase the amount of sugar, but when the cane is once frozen, it must not be suffered to thaw out until it is manufactured. Preserve the seed, as it also is valuable for stock feed,—even more valuable than oats. The seed is also good breadstuff for man; some have said it is even better than wheat. Until it is made up, keep it in piles or ricks, under cover.

Varieties. The most common variety of sugar cane in the Northern States is the Chinese or Sorghum (sometimes spelled Sorgho or Sorgo). Its most striking difference from the African kinds consists in the spreading character of the tassel. The stalk is tall, tapering and graceful, reaching the height of 12 to 15 feet. As the plant approaches maturity a whitish efflorescence appears underneath the leaf-stems. This variety requires about five months for its full development, though the time is materially modified by soil, season, etc. As the seed approaches maturity and ripeness, it changes its color from green to a dark purple or black.

Of the African, or Imphee, there are several varieties, three of the best of which are of equal value, namely, the Liberian, the Neeazana and the Oomseeana. They all have heavy, compact tassels, and, although two weeks later in maturing, these varieties may be cut a week or two earlier than Sorghum, that is, when the seed is "in the milk." The Liberian was at first considered inferior to Sorghum, but its reputation is growing comparatively better. In some places it yields more and better sirup than the Chinese. It is also supposed to be freer from mildew, rust or blight of any kind. The Neeazana should be cut while green and made up immediately, when it yields a pure and light-colored sirup. The Oomseeana is good for

sugar, but does not yield as largely in sirup as either the Liberian or the Sorghum.

The "Minnesota Early Amber" cane is the best for the high North, being better than the common Amber, or, of course, any other kind of cane. In appearance it presents some of the characteristics of both Sorghum and Imphee. It grows quite tall and yet not quite as tall as the Sorghum. Its heads are not so open and branching as the Sorghum, but are more open than either the Liberian, Oomseeana or Neeazana. When fully matured the seed is but slightly enclosed in its glumes. It receives its name from its ripening early, and from the bright, amber color which characterizes the sirup when properly made from it. The new Early Amber is three to four feet taller than the ordinary cane, and is very rich in saccharine matter, the proportion being larger than in any of the many varieties of Chinese and African cane introduced into this country. The sirup, if properly made, is free from the cloudy appearance, offensive odor and taste peculiar to Sorghum. It is of a beautiful, clear amber color, and of a delicious flavor resembling honey. It is very prolific, the yield to the acre being greater than any variety ever grown in the North, not even excepting the old regular Sorghum. As much as 288 gallons sirup to the acre has been obtained. The Early Amber is especially adapted to a high latitude, from the fact that it is a very early cane. It will ripen wherever flint corn will mature.

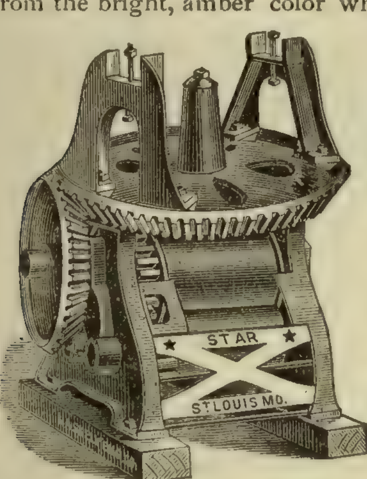


FIG. 1.—*"Star" Cane Mill.*

MANUFACTURE. Under this head it is hardly necessary to observe how essential it is to keep the material perfectly clean. As to the mill, the stronger the better, such as the "Star" cane mill (Fig. 1). It is very heavy, does not clog, and the rollers have guides which prevent the cane from running out at the ends. The spur gearings are all inside the side plates, and are protected so that they are free from obstruction, thus avoiding the danger of breaking the mill by getting anything between the cog-wheels, or danger of accident by the operator having clothes caught in cogs while operating the mill. The rollers can be adjusted to any desired capacity. They are so geared as to make two revolutions to one of the horse's. The mill can be run with any portable farm engine or threshing-machine horse-power. The same party, J. A. Field & Co., St. Louis, Mo., manufacture also a vertical, three-roll mill called the "Forest King," Fig. 2. It is a very desirable mill, and has many points of excellence. Two sizes of this mill are made, 375 and 600 pounds, with a capacity of 40 to 60 gallons per hour.

To save labor in handling the juice, the mill may be placed, where the location will permit, above the level of the evaporator on a hill-side, or elevated plane. Where the location prevents such an arrangement, the mill should be set on posts firmly planted in the ground, about three feet above the surface, and the juice conducted by a trough to the evaporator and pumped up into the juice tank ready for feeding the evaporator. The cane should be fed butt end. The mill should be strong enough to press out all the juice, leaving the bagasse dry, or there will be serious waste of juice. The mill should have three rolls; otherwise there will be a great loss of juice.

The juice should be evaporated as soon as practicable after it is expressed. It should not be exposed to the air over twenty minutes before heating to the boiling point. Filter it through bright hay or a woolen cloth, and convey it to a double tank through a pipe. When one side of the tank is filled, shovel in one gallon clay subsoil, sprinkled with lime, to fifty of juice. Stir well and allow it to settle, packing hay over the faucet, which should be near, but not at the bottom of the tank. Prepare one gallon new milk with two ounces of soda to every 100 gallons juice. Place over the evaporator, so as to make a continual dropping where the juice breaks into the boil. Use no other drug, especially of an alkaline nature. The boiling can all be done with the bagasse and cane-tops with a furnace properly constructed. Neither wood nor coal will excel this fuel for the purpose.

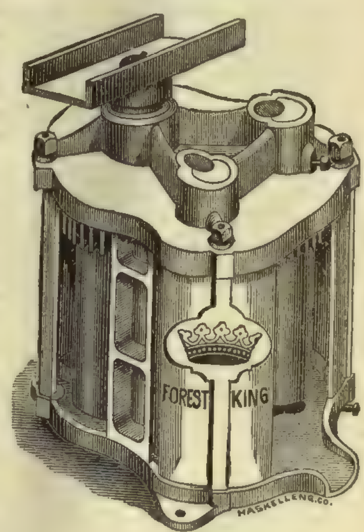


FIG. 2.—*The Cane Mill "Forest King."*

And now comes the climax of all the process, the reduction to sirup, and without that simple combination of furnace, boiler and cleanser, in the adjustable rocking machine called the "Mound

City Evaporator," Fig. 4, or some equivalent, no one could have patience to engage in the business at all. But this is so simple, economical, portable and effective, that it is a pleasure to run it, and instead of its being the burning, sooty, dipping, daubing operation of the old way, the work is cleanly, pleasantly and quickly performed.

Its construction is upon a new principle, which secures the constant flow of the juice, from the time it enters until it passes off sirup. It also retains the scum and feculent matter at the ends of the several channels, from which it can be removed every half hour, and performs the cleansing operation better than by introducing alkalies and foreign ingredients. It is made of sheet metal, galvanized iron or copper, of thickness proportioned to the size of the pan, having ledges to project upward, across the bottom of the pan, the alternate ends being open so as to form a continuous channel from one end of the pan to the other. The sides of the pan extend beyond the fire line of the furnace, so as to give a cooling surface for the collection of the scum.

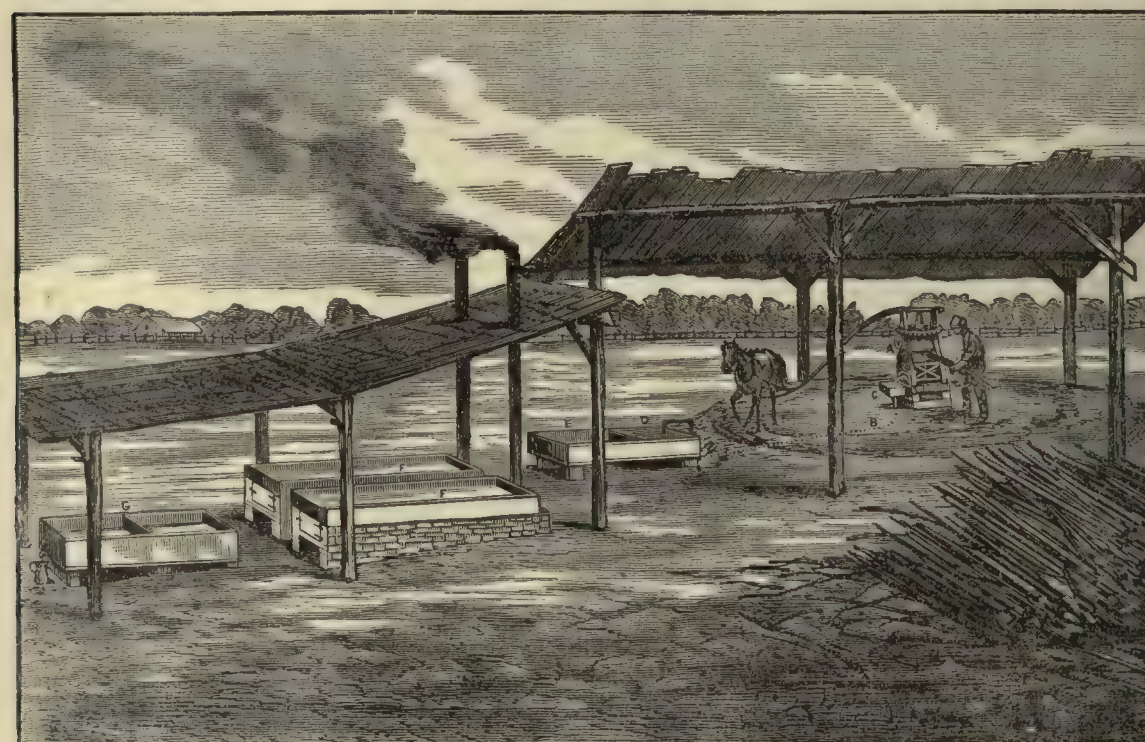


FIG. 3.—*Position of Mill and Evaporator.*

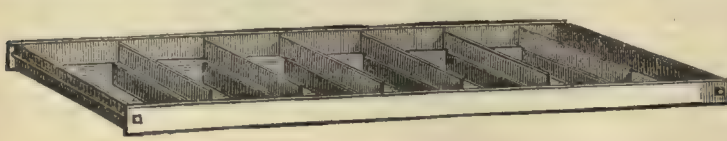


FIG. 4.—*Mound City Evaporator.*

The evaporator should be capable of producing the most and best sirup with the least expense and labor. To secure the best result the juice must be exposed to the fire the shortest possible time. To do this a shallow, moving body of juice is indispensable. Even this will not make the best quality of sirup unless the juice during evaporation is exposed suddenly to alternate heat and cold, thus freeing it more effectively from its impurities. Good, well-seasoned wood, or the dried bagasse, should be provided for the evaporator, that the fire may be kept evenly hot. The evaporator should be set on a firm and level foundation, with the mouth toward the prevailing winds. An ash pit should be dug under the grate, and kept clean. It should be protected from the wind. Sour juice can not be worked to advantage. The skimmings make excellent food for hogs.

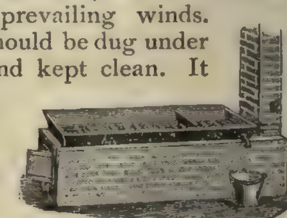


FIG. 5.—"*Improved*" *Evaporator.*

Fig. 5 represents a very simple yet efficient apparatus for making maple and Sorghum molasses and sugar. It is known as the Improved Evaporator, and is made

by the Vermont Farm Machine Co., Bellows Falls, Vt.

Prime vinegar may be made from the washings of the evaporator, that is, the sweetened water which follows the sirup on finishing for the day. This should be run off into casks, care being taken to give it air, and to keep it from freezing during the winter. In the summer expose it to the air, and excellent vinegar will be the result. Good vinegar may also be made from the skimmings by much the same process: see Sugar.

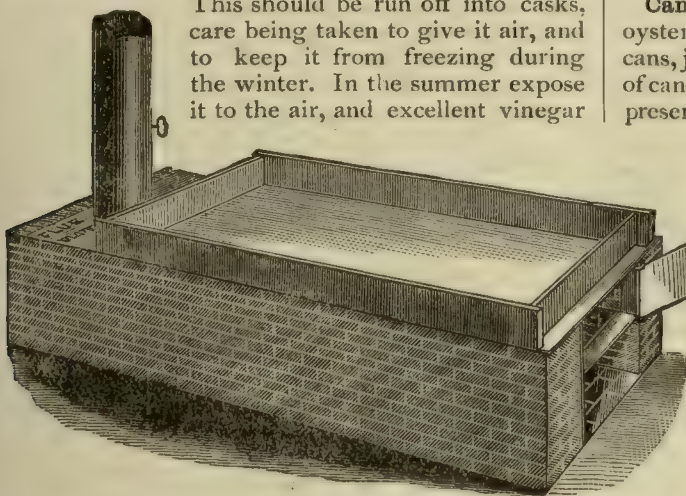


FIG. 6.—*Galvanized Iron Evaporating Pan and Furnace.*

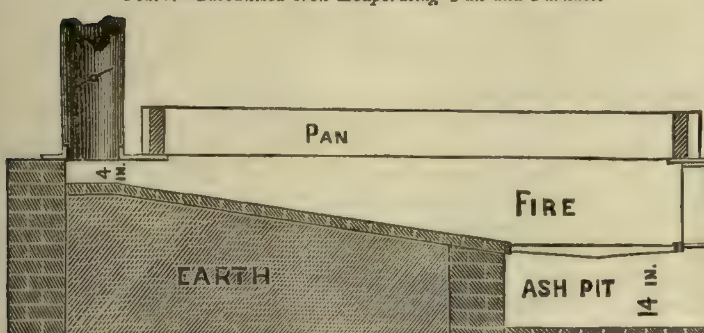


FIG. 7.—*Sectional View of Furnace.*

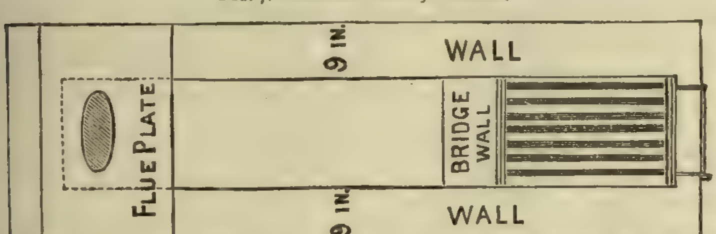


FIG. 8.—*Top View of Furnace. Pan removed.*

Canine Teeth, the longest and most pointed teeth, of which there is one in each side of each jaw; called also "eye teeth."

Canker, a corroding humor or ulceration, especially in the mouth. For this disease, one should not medicate without the advice of a physician. The term also denotes a disease in trees, causing the bark to rot and fall off: see Apple.

Canker Worm: see Apple.

Cannel Coal, a kind of soft coal which burns with a steady flame.

Canning, the art of preserving fruits, vegetables, oysters, meat, and other food in their natural state in cans, jars, etc., hermetically sealed. The popularity of canned goods arises from the fact that this process preserves different foods in their natural state, which are always more healthful, and grateful to the taste. This method also facilitates transportation, and defies climatic influences and changes of temperature. Canning in glass jars is in some places called "bottling." So to seal as to exclude all the air in which the germs of decay are not killed, is the great object in canning fruit. It cannot be *perfectly* done, not even with an air pump. It may, however, be so nearly done as to preserve fruit for years. To accomplish this, the cans have to be heated after the fruit has been deposited in them. Modern science asserts that the reason why heating and sealing preserves fruit, is because the heat destroys the germs of fungoid growth (whethes the germs be animal or vegetable), and thus prevents decay, the sealing preventing the ingress of any more germs.

In making the canning process perfect, care must be taken that the cans and their covers are not defective, and that the screw, or whatever means of sealing is employed, fits accurately and works properly. Have both fruit and jar boiling hot, and the jar brim full when sealed, that as nearly all the air as possible may be excluded.

The sealing must be done quickly after the can is taken from the water, as cooling will cause condensation of air in the can, and this should be prevented. If a rubber screw jar is used, screw tightly at first, and turn on the cover two or three times while the fruit is cooling. The thread of the screw, on jar and cover, must be perfectly clean, or the sealing will be imperfect. If these directions are faithfully followed, not a can in a thousand will turn out imperfect fruit when opened.

Glass jars are better than tin cans. The acids of the fruits act upon the tin and solder of tin cans, which sometimes become corroded, forming poisonous salts. The danger is less when pure tin is used, but absolutely pure tin is rarely used in making fruit cans. A glass jar, with a porcelain-lined metal cover, screwed down upon a rubber ring, is a good article, and the best for domestic use. They

are not very expensive, and are largely used by housewives. They have the great advantage of enduring use for several years.

In selecting and preparing fruit for canning, freshness and freedom from blemish are the first requisites. The sooner canned after picking the better. All table fruit, except small plums, grapes, berries, etc., should be pitted and peeled. Some of the larger fruits will need to be halved, quartered or sliced. White sugar is best, if sugar is used at all. Peeling peaches and tomatoes can be facilitated by plunging them into hot water. A corn-popper is handy for this.

Tin cans must either be sealed with wax or soldered. The latter is the better method if it can be done without too much trouble and expense. There are irons made on purpose, and almost any one can learn to use them. Sealing wax is made by melting together rosin, one pound; beeswax, lard and tallow, one ounce each. Melt over a slow fire, and stir occasionally. When using, the wax must be hot, and the dish large enough to admit the top of the jar. The dish should have a snout to enable the operator to pour the wax upon the can.

When glass jars are used, they are placed in cold water, in a boiler over the fire. A cloth or board is put in the bottom of the boiler for the cans to stand on to prevent breaking. A porcelain or copper kettle must be used for cooking the fruit. Iron or tin will discolor the fruit, besides generating poison. Have as much fruit in the kettle as you can handle well, and cook until done, using only water enough to prevent scorching, and furnish sirup enough to fill the cans. A boiling hot sirup made of white sugar is used, while some apply the sugar to the fruit after it is served on the table. Sugar is not necessary to preserve the fruit. When used, the sirup should be made in a separate kettle, and poured into the can after the fruit has been placed therein. Sometimes three or four pounds of sugar is added to the bushel, while the fruit is cooking, but it is not necessary. After placing the fruit in the cans, leave them in the hot water for ten or fifteen minutes to settle; then fill to the brim with sirup, or the liquid from the fruit-kettle; clean the sirup from the top of the can, then put on the cover, hold it down with a sharp instrument, and pour around it the hot wax, or solder it down. If there is a bubble in the wax, break it and apply more wax.

When bottles or jugs with corks are used, push in the cork firmly, and thrust the top into the melted wax. If it is not convenient to place the fruit in cans while they are standing where they were heated, they may be put into a pan of hot water and left until sealed.

Each can or jar should be labeled with the name of the variety of fruit which it contains, and the date of canning. A good and cheap cement for this purpose is made by dissolving one pound of glue in one pint of skim milk. Stir well, and avoid burning the mixture.

A cellar, cool, dry and nearly dark, or a closet, is the best place to store canned goods. The cans should not be placed against the wall, and should be raised above the floor. They should be examined occasionally to see whether fermentation is taking place. Should a thick mold form at the top, it will do no harm. If fermentation is noticed, boil the fruit again and can. In case fermentation is well advanced, throw the fruit away, and the can may be filled again with fresh fruit or vegetables.

The following are more specific directions for canning special fruits and vegetables:

To can peaches, peel, halve and pit them; boil the pits till the flavor is extracted, and pour the liquor into a porcelain kettle; put into the kettle prepared peaches enough for three or four cans, and place over the fire. When the peaches are hot, can them and seal.

Pears should be cut in halves, and the stems left on, as they add to the appearance of the fruit. After peeling, dip each piece into cold water to prevent discoloring. Place a little cold water in the kettle with the fruit, and boil twenty or thirty minutes.

Plums should be canned whole, unless large, when they may be halved and pitted; but they should never be peeled. If pitted, boil the pits the same as you do peach pits.

Blackberries, raspberries, cherries, currants, strawberries and gooseberries are simply thrown into a little sweetened water and scalded, not cooked.

Crab-apples can be treated as pears, unless small, when they should be canned whole. Quinces may be treated as pears. Strawberries come so early that they are difficult to keep with perfect flavor; yet, put up with care, air-tight, they can be kept. The bottles should be buried in the cool earth, either in a box, or simply in the ground, kept from the light and as cool as possible. In this way they retain flavor nicely and make a delightful change on the table later in the year.

In canning vegetables, being less tender and acid than fruit, they may be canned with less risk and loss. The process is the same in all respects.

When corn is to be canned, cut the kernels from freshly-gathered corn. Fill the cans with corn and solder; place over the fire the cans in enough cold water to cover them, and boil gradually for one and a half hours; then punch a small hole in the top of the can to allow air and gas to escape, and instantly solder. Place the can in hot water, and boil for two and a half hours longer. The juices supply sufficient moisture in the cans so that they

need no water. Wax cannot be used in sealing. The corn should be of the sweet or evergreen varieties, picked when just right for the table. Another method is to cook the corn as for present use, place in the can, pour in enough water, well salted, to cover the corn, fill the can, then seal. Some put one ounce of tartaric acid to eight quarts of corn, and cover it with boiling water. Boil it constantly half an hour, and put it up only in Mason porcelain-lined jars. Tighten occasionally while cooling, to exclude air, and cover the jars with rags to keep light off. When opened to cook, put enough soda to get rid of peculiar sourness.

To can corn in the raw state, silk your corn well and cut it off the cob without cooking, and put it in a jar, and to five gallons of corn put one of salt. Have just brine enough to cover. This will keep two or three years. When you cook it, drain out and put in plenty of fresh water to soak over night, and season with butter and pepper and a very little white sugar.

To can rhubarb, clean and slice as for pies; put in a glass bottle; fill up with water and seal. Do not cook it.

Tomatoes should be scalded and peeled, and, if large, cut. Have a board in the bottom of the boiler, with holes bored in it, on which to set the cans. Put water in the boiler till within two inches of the top of the cans; boil till the tomatoes are well cooked; with a spoon crowd down, fill the can full, seal and cover quickly with several thicknesses of cloth, letting stand till next morning; then set the cans in the darkest part of the cellar, or in a box cupboard that can admit no light, but where they will be dry and not freeze. Tomatoes treated in this manner will often keep two or three years. Corn and tomatoes are often canned together—one part corn to three parts tomatoes; but they should be cooked separately.

Peas, onions, asparagus and beans are easily canned. String the beans and break in two or three pieces; throw into boiling water and scald. After filling the can, pour on well-salted hot water, and seal. Succotash can also be canned, the separate vegetables being scalded apart from each other.

To keep fruits without loss of color or flavor, to each pound of resin put in 1 ounce of tallow, and 1 ounce of beeswax. Melt them slowly over the fire in an iron kettle, and be careful to not let it boil. Take the fruit separately and rub it over with whiting or fine chalk (to prevent the coating from adhering to the fruit), then dip into the solution once and hold it up a moment to set the coating; then pack away carefully in barrels or boxes in a cool place. When you dip oranges or lemons, loop a thread around to hold them; for pears or apples insert a pointed stick to hold them by; then cut it off with a pair of sharp, heavy shears. Oranges or lemons cannot be put in boxes, but must be placed on shelves, as the accumulated weight would mash them down.

Peaches, pears and plums, also green tomatoes and cucumbers, may be kept perfectly by packing them in fine salt, in stone jars, allowing them to make their own brine. They must be kept covered with salt until the brine made by the salt and extracted juice covers them; then kept under this brine until wanted for use, when they must be soaked in several waters until fresh enough to put into vinegar.

Cantaloupe: see Muskmelon.

Canter, a gentle gallop in which all the feet of the animal seem to follow one another in a row, instead of two following two, as in the full gallop.

Cantharides (can-thar'i-deez), Spanish flies; used for blistering.

Cant-Hook, a wooden lever with an iron hook at the end, for canting or turning over heavy logs.

Cantle, OF A SADDLE, the hinder part, projecting up in the form of a rim.

Canvas, coarse cloth made of hemp or flax, used for tents, sails of ships, painting and other purposes; also, a clear, unbleached cloth, woven regularly in little squares: used for working tapestry with a needle. The best flexible paint for canvas is probably the following: Dissolve 2½ pounds good yellow soap in 1½ gallons boiling water, and grind the solution while hot with 140 pounds of good oil paint.

Caoutchouc (coo'chook), India rubber.

Capillary Attraction, that which exists in a small tube, in which a liquid will rise to an indefinite height. Exemplified by masses of cotton, wool, sponge, sand, etc., which are filled with small spaces.

Capon (ca'pon), a castrated cock or rooster. Capons grow larger than roosters, and their flesh is as much better for eating as that of an ox is better than bull's flesh, or as a barrow's is better than that of a boar. The Asiatics or large breeds are the only varieties worth caponizing, and of these the Brahma and Partridge Cochins are the best. Well-bred specimens will average, at 9 to 11 months, when dressed, 10 pounds each, and sell for 75 cents to $2.50. Capons are very quiet, associating only with each other; are never quarrelsome, and may be taught to take care of young chickens. This is done by picking most of the feathers from the breast of the capon, and placing him under a barrel at night. Some young chickens are also placed under the barrel; these immediately seek

shelter under the capon, and he is willing to permit them to cluster under him because of the warmth they impart to his denuded breast. He will even spread out his wings and draw them under him. This soon becomes a habit, or the capon becomes attached to the chicks, and keeps with them and cares for them until they are large enough to care for themselves.

Caponizing, castration of cocks (roosters). To perform the operation well, it is necessary to have some preliminary practice. In the first place examine carefully the fowls that you kill for the table, so that you may be able to tell the exact position of the organs to be removed. You will find them attached to the back, one on each side of the spine; they are light colored and shaped something like a Lima bean. The size varies with the age and breed. Next kill some young cockerels and practice on them until you are sure that you can perform the operation quickly and successfully; then you may try your hand on the living chickens.

Select young cockerels that are fully three months of age, and not over four months; but some who caponize operate successfully upon cockerels that are five or six months old. Keep them from food for 24 hours previous to the operation; if the intestines are full the operation will be more difficult. Draw the wings gently backward and secure by a broad strip of soft cloth; lay the fowl on the left side, draw the legs backward and secure by another strip of cloth. From the spot near the hip joint, and between the last two ribs, pick off the feathers for the space of an inch square. With a small sharp knife make a cut an inch and a half long, through the skin, then another through the flesh between the ribs, and lastly through the thin membrane that lines the abdominal cavity—taking care in the last cut not to injure the intestines, and see that you make a clean cut every time. Now introduce the fore finger, which should be well oiled, find the testicles, scratch them off with the finger nail, and bring them out with the finger. If you have practiced enough on the dead chickens you can do this quickly and readily; and if you haven't practiced enough on the dead fowls you have no business to attempt the operation on the living ones. This part of the operation over, bring the edges of the cut together, take two or three stitches and press the feathers that were removed upon the cut to absorb the blood and cover the wound. Feed sparingly for a few days. Of course some of the chickens will die, but unless you bungle your work awfully the loss will be trifling.

Instead of performing the chief part of the operation with the finger, as above directed, some use the caponizing instruments that are made especially for the purpose; but one can do just as well, if not better, with no instrument except a sharp knife, his finger nail, a needle and some white sewing silk.

Caps. The nature of this work allows us to say nothing under this "cap"-tion, except that, as a general rule, they confine the exhalations of the scalp more than hats, and are therefore more unhealthful; but they have the advantage of being kept on the head better when one is at work.

Caramel (car'a-mel), burnt sugar; a black, porous substance, obtained by heating sugar to about 400°. It is soluble in water, forming a dark brown solution, and is used to color brandy and other spirits. This is also the name of a popular kind of candy. See Candy.

Cheap Caramels for Children. Take one cupful of water, one of sugar, one-half cupful of grated chocolate, and a piece of butter the size of a walnut; boil the water, sugar and butter to a sirup, and add the chocolate when nearly done; stir to prevent lumping; spread on greased paper, and cut into squares. Or, one cupful of milk, two cupfuls of sugar, two cupfuls of New Orleans molasses, one cupful of chocolate; boil till it candies; be careful not to burn; pour on greased tins, and mark in squares.

Caraway (car'a-way), a biennial plant of the parsnip family, the seeds of which have an aromatic smell and a warm, pungent taste. They are used in confectionery, and also in medicine as a carminative. Also, the term denotes a kind of sweetmeat containing caraway seeds. To raise caraway, sow the seeds in drills six inches apart, early in spring; weed and hoe. The seeds ripen in autumn. The roots are perennial, and yield well for three years.

Carbolic Acid, an oily liquid, colorless, having a burning taste and the odor of creosote, to which it has great resemblance. It is obtained from coal tar. Its form is that of an acid solution, though it is sometimes sold in crystals. It may be applied with safety to all parts of the body or legs of animals, and is invaluable for destroying lice, wood ticks, and all forms of parasite life; and by merely washing or moistening those parts of the legs and bodies of horses, cattle, and sheep chosen by the bot, horse, or other flies to deposit their eggs, their hatching or even deposit may be prevented. As a disinfectant in stables and buildings infected with malaria and distemper, it is of great value. To disinfect such places, wash the walls and ceilings with a tablespoonful of the solution of the acid to a bucketful of water.

For sores and wounds, when unhealthy, a good application may be made by adding one dram of the acid to one pint of water. This will destroy all putrefaction and induce the wound to take on a healthy action.

Carbuncle. This commences with a hard, red swelling, which soon becomes of a purple or livid color; the tumor, as it extends, becomes soft, little

pimples form on the skin around the center mass, which soon break into small ulcers, from each of which oozes a thin, irritating discharge. After some days these small ulcers spread, and uniting form three or four large suppurating surfaces, from which the discharge becomes strong and tenacious. A carbuncle differs from a boil in having no core, and terminating in gangrene, or sloughing, instead of suppuration. Treatment: Keep cold by one thickness of cotton or linen cloth, until it is about as large as it will probably become, then cut across as for a boil, to relieve the pressure. There is very little or no discharge, and that little will be blood, or bloody pus. After the incision warm applications may be made, to allay the pain. No medicaments can hurry it or cure it, but that condition of the system which produces carbuncles may be altered by a radical change in the diet and mode of life.

Cardoon, a plant resembling the artichoke. The stalks of the blanched inner leaves are used as salad in soups, etc. The seed is sown in April, in rich earth. It requires nearly a month to start. The plants should be thinned to five inches apart. Transplant in June, and allow four feet to each. Dress like celery. As they grow, tie up the leaves and earth up several times; they may thus be obtained two feet high. They are to be taken up during winter, like celery. An ounce of seed will produce about six hundred plants. For seed, protect the plant without blanching, through the winter, and it will flower in July following.

Carney, a disease of horses, in which the mouth is so furred that they cannot eat.

Carpet. The time has passed when the "white sanded floor" is the pride of the housewife. Her pride is now to have as nice a carpet as her neighbor, and then preserve it as long as possible. As to the quality of the carpet for the farm house, we must let you judge; we can do no more than tell you how to take care of them. In putting down the carpet, the first thing necessary is to scrub the floor clean, then lay newspapers down two deep, or clean wheat straw, then put down the carpet. A stretcher should be used, and the carpet stretched as much as possible without tearing it. Carpets should be taken up and shaken thoroughly, if in constant use, as often as three or four times a year, as the dirt that collects underneath them wears them out very fast. Straw kept under carpets will make them wear much longer, as the dirt will sift through, and keep it from grinding out. Carpets should be taken up as often as once a year, even if not much used, as there is danger of moths getting into them. If there is any appearance of moths in carpets when they are taken up, sprinkle tobacco, powdered alum or black pepper on the floor before the carpets are put down, and let it remain there. When the dust is well shaken out of the carpets, if there are any grease spots on them, grate on potter's clay very thick, cover them with a brown paper, and set on a warm iron. It will be necessary to repeat this process several times, to get out all the grease. If the carpets are so much soiled as to require cleaning all over, after the dirt has been shaken out, spread them on a clean floor, and rub on them, with a new broom, pared and grated raw potatoes. Let the carpets remain till perfectly dry before walking on them. If they are still soiled, take a pailful of clean water, put into it three gills of ox-gall; take another pail of clean cold water, and rub with a soft scrubbing-brush some of the ox-gall water on the soiled places, which will produce a lather; then wash the lather off with a clean linen cloth dipped in the clean water; open the window to allow the carpet to dry. Every particle of grease can be removed from the carpet by observing the following: Scrape and pound together in equal proportion magnesia in the lump and fuller's earth. Having mixed these substances well together, pour on them a sufficient quantity of boiling water to make them into a paste; lay this paste as hot as possible upon the grease spots; next day brush it off, and the grease will have entirely vanished. Another method to remove grease is to mix a little soap into a gallon of soft water, then one-half ounce of borax, and wash the part well with a clean cloth.

To sweep a carpet, before applying the broom scatter over the carpet the refuse tea leaves from the tea-pot. This will prevent dust and brighten the colors. Indian meal is also recommended. In using a "carpet sweeper," bear down upon it slightly.

Carriages. In a country where riding in carriages is an almost universal custom among those who can afford the pleasure and convenience, the selection of a carriage and the manner of taking care of it are subjects of no small importance. The vehicle, as soon as it rises above the condition of a "business wagon," and is constructed with a view to comfort, elegance of appearance, and assumes the character of a "carriage," becomes an article of luxury, although by no means a useless one; and its selection is a question which should exercise both the judgment and the taste of the purchaser.

No carriage can really look well if it does not look serviceable. If for heavy work, it must be strong and appear strong, without appearing heavy or unwieldy. If for light work, it can hardly appear too light; for it is so generally known that delicately made carriages may be very strong, that the light appearance does not convey an idea of weakness. Economy and safety demand that the purchaser assure himself that the carriage is sufficiently strong and well made for the service for which it is required.

In these hints to those who would purchase a carriage either ready made or made to order, we would not claim that anyone, however experienced, can avoid being cheated if he falls into the hands of a dishonest maker who has no regard for his reputation. In a hundred things can a purchaser be deceived; the quality of the iron and steel, of the wood and leather, of the paint and varnish even, can only be tested by actual use; and the carriage-maker himself has to depend in a great degree on the "brand" or the reputation of the manufacturers, for the quality of many of the materials. Much more, then, must the purchaser of a carriage, which, when it is delivered to him is covered up with paint and trimmings, depend on the character of the carriage-manufacturers or merchants.

There are many varieties of carriages, of which we describe and illustrate the most common.

COACH. All paneled carriages with seats for four persons inside, and an elevated coachman's seat, are designated "coaches." Fig 1.

FIG. 1.—*Coach.*

CALASH or CALECHE, a carriage with leather top, portable glass shutters on the sides, and a paneled front, with sliding windows. The whole front may be removed in a few minutes, making it an elegant open barouche, with a half-top over the back seat. No carriage is so desirable for both winter and summer use. They are made for four persons inside.

LANDAU is similar to the caleche, without the portable front and glass sides; the entire top being of leather supported by folding joints in each quarter. The top may be divided in the center, the whole falling front and back. These are complex in construction and liable to get out of order, which prevents their popular use.

BAROUCHE is made for four persons inside, and has an elevated coachman's seat; leather half top over the back seat, or an extension top, covering the four inside seats. The leather form is desirable for country use, as it affords protection from the sun and rain. The half-top for morning and evening drives is much liked; the top being thrown down, the carriage presents an elegant appearance, and affords an opportunity for the display of full dress; hence it is popular with visitors at watering places and public parks.

COUPE or BROUGHAM. A half coach, with body for two persons inside and an elevated coachman's seat. A rockaway proper has a plain square or straight body, with standing top and leather curtains to roll up; for either four or six persons; all seats on a level. Of late years, all vehicles with standing top and seat on a level are called "rockaways." Some are made for six persons, with paneled sides and glass windows, which approach nearly to a coach in weight and cost.

BRETT. A brett proper is a French half-top barouche, with all the lines of the body at right angle. They are generally made with four inside seats, and elevated coachman's seat. The form more familiarly known in this country as a brett, resembles that of the English barouche, except it has only a half-top.

PHAETON. There is an infinite variety of phaetons

FIG. 2.—*Phaeton.*

now manufactured. As originally made, they have seats for four, with a portable half-top, or without a top; but the more common and popular kinds, at present, have seats for two. Fig. 2 represents an excellent build of the phaeton. This is a good carriage for old people or for the use of ladies, being wide and roomy, hung low, and the top coming well over the seat.

DOG-CART is made with two or four wheels. The

FIG. 3.—*Angular Side-Spring Top Buggy.*

original English dog-cart is on two wheels, the body being nearly square, and carrying four persons. The back end of the body is made to drop and form

a foot-board, the persons on the front and back seats riding back to back. The sides are generally made with blinds or lattice-work, to accommodate dogs, when used for sporting purposes.

BUGGY. Of this kind there is a great variety: all, however, have four wheels, and seats for two persons. They are made of every conceivable form, both with and without a top; at all prices, varying from $75 to $400.

We represent a standard and very popular buggy by Fig. 3. This is an angular, side-spring top buggy. Fig. 4 illustrates an angular or flat-top, side-spring, open buggy. These are made with square-corner body, and are a very neat and convenent buggy for country use.

A most excellent family buggy or spring wagon is shown by Fig. 5. This is a far more convenient and comfortable vehicle for a farmer to take his family to town in than the lumber wagon; besides, it saves much wear of the wagon, is easier on the team, and transit is much quicker. They are large and strong enough to carry four or five persons, and considerable produce. A farmer who cannot afford other carriages should at least make an effort to have one of these spring wagons.

To those who can afford a more imposing carriage, one adapted to all circumstances and usages, we recommend the style illustrated by Fig. 6.

In the construction of a carriage it is essential that all its various parts should be made of good material, well proportioned and made well. That the farmer may know something of the best material for the different parts of a carriage, and of the manner in which it should be handled, we give at some detail a description of these parts.

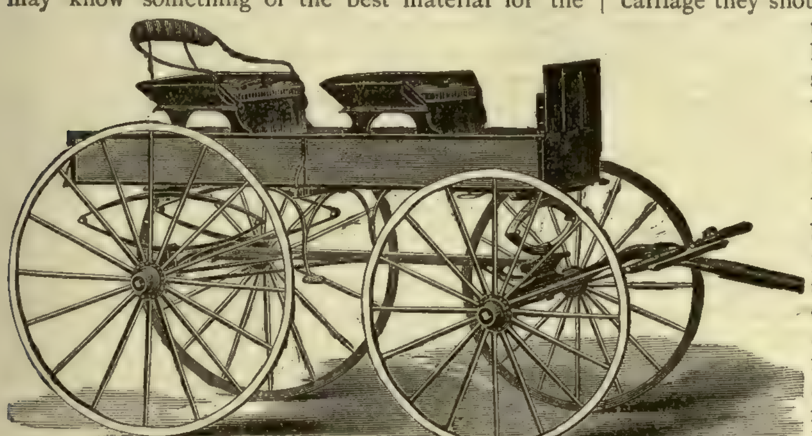


FIG. 5.—*Spring Wagon.*

The HUB of the wheel, being at once its center and foundation, mechanically speaking, should be particularly strong and of well-seasoned wood. Red elm, white elm, and particularly the gum, are good timber for this part, as they are not liable to crack in seasoning, or split by the pressure of the spokes.

SPOKES should, for heavy work, be made of white oak of clear grain, and free from checks or knots.

For light carriages hickory is preferable,—14 in the fore wheel and 16 in the hind wheel, except in the vehicles of the lighter kinds, when two less in each wheel will answer. If the tenon or "tang," which is inserted in the felloe, is square instead of round, it will greatly add to the strength, though few makers are found who will take this trouble. Every spoke which is discovered to be defective, in any way, should be scrupulously rejected by the carriage-maker; for one bad spoke will spoil the wheel. In a business wagon, the spokes should be set in the hub in range, or in a straight line, while in a buggy or light carriage they should be placed alternately in and out, that the weakness caused by their light construction may be compensated for by the bracing position, which this zigzag position affords.

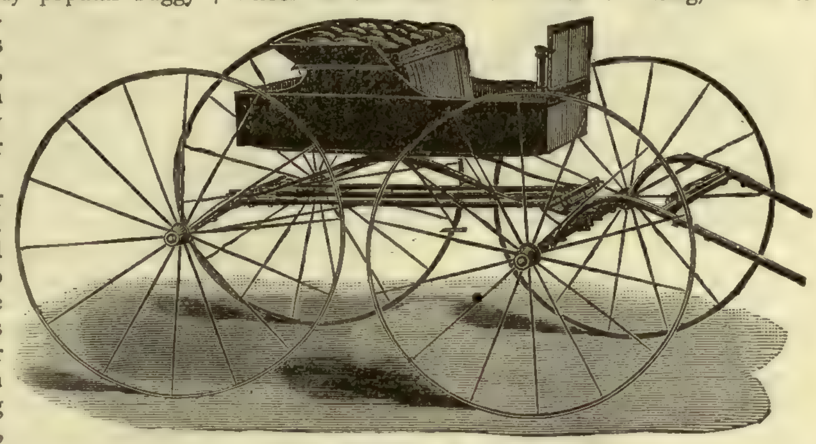


FIG. 4.—*Side-Spring Open Buggy.*

FELLOES OR RIM. This part of the wheel should be of the best Eastern white ash or hickory. (The Western growth is softer and more brittle). Oak is often used for this purpose, but is much more liable to sun-checks, and will split more easily, and is more apt to break in at the joints. For pleasure carriages, which are kept well painted, and, for the most part, secure from the weather, the bent rim is better than the short pieces or sawn felloes; but for business wagons, or those much exposed to the sun and rain, with the paint not always in the best condition, and which require a more frequent re-setting of the tire and the consequent cutting of the ends of the felloe-sections, it is better not to be obliged so often to cut the same

ends as in the case when there are only two pieces. There are always, when the felloes are sawn, two spokes in each section.

The wheel should, in all cases, be dished, as this adds to their strength and durability. A light wheel for road wagons, four feet in diameter, should dish about three-eighths to one-half inch; the coach wheels, three feet six inches in diameter, should dish one inch, the measurements being taken, in both cases, after the tire has been set.

Fig. 6.—*Family Carriage.*

TIRE. It is upon this part of the wheel that most of the wear comes, and if defects exist here, no excellence in the other parts will be of any avail. The important points in a good tire are, that it should be made of good iron, that it should be of the size best ad-adapted to the vehicle on which it is to be used, and that it be "set" well, neither so tight as to draw the wheel out of shape, nor so loose as to allow any racking of the spokes. Wide tires are desirable on soft roads, being less likely to cut in (causing the carriage to run heavily, and injuring the roads) than narrower tires. All tires should be fastened on with bolts, one between each two spokes.

AXLE. Since the general introduction of the iron axle, the wooden axle has gone out of use, except for the heaviest description of wagons for the farm or other heavy work. Axles may be either straight, arched, or cranked; the arched form, which is essential for all very light axles, being stronger than the straight ones, though a very light arch answers the purpose.

SPRINGS. These are of many kinds, as the old C spring, the ellipitic spring, and the shackle spring, the platform spring, etc. That in most common use, and by far the best for ordinary purposes, is the elliptic spring. It is of the first importance that the springs should be of the proper degree of stiffness required by the weight of the carriage, and the number of persons they are intended to bear; if too stiff, they will "ride hard," and cause great discomfort; or if they are not stiff enough they will collapse or break. The stiffness is regulated by the thickness of the steel used, the length of the springs, and the width and number of leaves or plats. The body should be set on the springs a little inclined backward, as the tendency is to "run forward" in use.

SHAFTS. The best wood from which to make shafts is hickory. It is, however, more easily affected by wet than ash or oak. Shafts for light wagons are generally steamed and bent to such form as is required. They should be bowed out widely at the rear, and in front should turn well out from the horse's shoulders. The pole for light wagons should be made of hickory, steamed and bent.

BODY. The body frame-work for coaches should be made of soft western ash; the top ribs, of hickory, ash or maple; the panels of white-wood; and roof, of pine-wood deal.

TOPS. Enameled leather is now almost universally used for tops, and though less durable than the old-fashioned "oil-top leather," it looks better, being black and brilliant, and is not so apt to shrink.

For the DASH, "grain" patent leather is the best. Its quality may be determined by its pliability. Hard, stiff leather will crack when exposed to heat and cold. The enamel should be smooth and brilliant, and show no "pitting," or unevenness in polish. Good dash leather is jet black, not greyish or reddish black.

TRIMMING. The most durable material for trimming is cloth; if in high colors, it should be of English manufacture, as in the grade of cloth used for carriages; its colors are more durable than those of French and German manufacture. High colors in American carriage cloth will not stand the sun.

For STUFFING the seats and backs, nothing but the best curled hair should be used. If hair of inferior quality is mixed with it, it will breed vermin, especially in damp situations. Curled hair keeps the seat elastic.

RULES TO BE OBSERVED IN PURCHASING VEHICLES. — First. Choose for your carriage-maker one who has a character for fair dealing and good work.

Second. Never purchase a vehicle made for two horses with the hope that it will "do" for one horse. Your mistake will be apparent when you find your horse failing from over-work.

Third. Always insist upon "case-hardened," or steel-covered axles. If you have any doubts of their quality, try a file on them. If hard it will make no impression.

Fourth. Insist upon tempered springs, made of English steel. Test your springs by loading the carriage before you buy it, and ascertain what weight they will carry when in use on the road.

Fifth. Examine all iron plates, clips and bolts. If the iron-work is not fitted to the wood with exactness, don't buy the carriage: a poor workman has been spoiling good material.

Sixth. See that the "jacks," or irons conecting the pole or shaft with the axles, are well fitted and sufficiently heavy. If badly fitted they will rattle; if not strong they will endanger your life, if you use the carriage.

Seventh. See that the axles are "set" with exactness. No carriage will be durable, or run with ease, if the axles are not set with mathematical precision.

Eighth. Never select a carriage because it is elaborately finished with silver plate. It soon looks shabby, and requires a great deal of care to keep it in order. Carriages are often elaborately finished to

cover up serious defects in the workmanship.

Ninth. Examine closely the painting. A few years' ownership of a carriage will show a greater outlay in making good original defects in painting, than for any other item. If varnish is dull, it generally argues that the painting was hurriedly done. The varnish will "strike in" on bad painting, and a little exposure in bad weather will crack the paint on the wood.

Tenth. Never permit, in the cushions or back, anything but curled hair. Moss soon gets hard.

Eleventh. See that the cloth on the glass frames has been shrunk before it was put on; if not shrunk, the first rain to which it is exposed will draw it off the frames.

Twelfth. See that the door-locks and handles work with ease, and do not rattle. Nothing is more annoying than bad door-locks, or even good locks badly fitted.

Thirteenth. In purchasing a carriage for road use, see that it is made to "track" in the ruts in the district where you intend to use it. There are at least a score of different tracks in different parts of the Union, —varying from four feet four (from center to center of the wheels measured on the ground) to five feet four and a half inches.

Care of the Carriage. Having procured a carriage which has a fine luster, which runs easily and smoothly, and which is generally well finished, it is desirable to maintain it in this condition as long as possible. This requires it to be properly cleansed, oiled when necessary, kept free from dust in the carriage-house, and to have its bolts tightened whenever they have worked loose.

The appurtenances necessary for this purpose are a pail and watering-pot (the water should not be thrown through a hose, as it ruins English varnish, and penetrates all the crevices in the springs, etc., causing rust), two large soft sponges, free from grit, two full-sized chamois-skins, an unlimited supply of water, a wisp-broom, a feather duster (a cloth one will answer), a sheet for covering the whole carriage, a can of sweet oil, or, which is better, pure sperm oil, and a screw wrench. Soft water is much better than hard, as the latter is injurious to the varnish.

All the fine carriages now made being varnished with English varnish, it may be well to call to mind that it has these peculiarities: It will become spotted whenever the mud is allowed to remain long upon it, and the more frequently it is washed, the more lustrous will it remain; hence it is necessary, in order that it may be kept in the best condition, that the carriage should be washed every time it comes in, and at least once a month whether it is used or not.

All freshly varnished carriages should be nicely washed, with soft cold water, four or five times before being used; it hardens the varnish and prevents it spotting by mud. Never place a carriage near stone or brick wall; the dampness destroys the varnish. Varnish requires a well ventilated room. Ammonia from the stable will also destroy varnish in a short time.

The Washing should be done in the following manner:

1. Supposing the top to be sufficiently clean, the cushions and whip removed, the inside of the carriage wiped out, and the curtains fastened down, sprinkle water on the body of the carriage with the watering-pot until all the mud is washed off, by the action of the water alone, without having recourse to rubbing, and until you are sure that no grit remains.

2. Wash the whole body with the sponge which is kept for this purpose, using as much water as possible, and rubbing very lightly, continuing the operation until the water runs from the body perfectly clear.

3. Wet the chamois-skin which is used for the body, and wring it out as dry as possible. This will soften it so that it cannot scratch the varnish. Use this to absorb the water which has been left after washing, wringing it out as often as it may be necessary. Continue this until the body is dry. Do not rub it with the chamois-skin, and do not use the skin, nor any substitute for it, when dry and stiff.

4. Pursue this course with the running gear (the wheels, springs, etc.), as has been specified for the body, but lay aside the sponge and chamois-skin which were used for the body, and use for this portion the ones designed for it. Be careful to wash the wheels in such a manner as to throw as little water as possible on the body, and whenever any does strike it remove it at once as before directed. Do not apply soap to any part of the carriage, or even a sponge which has been used with soap, as it will destroy the varnish.

5. Having removed the dirt, and thoroughly dried the carriage, paying particular attention to those parts where the iron is likely to rust if any water is left, rub up the plate with dry chamois-skin kept for that purpose, adding a little dry whiting where necessary, though if the plate is never allowed to become much tarnished there will be little occasion to do more than to rub it with the leather.

6. The top may, when necessary, be washed by the same process as recommended for the body, and with the same care.

Having cleaned the carriage in every part, replaced the cushions and rolled up the curtains, throw a muslin sheet over it to keep dust from it.

If the carriage has not been out since it was washed before, it will only be necessary to wet it thoroughly and dry it as directed.

This is the best method for washing the best carriages. It may be, and in most instances it probably will be, modified to suit the purposes of those who do not care to devote so much labor to this work; and in all such questions of object and expense, the judgment of the individual must establish the compromise.

At least once a month place a wrench on every

nut on your carriage. You will thus prevent the loss of nuts and bolts, and preserve your carriage; a loose bolt frequently leads to serious breakage.

As often as once a month, and oftener if necessary, the wheels should be taken off, and the axles and boxes should be thoroughly cleaned, by scraping them with a sharp-edged piece of hard wood, covered with flannel or woolen. They should then, if full-patent axles, receive as much sweet oil, or pure sperm oil, as they will retain without allowing it to work out over the wheel. One tablespoonful to each wheel will be a good quantity.

When the leather-washers are worn out, replace them with new ones. A patent axle running with worn-out washers will soon be good for nothing.

For the half-patent axle, clean lard, or other greases, or any of the patent wagon greases, will be found as effective as oil, and more permanent.

Tire-setting is the most important repair which will be necessary in the case of well-kept carriages, unless they become accidentally broken or worn from long use. This operation should, unless rendered necessary by accident, or improper construction, be performed only in the dryest summer weather, when the wood of the wheel is shrunk to its narrowest limits.

CARRIAGE STEPS. No well regulated farm-house fence should be considered complete without a carriage step at the front gate. A cheap form of step is shown in Fig. 7. It is 2 feet 4 inches high, 2½ feet wide, and 3¼ feet in length, and is provided with two steps. Two by 3, or 3 by 3 inch pieces are placed upright at each inside corner, to nail to. This is generally placed at the left of the gate as you enter the yard, and always has the latch end of the gate nearest the step, as it will be far more convenient.

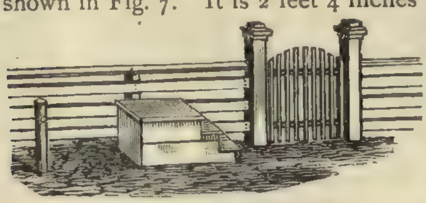


FIG. 7.—*Carriage Steps.*

Carrots thrive best in rather a light loam. The ground should be well manured with fine well rotted or composted manure, 10 or 15 wagon-loads to the acre, and be thoroughly worked quite deep by two plowings at right angles with each other; also roll and harrow. Plant in rows 14 inches apart, and thin plants three to five inches in a row. Plant from middle of April to middle of May, putting in the seed liberally, say eight ounces of seed to 300 feet of row, or about four pounds to each acre. A thousand bushels to the acre might be raised. Carrots are excellent food for horses and cattle.

FIG. 1. *Early Scarlet Horn.*

VARIETIES. *Long Orange.* The standard field carrot; good for stock.

Short Horn. A standard early variety, sweeter than Long Orange and more solid; good to color butter.

Improved Long Orange. Of a darker and richer color than long orange.

Early Scarlet Horn. The best early short variety for forcing; excellent for the table; very deep orange.

Extra Early Forcing. The earliest and smallest of all varieties; of special value for forcing.

Large White Belgian. Largest of all, white and most productive; good for horses; entire crop can be pulled by hand.

Yellow Belgian. Grows partly out of ground; a capital sort for late keeping.

FIG. 2. *Extra Early Forcing Carrot.*

Danvers is a new and promising variety, having the greatest thickness and smallest length of root; easy to dig.

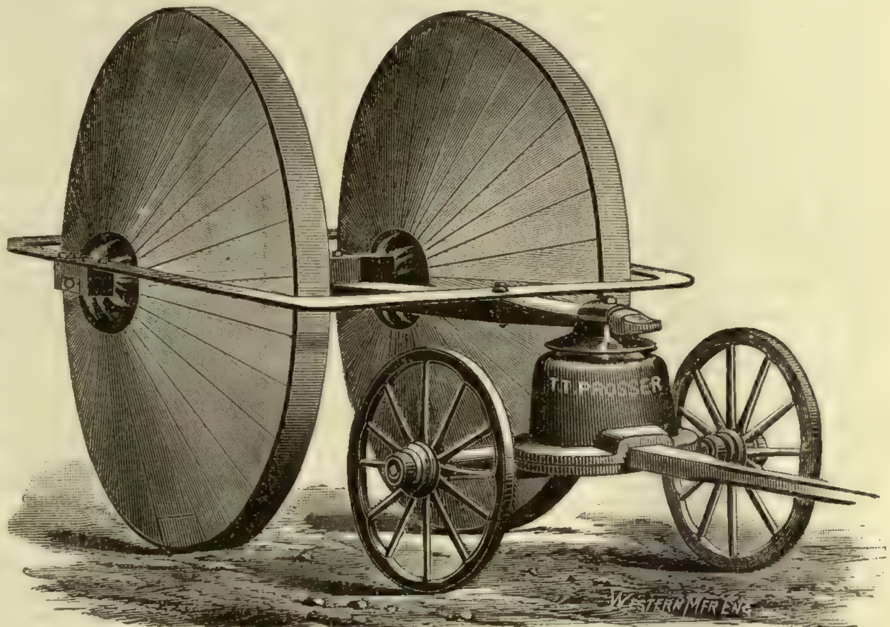
TO COOK CARROTS, first scrape them nicely; slice them lengthwise; put in cold water, then boil them till tender, and drain the water all off; then season with a little salt, pepper and butter; then take about two spoonfuls of rich milk and flour, not enough for thick gravy; you only want a little. Cut them in slices with a knife. Carrots are good for flavoring soups.

Cart. Mr. T. T. Prosser, of Chicago, Ill., has recently invented a wagon or cart for the use of farmers in hauling their grain to railway stations or elevators, on the prairies and in newer portions of the country where they are not supplied with macadamized or planked roads.

We illustrate on next page this novel grain-wagon, a brief description of which will make its advantages clear to the comprehension of the ordinary reader. Upon the forward axle of the wagon is attached a truncated hollow cone, which takes the place of the ordinary shear, sand board and bolsters. Through this the base of the tongue of the vehicle passes, which is held in nearly rigid position, having a slight perpendicular movement, but no side or horizontal movement independent of the wheels. By this arrangement the weight is relieved from the necks of the team. In the upper end of this cone is set the king bolt, or what takes the place of this article, to which is attached the reach, forming the connection of the carrying cylinders of the wheels. This has a free revolving motion inside the cone, allowing the fore wheels to turn either way to a right angle with the reach or connecting pole. These wheels have a broad, corrugated tire, which not only prevents their sinking in soft ground, but gives them the very best holding capacity in leading the loaded cylinders. It will be seen that this independent action of the fore wheels has another advantage. Should one or both the cylinders or loaded hind wheels get into ruts or soft ground, the entire force of the team may be exerted in a direct transverse draught to extricate first

one cylinder and then the other, or both at once.

The cylinders or grain-carrying wheels are intended to be about ten feet in diameter with a tire about 12 inches in width, bellying out to about three feet at the center. Such a pair of cylinders will carry about 150 to 300 bushels of grain, which is three to six ordinary wagon-loads. These cylinders with their load rest directly on the ground, the trunnions bearing no weight, and thus offering no friction except the horizontal force necessary to roll the cylinders. So much has already been said in reference to the difference in the power required to move a given load when resting upon the axles with small wheels, and the same load when resting directly upon the track or ground, that we need not go into that question. It has been demonstrated by experiment that a grain-cart or wagon like the one illustrated, carrying 150 to 300 bushels of wheat, will actually require less power to move it over the same road than an ordinary wagon loaded with 35 to 50 bushels, the usual load on country roads. These cylinders are intended to be made ordinarily of hard wood, with wrought-iron tires and trunnion boxes. The only frame necessary is the light wrought-iron bar passing around the cylinders attached to the trunnions and to the center pole both before and in the rear of the cylinders.



Prosser's Cylinder Grain Cart.

We hardly need refer to the advantages of such a grain cart in hauling a large crop of wheat to the railroad station or warehouse. On many large prairie farms the wheat crop is thrashed out in the fields, cleaned up and moved direct to the station for shipment. One team with one of these grain carts would do the work of four to six teams with four to six wagons and four to six men; or a man with one team would save three days' time and labor each day in getting his grain to market or to a shipping point. In many cases the work of getting the grain to market or to a shipping point comes just at a time when the farmer wants to be at work getting his ground ready for fall sowing, when time is everything, and when the time thus saved in a single season would pay for the cylinder grain-cart.

Carving. To be proficient in this is an accomplishment to be greatly desired. In carving the various kinds of meats and fowls we give the following brief and pointed instructions:

A Roast of Beef. The carving-knife should be rather light and very sharp. Cut the outside pieces thin, and lengthwise of the bone, drawing the knife through with a quick motion, and then lay them in order.

Lay them in order on the platter till there are as many as there are persons to be helped. Then cut the inside meat in the opposite direction, across the bone, laying the slices—cut very thin—in order by themselves. Give each person an outside and an inside piece, but never overload a plate.

Saddle of Mutton. Cut the slices lengthwise from end to end, on each back-bone. If very large divide and give a portion of fat with each piece.

Loin of Veal. Same as sirloin of beef, except that the carver turns the veal over and removes kidney and fat before cutting slices.

Leg of Mutton. Lay it back down; cut the first slice across the lower part about one-fourth of the distance between the knuckle and cramp-bones; then cut the thin part near the thickest until it is sliced to the bone; cut slices toward the thickest part until sliced to the bone; then cut the part near the knuckle lengthwise. The best pieces are the thickest. If any is left let it be the thickest and best part.

Shoulder of Mutton. Lay the back up. Cut the leanest part to the bone across the point. The best are on each side of the blade bone.

Ham. Lay back up; cut thin slices near the middle to the bone; also near the thin end; give bit of fat and lean together.

ROAST PIG. If served whole, cut off the head at the neck joint; lay open along the back bone from neck to tail, and lay crackling side down; divide the ribs and help part crackling and dressing to each person. Cut up the head for those who prefer it.

A FOWL. Place the fork firmly in the thick part of the breast; take slices from each side of the breast-bone, the whole length of the fowl; unjoint and remove the wings; divide at the first joint. Cut the ligaments of the legs, and twist them out of their sockets, dividing at first joint; cut down the merry-thought or wish bone and separate by lifting and pressing backwards; lift up the collar-bones, at each side of the merry-thought, at the broad end, with the knife, and force them toward the breast-bone until they break off; cut through the ribs on each side and remove the breast. Now turn up the back-bone and press the knife firmly across it near the middle, lifting the lower end at the same time with fork, until the bone breaks; then turn the lower end away and remove the bones from each side, by placing the point of the knife on the spot where the side bones are jointed to the back bone. Ducks and prairie chickens are carved in the same way.

TURKEY OR GOOSE. Cut as many slices as possible without cutting up the carcass. The rest is like carving fowls.

Case-Hardening, putting a steel surface on iron. It is accomplished by heating the iron in contact with animal carbon in close vesels. The articles are put into a box with animal carbon, and the box made air-tight by luting with clay. They are then placed in the fire and kept at a light red heat; in half an hour after the box and its contents have been heated quite through, the hardness will be about the thickness of a dime; in an hour it will be double that, and so on until the desired depth is obtained. The box is then taken from the fire and the contents emptied into pure, cold water. They can then be taken out and dried by riddling them in a sieve with dry saw-dust, when they are ready for polishing.

Cashmere, a rich and costly kind of shawl, made from the soft wool of the Thibet goat. To renovate black cashmere, take about one-half teacup spirits of ammonia to one quart of soft water; then with a soft sponge rub the pieces till thoroughly wet; then roll tightly; when the pieces are all sponged, iron immediately; put the right side of the cashmere next to the flannel; use as hot an iron as possible and iron till perfectly dry. Then use a soft brush to remove flannel lint from the right side.

Cassava (cas'a-va), a starchy food prepared from the poisonous roots of tropical plants. Sometimes kept on sale at groceries. Tapioca is purified cassava.

Cassimere, a thin twilled woolen cloth, used for men's garments.

Caster, or **Castor**, a small wheel fixed to the feet of articles of furniture for facility in moving. At the hardware stores nowadays can be obtained casters so made that they may be screwed to the outside of any furniture leg. They are not only more convenient but also more substantial than the old or common kind. The word "caster" denotes also a vial, cruet, or other small vessel, to contain condiments at the table; also, a stand, to contain a set of such cruets.

Cast Iron: see Iron.

Castor Bean. This is cultivated as a field crop in many sections south of latitude 39°, and will grow very vigorously north of this parallel. It thrives best in a rich, mellow soil, and is easy to raise, as it is planted and cultivated like corn. It grows five or six feet high, and bears 20 to 30 bushels per acre. The beans are taken from the pods, bruised and subjected to a great pressure, by which they yield nearly a gallon to the bushel of "cold-pressed" castor oil, which is better than that extracted by boiling and skimming. The last is done either with or without first slightly roasting. The oil is generally used for medical purposes, as a mild cathartic, but it has even been used as an article of food. Its manufacture into a limpid oil for machinery and lamps, and stearine for candles, has of late been superseded by the products of petroleum.

CASTOR OIL, TO MAKE PALATABLE. Boil it with an equal quantity of milk, sweeten it with a little sugar, stir it well, and let it cool; beat it up with white of egg; or, envelop the oil with orange or lemon juice in a glass.

Castration, removing the testicles. See Calves, Horse, Sheep and Swine.

Cat. This domestic animal is too well known to require description. Its usefulness upon the farm and in the household for the suppression of rats and mice renders it deserving of mention in these pages. The rule which should always govern a farmer to keep nothing but the best stock should also apply to his cats and dogs. A handsome, well-conditioned cat is an ornament to the kitchen, the porch, or the lawn, and is always noticed by the visitor. A mean, half-starved cat is always a disgusting object. A cat of pure breed is also apt to be the best mouser. The varieties of the domestic cat are neither numerous nor strikingly different. The Tortoise-Shell cat differs from the common variety in color, and is also very elegant. The Angora is a beautiful variety remarkable for its long, silky hair. The Chinese cat has a fine glossy fur, and is remarkable for its pendulous ears. The Chartreuse (shar-truss') is of a bluish color. It is supposed that the Toby has undergone less change by domestication than any other. In this country, the Maltese variety is common and popular.

Insect powder rubbed on the bodies of dogs and cats for the purpose of killing fleas, is apt to get into their noses and eyes when they turn to bite their itching skin. Liquid home-made soap rubbed over

their skin is a better remedy. After leaving it on half an hour or so, wash it off clean with warm water, put the dog or cat in a clean place to dry, and then comb down its hair nicely. Kerosene is a far better remedy.

Catalepsy. This is a species of convulsion in which the patient lies perfectly calm, with the muscles partially or totally relaxed. It is brought on, in certain constitutional conditions, by a protracted concentration of the mind or some particular object, and seems akin to other states of the body called "trance," and 'ecstasy." It continues from a few minutes to several days, and used to occur frequently at exciting religious meetings. External sensibility is suspended. During the fit no treatment is required except to keep the patient at a comfortable temperature; but he may be aroused with a careful manipulation and an application of cold water to the face and head. The constitutional and preventive treatment consists in abstinence from sexual and other excesses, and in cultivating sociability.

Catalpa, an ornamental and useful tree, of which there are two species. See Forestry and Landscape Gardening.

Catarrh, mucous flow from diseased air passages, or morbid fluid from other diseased mucous surfaces; also the disease that produces such flow.

There is perhaps no complaint so common as catarrh or cold in the head; it occurs both in winter and summer, and generally the summer cold is more difficult to get rid of than the winter. The attack begins with pains in the limbs and back, tightness across the forehead, repeated sneezing, watery and inflamed eyes, increased discharge from the nose, sometimes inflammation of the throat. Treatment: Wet cloths in cold water, and wring as dry as you can, and apply to the outside of the throat, and wrap a towel around the neck, so as to exclude the air as much as possible. Keep this up during the night for a succession of nights. Also apply some good liniment, rubbing in well two or three times daily. Two parts spirits camphor to one part turpentine makes a very good liniment. Bathe the neck frequently with cold water, and rub dry with a coarse towel. A little cayenne pepper, with saltpeter, dissolved in water, and used as a gargle, is good to allay inflammation. If the throat is raw and sore, dissolve two teaspoonfuls of borate of soda in a teacupful of soft water, and gargle every two or three hours. Smoking dried mullein leaves and exhaling the smoke through the nostrils, and breathing into the lungs, often gives relief. Avoid exposure. In connection with the above, take some good alterative. The following we think excellent: Compound extract sarsaparilla, 4 ounces; fluid extract yellow-dock, 1 ounce; iodide potassium, 2 drams; mix. Dose, one teaspoonful three times a day. Others recommend crushed cubeb berries smoked in a pipe, emitting the smoke through the nose. After a few trials this will be easy to do. If the nose is stopped up so that it is almost impossible to breathe, one pipeful will make the head as clear as a bell. For sore throat, asthma and bronchitis, swallowing the smoke effects immediate relief. It is also a good remedy for offensive breath, and will make the most foul breath pure and sweet. Sufferers from that horrid disease, ulcerated catarrh, will find this remedy unequaled, and a month's use will cure the most obstinate case. Eating the uncrushed berries is also good for sore throat and bronchial complaints. After smoking do not expose yourself to cold air for at least 15 minutes, and let the pipe be a common clay one, new and clean. Let the diet be low, drink toast water, warm gruel, or barley-water acidulated with a little lemon or cream-of-tartar. Bathe the feet at bed-time in hot water. Use the vapor bath, or wrap hot bricks in cloths or flannels dipped in vinegar and water, to the feet and sides. Should the cough be troublesome, take a cough pill or pulmonary syrup. Or, snuff up the nostrils about as much iodoform as would lie on a three-penny piece.

Cat-Bird, a species of thrush, of a leaden color, which is a beautiful singer in spring and early summer, but late in the season, makes only a mewing cry like a cat.

Catch Drain, a large drain to catch the collection of water made by other and smaller drains and convey it to a natural water-course.

Caterpillar, the larva (or worm form) of a butterfly. A general remedy for driving caterpillars away is: Sprinkle upon them a weak solution of chloride of lime, or a strong decoction of rue, wormwood and cheap tobacco: the latter should be applied every morning and evening while the fruit is ripening. See respective fruits and vegetables.

Cathartics, medicines increasing the discharge from the bowels.

CATHARTIC POWDER. Best senna, ginger, camomile flowers, of each 1 ounce; jalap, ½ ounce. Powder fine, and mix well. Take from a half to a teaspoonful in warm water or tea. This is a valuable aperient; it is powerful, and yet mild; effectually cleanses the bowels, and produces a healthy action in them, and also upon the liver. Among the "Hygienists" the most common cathartic is, raw corn meal, mixed with water, in doses from a tablespoonful to a gill; injections of water into the bowels with a syringe.

Catsup, or **Catchup.** There are several ways of making catsups, but to make what every one will like and will keep well, try one of the following, and let the wife or daughter remember she should not permit any thing in the shape of copper, pewter or lead come in contact with the article from which the catsup is made. Only earthenware or stoneware should be used.

TOMATO CATSUP. Cut up ripe tomatoes, boil one hour in their own liquor; strain and press through a hair sieve; to one gallon of juice, add 1 tablespoonful of salt, 1 tablespoonful of black pepper, 1 tablespoonful of cayenne pepper, one tablespoonful of nut-

meg, two of cinnamon, two of allspice, two of powdered cloves, 1 of mustard and 1 of celery seed tied in a bag, and 1 pint of vinegar; boil until quite thick; bottle and cork while hot; seal with sealing-wax.

Another: Take perfectly ripe tomatoes, ½ bushel; wash them clean and break them to pieces; then put over the fire and let them come to a boil, and remove from the fire; when they are sufficiently cool to allow your hands in them, rub through a wire sieve; and to what goes through, add salt, 1 tea-cup; best vinegar, 1 quart. Put upon the fire again and cook one hour, stirring with great care to avoid burning.

If they were very juicy they may need boiling over an hour.

Green Tomato Catsup. One peck of green tomatoes, one dozen onions, not the largest. Cut the tomatoes up, peel on; stew onions and tomatoes together until fine; strain through a colander, then put on and stew again, with a quart of good vinegar, spices to taste, half-cup sugar, spoonful of salt; put two red peppers in while cooking, then throw away the peppers. When bottled, seal up as any fruit; it is nice.

Walnut Catsup. Take green, tender walnuts, prick them in several places, put them in a jar and sprinkle them over with salt and water enough to cover them; let them remain from three to six days; break them and let them remain in the pickle 10 to 12 days; pour off the liquor and cover the shells with boiling vinegar to extract what juice remains in them; crush to a pulp and strain into the liquor. Allow for every quart, 1 ounce black pepper, 1 ounce of ginger, ½ ounce of cloves and ½ ounce of nutmeg, ½ teaspoonful of cayenne pepper and celery seed tied in a bag. Boil for one hour and a half and bottle when cold.

Mushroom Catsup. Lay alternately in a pan the mushrooms and salt; allow half a pound of salt to four quarts of mushrooms, let them remain until next day, then mash them well and let them remain for three days longer; strain, and for every quart of juice allow 1 ounce of allspice, 1 of ginger, a teaspoonful of powdered mace and 2 of cayenne pepper; put into a stone jar, cover closely, and boil in a kettle of boiling water for seven hours; let it stand in a cool place over night, until well settled; pour off carefully from the sediments and put up in small bottles, and seal up air-tight.

Oyster Catsup. Chop the oysters and boil in their own liquor with a teacupful of vinegar to every quart, taking off the scum as it rises; boil from three to five minutes and then strain; return the liquor to the fire and add one cupful of sherry wine, some cayenne pepper, one tablespoonful of mace and one of salt to every quart. Boil fifteen or twenty minutes, and bottle when cold.

Currant Catsup. Take 5 pounds of currants, 3 of sugar, 1 tablespoon of pepper, 1 tablespoon of cloves, 1 tablespoon of cinnamon, 1 tablespoon of salt. Steam the pulp and juice of the currants, then add a pint of vinegar and boil half an hour.

Cattle. At the present day all domestic animals of the bovine species are known as cattle, though the signification of the word in former times had a wider range of meaning and applied to all goods and chattels of the farmer and householder, and later to all live domestic animals. The genus *Bos* as a domesticated animal has been the useful and cherished companion of man from the earliest date of history, either sacred or profane. In the fourth chapter of Genesis we are informed that cattle were kept by the early descendants of Adam. The natives of Egypt, India and Hindostan, as well as in other countries, placed the cow amongst their deities, and indeed the traditions of every Celtic nation enroll the cow among the earliest productions, and represent it as a kind of divinity. Oxen have also been used for labor in husbandry, and more or less in commerce, in all countries where neat cattle were kept, and could endure the climate well, as being the most convenient beast of burden. It is probable that they were bred in their best estate by those who used them, and the cows were cultivated for dairy and household uses in the family. As they spread from Asia west and north into the higher latitudes and elevations of Europe, they somewhat changed their characters, and became, as now known there, acclimated and fitted to their new conditions, and inured to the habits of the people who kept them. We may suppose, too, that in the severer climates they were afforded somewhat of shelter, and more pains-taking in food and treatment, than in the milder latitudes where they had long ranged, and with such increased care improved in quality and appearance. They took, possibly, somewhat different shapes, and conformed more or less to the uses to which they were subjected. The Moors of Spain reared great herds of neat cattle, and from them descended the dominant races of Spanish herds. They were there the progenitors of the savage and headstrong bulls still sacrificed in the arena of bull-fights and picadores. The Gauls of France bred the gentler and more economical forms of cattle, adapted to a better husbandry. By what gradual, peculiar, or natural progresses these European cattle acquired their present distinctive characteristics, we have no definite information. History is either altogether silent or obscure on these subjects, and we have no better guide than conjecture to inform us. Throughout Western Europe numerous different breeds exist, of diverse qualities, all more or less useful for the purposes to which they are applied, and profitable to the people who breed and rear them. Italy, France, Spain, Germany, Switzerland, Holland, and other northern countries, all have their peculiar national breeds, while England, Scotland and Ireland have many varieties widely divergent in character and appearance. Indeed, it is not necessary, unless for speculation or curiosity, that we know the particulars of their history or progress, inasmuch as we, in America, are already in possession of the best breeds in Western Europe, fully answering our own immediate purposes, and which have

Fig. 1.—DEVON BULL.

been successfully naturalized on our soil. It has been said, or conjectured, by some speculative antiquarians, that neat cattle were introduced to the continent of America by the Northmen, who are supposed to have made a descent upon the coast from Northwestern Europe some centuries before the discovery of the continent by Columbus. This, however, is simply a conjecture, as no cattle were known here before they were brought out by the Spanish and Portuguese emigrants, a few years after the voyages of Columbus.

We may suppose that cattle were introduced into Mexico as early as the year 1525, and in the mild climate and abundant pasturage which the country afforded, they rapidly increased. As Mexico became peopled and spread her population along the coast, and into the interior, in the course of time Texas was reached, and there were spread the foundations for the immense herds of Mexican, or, as we now call them, Texas cattle. California was afterwards settled by the Spanish Mexicans, who drove their cattle thither and, in time, scattered over it numerous herds. The first English settlement was made in what is now the United States, in 1607, at Jamestown, Va. In 1622 the colony was massacred and broken up by Indians, but as to whether their cattle were destroyed or not history does not state. Soon, however, the colony was re-established and cattle introduced and propagated. The first importation of cattle in New York was made in 1625, by the Dutch from Holland.

In 1620, the English Plymouth colony landed in Massachusetts. In 1623, further English colonies came and settled at Boston and in New Hampshire. In 1624, the first arrival of cattle entered Massachusetts Bay. These were soon followed by other arrivals. New Jersey was settled by the Dutch in 1624, and Delaware by the Swedes in 1627, who brought cattle with them. The early records of New Hampshire state that in the years 1631, '32 and '33, Captain John Mason made several importations of cattle into that State from Denmark, to supply the Danish emigrants who had settled on the Piscataqua river. These Danish cattle were coarse, large beasts, and yellowish in color. Settlements were made in Maryland in 1633; in North and South Carolina in 1660 and 1670; and in Pennsylvania in 1682, all by the English, who either with the first settlers, or soon after, brought cattle over, chiefly from the countries nearest the ports whence they sailed. In all probability, numerous importations of cattle were annually made into the several colonies, during successive years, as the emigrants came in rapidly, and the few early importations, with their increase, were insufficient to supply their wants. That cattle multiplied, both by natural increase and importation, is evident. We see it recorded, that in the year 1636, a party of emigrants went out to settle the town of Northboro, Massachusetts, thirty miles west of Boston, and in a company of one hundred men, women and children, they drove with them one hundred and sixty cattle, and that was but twelve years after the first importation into the colony. From these diverse and miscellaneous beginnings, our native cattle originated. Of what distinctive breeds they were selected, if selected with reference to breed at all, we have no information, nor at this distance of time can we be at all certain. Distinct breeds did then exist, well defined in their characteristics, both in England and Scotland, and we are to presume that, needy and necessitous as the emigrants mostly were—going out for conscience' sake, as many of them did, and in a hope to better their fortunes withal—they paid little regard to breed or race in their cattle, so that they gave milk, performed labor, and propagated their kind. As the merchants of the sea-coast towns grew rich, some enterprising ones made importations of choice breeds from England, which were driven into the country neighborhoods, and very considerably benefited their common stock. Of the improved breeds introduced into the United States the Herefords and Short-horns are deservedly the most popular for beef and early maturity. The Devons as working cattle and in the quality of their flesh are acknowledged to be superior to any other. Of dairy cattle the Ayrshire originally brought from Scotland, the Jersey from the Channel Islands, and the Dutch and Holsteins from Holland and Holstein, have merits of exceeding excellence. The Ayrshire and the Dutch and Holsteins are noted for large messes of milk, rich in caseine, and the Jersey and Guernsey as cows giving milk exceedingly rich in cream and consequently in butter.

Of late, however, the importations to this country have been limited to a few well known breeds, each having desirable characteristics. The breeding of these and the improvement of the natives by intermixture with them is the present enthusiastic work of the American cattle fancier. While every farmer can not be an importer, still every farm must have its cattle of some kind, and the raiser can, in a few years, have a herd of high grades with a few pure bloods at a very little expense over that of keeping up his herd of natives or "scrubs."

Increased prices per pound, and more pounds of beef cattle to sell annually, will be the speedy result. He should be a breeder of cattle to the extent at least of keeping one bull of pure blood.

This will serve a large number of native cows. The progeny of these, called "grades," will show a marked improvement upon their dams, having to a greater or less extent the characteristics of the pure bull. The heifers of these grades should be kept for breeding purposes, and the bull calves be castrated and reserved for oxen or fattening. When the heifers arrive at a proper age, two years, for breeding from, the parent bull should be sold or exchanged, and another of the same breed procured. The second generation of grades will be a great improvement upon the first, approaching more nearly the desirable characteristics of the pure breed of the bulls. This process may be continued indefinitely, and in a few years the farmer will be the possessor of a herd of cattle as good as the pure bloods, except for breeding perfectly pure bloods. His beef cattle will bring the

highest prices in the market, or if he is breeding for dairy purposes, his herd will possess the qualities of pure bloods to which the bulls belong. If possible, however, the farmer should, in addition to the improvements of the natives, procure one or more pure-blood cows of the same breed as the bull, and make the beginning of a herd of thoroughbreds. If he desires to make a specialty of cattle-breeding, either for beef or dairy purposes, he must, of course, be governed in his selection of a breed or breeds by the specific qualities of each. The following are all the varieties bred in this country, given alphabetically. We also must fully treat the breeding, care and management of cattle, the manner of diagnosing for diseases, and treat in the most practical and modern manner all of the diseases and ailments which this stock is heir to in this country. This portion of the work will be found especially valuable, as it is given in the simplest and most common-sense way, and no remedy prescribed but has been thoroughly tested. Also, as far as possible such remedies were given as the farmer may have on his place, or to be easily obtained and easily administered. For the selection, care, management and treatment of the cow, see article on Cow, for calf, see Calves, for bull, see Bull, and for oxen, see Oxen. For the laws and principles of breeding, see article on Breeding.

ALDERNEYS. The original stock of the Alderney breed was from Normandy, France. Between England and France, in the British Channel, are the islands of Jersey, Alderney and Guernsey. These islands have given names to as many breeds of cattle, though they are nearly all identical, and of the same Norman, or French extraction. In describing the Alderney breed, a portrayal of the Jersey and Guernsey breeds is really given, though from the fact that the shipment to this country of Jersey stock has been very large of late years, the latter name has become best known here as applied to the Alderney breed of cattle. The pure-blood Alderney cattle are now found in England mainly in gentlemen's parks, and it is thought fashionable that the view from the drawing or breakfast room of the house should present an Alderney cow or two grazing at a little distance. In color the Alderneys are light red, yellow, dun or brown colored; short, wild-horned, deer-necked, thin, and small-boned; irregularly, and often very awkwardly shaped. Their size is small; the bellies of many of them are four-fifths of their weight; the neck is very thin and hollow; the shoulders stand up and are the highest part; they are hollow and narrow behind the shoulders; the chin is nearly without flesh; the hocks are narrow and sharp at the ends; the rump is short; and they are light and narrow in the brisket. This is a description of the pure Alderney, as seen to-day in England, and does not adequately apply to the Jersey stock as latterly improved on their native island.

The Alderney has a voracious appetite and yields but very little milk, but it is however of excellent quality, and yields more butter per quart than can be obtained from any other cow, though some writers deny this.

AYRSHIRES. This breed of cattle originated in the county of Ayrshire, Scotland, which extends along the eastern coast of the Frith of Clyde, and the North Channel. The climate of the district is moist and mild, and eminently adapted to the pursuit of dairying, and the production of dairy stock. A well informed Scotch writer thus describes the Ayrshire cattle:

The shapes most approved of are: Head small, but rather long and narrow at the muzzle; the eyes small, but smart and lively; the horns small, clear, crooked and their roots at considerable distance from each other; neck long and slender, tapering toward the head with no loose skin below; shoulders thin; fore quarters light; hind quarters large; back straight, broad behind, the joints rather loose and open; carcass deep and pelvis capacious and wide over the hips, with round fleshy buttocks; tail long and small; legs small and short, and firm joints; udder capacious, broad and square, stretching forward, and neither fleshy, low hung, nor loose; the milk veins large and prominent; teats short, all pointing outward, and at considerable distance from each other; skin thin and loose; hair soft and woolly. The head, bones, horns and all parts of least value, small, and the general figure compact and well proportioned. In color they are not uniform, but red and white, brown and white, and black and white predominate. Small red, black or brown spots, on a white ground, is perhaps a more uniform mark than any other, though in many cases red predominates. The cows especially have small heads and horns, light necks and shoulders, deep flanks and heavy hind-quarters, with all the marks of deep milkers. The Ayrshires are essentially a dairy breed. Though the milk of the cows is not especially rich in cream, like the Alderneys and Holsteins, yet in all other respects their milk is equal to the best; is of average richness in cream; and the breeders of Ayrshire cattle claim that the quantity of milk produced by their favorites exceeds that of any other breed of dairy stock. Large numbers of Ayrshire cattle are bred for dairy purposes in the United States with satisfactory results. Though most highly valued for their milking qualities, the Ayrshire fattens well and easily—an important item in the final disposal of the cows.

THE DEVONS. The native country of the Devons, and where they are found in the greatest purity, is the district skirting the Bristol Channel, England, from the river Taw westward. They belong to the middle-horned group and are of symmetrical form, of medium size, and red in color. They are good milkers, and their flesh is of fine quality. When well bred they are the most beautiful of farm animals, and the steers are susceptible of training to be excellent oxen. The perfect specimens of the Devon bull are admired for their rich red color, their fine clean heads, adorned with long, up-turned horns, shapely and of a yellow hue. The cows are not con-

sidered very profitable for dairy purposes, but there are exceptions. They certainly give very rich milk. The Devon ox has his legs placed well under the chest, and they are straight in the best herds. The fore arm is particularly large and powerful. It swells out suddenly above the knee, but is soon lost in the substance of the shoulder. Below the knee the bone is extraordinarily small, but the smallness is only in front, and in the bone, not in the sinews and muscles; the leg is deep, and the sinews far removed from the bone, indicating both strength and speed. The leg is rather long, which is necessary to a working animal. The line of the back is straight from the withers to the tail. The hips are high and on a level with the back, and the space from the hip to the point of the rump is long and well filled up. The setting on of the tail is high and level with the back, and the tail is long, small and tapering. The skin is thin, and the appearance of thickness that it sometimes bears arises from the curly hair which covers it when the animal is in good health and keep; the curled hair also indicates purity of blood. In selecting an ox of the Devon breed the paler color should be avoided, as they are less hardy than the reds. One peculiarity of the Devon breed is the smallness of the bulls and cows in comparison with the oxen. The bull is smaller than the ox, and the cow than the bull. This has been an annoyance to breeders. The cows, however, although small, possess that roundness and projection of the two or three last ribs which make them actually more roomy than a careless examination of them would indicate. The cow is particularly distinguished for her full, round, clear eye, the gold-colored circle round the eye, and the same color on the inside skin of the ear. The countenance is cheerful, the muzzle orange or yellow, the jaws free from thickness, and the throat from dewlap. The points of the back have more of roundness and beauty, and are freer from angles than most animals. The Devon cattle were formerly great favorites with the New England and Middle State farmers, on account of the working qualities of the oxen, and the easiness of their keep. But latterly milking qualities are more largely sought, and the Devon ox has been superseded by the horse. Many farmers, however, value the Devon for crossing with other breeds.

To represent the Devon stock we have selected two of the finest specimens of the breed in America. The Devon bull as shown by Fig. 1 is a likeness of the celebrated bull Shelto 2nd, owned by L. F. Ross, Avon, Ill. The cow, Henrietta (Fig. 2), was formerly owned by the same gentleman, who is one of the leading breeders of this stock in America.

Dutch Friesian. This breed is identical with the Holstein, which we describe at length. It is claimed that the name of Holstein is incorrectly applied. It has become popularized and more common than the correct name, as it is claimed, the Friesian. Two herd books of this breed are kept in this country, the Holstein and the Dutch-Friesian. There is at present a controversy going on in this country between the breeders of the Holstein and Dutch-Friesian cattle as to whether the latter shall be admitted under the name of Holstein and to compete with them at the State and county fairs. As a magnificent representation of the Dutch-Friesian we show by Fig. 3 a picture of Sjoerd, a cow owned by H. Langworthy, West Edmeston, N. Y.

Galloway Cattle. This breed is a native of the shires of Kirkudbright, Wighton, Ayrshire and Dumfries, which were embraced in the ancient province of Galloway, Scotland. They are hornless and are therefore called "polled," "dodded, "humble" or "muley" cattle.

They have always been favorites with English farmers, because they fatten easily, attain large size, their flesh loses no fineness because of size, and they manifest a kind and docile disposition. They are straight and broad in the back, round in the ribs, and broad in the loins, without any projecting, hooked bones. In roundness of barrel and fullness of ribs, they will compare with any breed. They are long in the quarters and ribs, deep in the chest, but not broad in the twist. There is less space between the hips and ribs than in most other breeds, a consideration of importance. The Galloway has short legs, with a clean short shank. They are not fine and slender, but well proportioned and clean in the neck and chaps. The neck of the Galloway bull is thick almost to a fault, the head is rather heavy, the eyes not prominent, the ears large, rough, and full of long hairs on the inside. These cattle are covered with a loose, mellow skin of moderate thickness, which is clothed with long, soft, silky hair. The prevailing color is black, a few are of a dark, brindle brown, and a few speckled with white spots, and some of a dun or drab color. The cows are not good milkers, but though the quantity of the milk is not great, it is rich in quality, and yields a large proportion of butter. The Galloway cattle have never been largely introduced into this country, a few having been imported and crossed with other breeds. Probably many of the "polled" cattle here and there seen mingled with the herds of this country have received their hornless traits from the Durham, or Short-horned cattle, that have been imported from England, the Galloways having been considerably crossed with that kind of stock by Charles and Robert Colling, breeders of Durham, England. A singular trait of the Galloway, or polled cattle, is an occasional horn that hangs from the brow of individual members of this breed. It is dependent from the frontal bone, and is not attached to any bone of the head, but grows from the skin and hangs down on the side of the face.

Guernseys. The Guernseys, as a breed, are identical with the Alderneys and Jerseys, though they are somewhat larger than the former. Their general characteristics are described in the articles on the Alderneys and Jerseys. They derive their names from the Island of Guernsey, one of the British Channel group.

The Hereford. These cattle derive their name

Fig. 2.—DEVON COW.

from a county in the western part of England. Their general appearance is marked by a white face, sometimes mottled; white throat, the white generally extending back on the neck, and sometimes, though rarely, still further along on the back. The color of the rest of the body is red, generally dark, but sometimes light. Eighty years ago the best Hereford cattle were mottled, or red all over, and some of the best herds, down to a comparatively recent period, were either all mottled, or had the mottled or speckled face. The qualities of the Herefords are described thus: The expression of the face is mild and lively; the forehead open, broad and large; the eyes bright and vivacious; the horns are glossy, tapering and spreading apart, the head small; chap lean; neck long and tapering; chest deep; breast-bone large, prominent and very muscular; shoulder-blade light, and shoulder full and mellow in flesh; brisket and loins large; hips well developed, on a level with the chine; hind quarters long and well filled in; buttocks on a level with the back; tail slender and well set; hair fine and soft; body round and full; carcass, deep, well formed, and cylindrical bones small; thigh short and well made; legs short and straight, and slender below the knee; as handlers, mellow to the touch on the back; skin soft, flexible, of medium thickness, rolling on the neck and hips; hair bright; and face almost bare, which is characteristic of pure Herefords. The Herefords belong to the middle-horned division of the cattle of Great Britain. They are noted for their fattening qualities, and take on a much greater weight than the Devons; and, though their size makes them good draft oxen, they are slower than the Devon. The ox fattens speedily, at an early age. The cows are not so good milkers even as the Devons, and a dairy of Herefords is rarely to be seen. They are an aboriginal breed, and descended from the same stock as the Devons. In point of symmetry and beauty of form, well bred Herefords may be classed with the improved Short-horns, though they arrive somewhat more slowly at maturity, and never attain such weight. Their beef in England commands the highest price, except, perhaps, that of the West Highlanders, but they are far less spread over England than the improved Short-horns. They have been to some extent imported into this country, and several fine herds exist in different sections. The earliest importations were made by Henry Clay, of Kentucky, in 1817. Some difficulty is experienced with Hereford cows, following the dropping of their calves, especially if they are feeding on luxuriant grass, on account of the swelling of the udders. This can be obviated by letting the calves run with the cows and suckle them four to six months. This method would be very objectionable to the dairymen but could be practiced by the stock breeder. As a fine illustration of this stock we give a picture of the famous Hereford bull, Success (Fig. 4), the property of T. L. Miller, Beecher, Ill. The Hereford cow shown by Fig. 5 is Princess B., owned by G. S. Burleigh, Mechanicsville, Iowa.

THE HIGHLANDERS. This breed is indigenous to Argyleshire, Scotland. The animals of this variety are famous for their hardiness, and are highly prized for the excellence of their flesh. The West Highland cattle are universally adapted for grazing farms in Scotland, but are seldom employed in the dairy. They have not been introduced into this country to any great extent.

THE JERSEYS. These cattle have become widely known and quite popular among American dairymen. As elsewhere indicated, they were originally identical with the Alderneys and Guernseys, and explanation of their origin and ancestry can be found in the paragraph under the head of "Alderneys." The head of the pure Jersey is fine and tapering, the cheek small, the throat clean, the muzzle fine and encircled with a light stripe, the nostrils high and open; the horn smooth and crumpled, but not very thick at the base, tapering and tipped with black; ears small and thin, deep orange color inside; eyes full and placid; neck straight and fine; chest broad and deep; barrel bodied, broad and deep, well ribbed up; back straight from the withers to the hip, and from the top of the hip to the setting of the tail; tail fine, at right angles with the back, and hanging back to the hocks; skin thin, light color and mellow, covered with fine soft hair; fore legs short; straight and fine below the knee; arm swelling and full above; hind quarters long and well filled; hind legs short and straight below the hocks, with bones rather fine, squarely placed, and not too close together; hoofs small; udder full in size, in line with the belly, extending well up behind; teats of medium size, squarely placed and wide apart, and milk-veins prominent. The color is generally cream, dun or yellow, with more or less of white, and the fine head and neck gives the cows and heifers a fawn-like appearance, and make them objects of attention in the parks. The prevailing opinion as to the beauty of the Jerseys is based on the general appearance of the cow while in milk, no experiments in feeding for beef having been made public, and no opportunity to form a correct judgment from actual observation having been furnished. As an illustration of this stock we give a cut of one of the finest specimens in America. She is owned by Messrs. Hoover & Co., Columbus, Ohio, and has been christened the Pride of Eastwood. She is represented by Fig. 6. We represent by Fig. 7 a fine Jersey bull, owned by Geo. Jackson, of Ingallston, Ind.

THE LONG-HORNS. Though this breed of cattle is but little known in America outside the books, it holds an important place in Great Britain, and our treatment of horned stock would not be complete without a description of it. The Long-horns were first known in Craven, a fertile corner in the West Riding of Yorkshire. They were distinguished from the home-breds of other counties by a disproportionate and unbecoming length of horn. In the older breeds this horn frequently projects nearly horizontally on either side, but as the cattle were improved the horn assumed other directions; it hung down so that the animal could

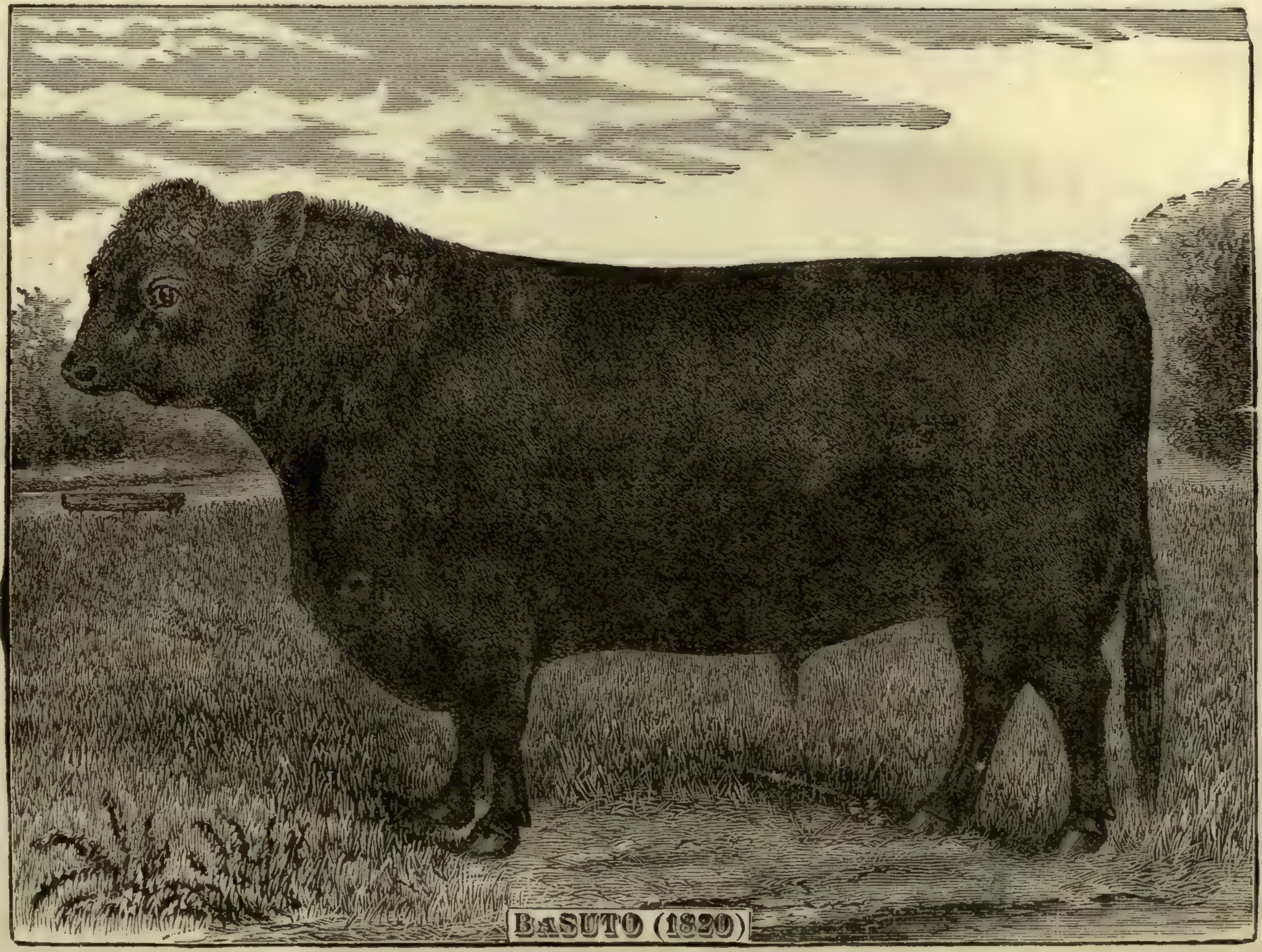


Fig. 13.—ABERDEEN, OR ANGUS POLLED BULL.

scarcely graze, or curved so as to threaten to meet before the muzzle, and so, also, to prevent the beast from grazing; or immediately under the lower jaw, so as to lock it; and the points often presented themselves against the bones of the nose and face, threatening to perforate them. When the breed was improved the horns lengthened. These cattle have become spread throughout the midland counties of England.

THE HOLSTEIN. The Holstein breed of Dutch cattle, now largely bred in North Holland, has been greatly improved in the last century. The earliest British writers say very little about this breed, but some have asserted that the Short-horns were greatly improved by the Dutch admixture. It is a fact that there is a great similarity in form and character between the Short-horn and Dutch cattle; but there is sufficient distinction to show that for centuries past each kind has been bred for different purposes. It must have been more than a century, perhaps two, since material improvement was begun in Dutch cattle. The Holsteins are noted for their surpassing excellence in milking qualities, coupled with large size, compact, massive frame, capability for making good beef, and for the strength of the oxen. In color they are black and white, spotted, pitted or mottled. The lacteal, or milk-producing formations are wonderfully developed, which makes the breed permanent in the dairy. It is but recently that this valuable variety of cattle was introduced to any considerable extent in this country. The late Mr. Wm. Jarvis, of Wethersfield, Vt., the noted breeder of Merino sheep, early in the present century imported a bull and two cows, placed them on his farm and bred them successfully for a number of years. Heman Le Roy, a New York merchant, in 1820 and 1825, imported some improved Dutch cattle and kept them on his farm in the vicinity of the city. Some of this stock was afterwards kept on the farm of Rev. A. Le Roy, near the Genesee river. They produced fine cattle, but in the herds of both gentlemen the pure breed was lost and none but grades were left after a few years. In 1852 a single cow was imported by Winthrop Chenery, of Boston. This arrival was followed by successive importations until 1859, when the cattle plague having broken out, all foreign cattle were killed pursuant to an act of the legislature, for the prevention of the spread of the contagion. In 1861 Mr. Chenery made another importation, and since that time the Holstein stock have been bred successfully in this country, and have considerably multiplied. This stock has been long bred to develop their milk-producing qualities. They are quick feeders, and turn their food readily to milk. Their faculty to lay on flesh is satisfactory, and as workers the oxen will rank with other heavy cattle of like quality. The Holsteins have grown in favor with stock-breeders throughout the West, and many fine herds can now be found upon the farms of Illinois and other States.

Fig. 8 represents the cow Aagie, a magnificent specimen of the Holstein breed. She is owned by the Smiths & Powell, of Syracuse, N. Y. At six years of age her milk record was 18,004 pounds and 15 ounces for the year. We also give an illustration of a Holstein bull, Fig. 9, owned by Severy & Sons, Leland, Ill.

NATIVE CATTLE. For many years of the early history of this country, even down to a quite recent period, the native herds of the United States were unmixed with the pure-bred cattle of Europe; and to-day a large proportion of the bovine stock of the country are native cattle, unimproved by the blood of thoroughbred animals. Our native breed (if breed it may be called) originated from a variety of sources. Each company of colonists that settled on our shores brought with them individuals of their own native cattle, and these became mingled as time passed, and finally merged into the common stock that is now known as "native." The Spanish conveyed their breeds to Mexico; the Dutch theirs to New York, which produced cattle of a fair size, but roughly formed; the Swedes brought herds to Delaware; the Huguenots, French domestic animals to their country, and the English their favorite breeds to the places on our coast where they first settled. The Devons and Herefords were early settlers in New England, and in due time the Short-horns of Lincolnshire, and the Long-horns of Lancashire, the polled or hornless cows of Suffolk, and possibly the Galloways of Scotland followed, the latter hornless breeds being brought to Long Island and New Jersey. Gradually the population spread into the interior, the domestic animals of the farmers of course increasing in numbers with the pioneers' progress. The rugged nature of New England caused oxen to become the favorite draft animals in that section, and the Devons early became the favorites for that kind of service, the Herefords also being well thought of for oxen. The south branch of the Potomac is bordered with broad, rich lands, and this section early became famous for fine cattle. Cattle were always a secondary object in the South, and even to this day a large preponderance of inferior stock prevails there; yet the Blue-Grass region of Kentucky is noted for its large product of improved Short-horns. Texas cattle may be classed as native stock, but their peculiar character demanded their separate treatment elsewhere in this article. Improved breeds of cattle are rapidly superseding the old native stock, either by pure breeding or by crossing. The rich lands of Ohio, Indiana, Michigan and the prairie States of the farther Northwest, are becoming well stocked with improved breeds.

POLLED ANGUS, OR ABERDEEN. By some in this country there is a tendency to confound the Angus with the Galloway. The Galloways, however, are natives of a different part of Scotland and claim no relation to the Anguses; their hair is longer and their hides thicker; their eyes not so full and their heads heavier.

This breed of cattle, like the Galloways, is of Scotch descent, and is extremely hardy and particularly adapted to a severe climate. They are considered good breeders and prime beef-producers. The milking quality of the breed is of a high order. It is claimed they will breed until their twentieth year. They are being extensively introduced in the United States for dairy and beef purposes, and for such have no superiors.

RED POLLED. This is a breed of polled, or hornless, cattle now being introduced into this country. We give on this page an excellent likeness of a pure Polled Norfolk bull and cow. These were imported by G. F. Taber, of Patterson, N. Y., in 1873. These are different from the Galloway and Angus breed of Polled cattle, but are more like the Jersey. They occupy front rank as milkers, and must prove a valuable stock for the dairy. Gen. L. F. Ross, of Avon, Ill., is attempting to establish a herd of Red Polled cattle as nearly like the Devon as possible.

FIG. 10.—*Red Polled Cattle.*

SHORT-HORNS. Probably more of this breed of cattle are grown in the United States than any other of the distinct, high-breed varieties. The race is susceptible of breeding for the production of milk, as several families show, and great milkers have often been known among pure-bred animals, but it is more common to find them bred mainly for the butcher; in fact, the Short-horn variety is peculiarly a beef-producing kind, and is for that reason highly esteemed in the Western States, and fattens rapidly and profitably on corn, which is so abundantly produced in this region. This makes the Short-horn cattle the most important stock to the Western farmer. There is a dispute among the most eminent breeders as to how far the Short-horns owe their character to the early importations from Holland. Durham and York counties, in England, have for more than a century been famous for their Short-horns, and they were once known as the Teeswater breed. They were of large size and extraordinary milkers. This stock was improved by crossing with the Galloways. It is said that toward the close of the seventeenth century bulls from Holland were introduced into Durham, and the blood of Dutch cattle was thus mingled with that of the Teeswater stock, giving to our present Short-horns much of that trait of squareness of buttock and readiness to take on flesh that now distinguish the famous variety. However the present breed may have been derived, none could be better adapted to meat-producing, which is more important to the American farmer. The desirable traits of the Short-horn bull may be summed up, according to the best breeders, as follows: He should have a short, but fine head, very broad across the eyes, tapering to the nose,

with a nostril full and prominent; the nose should be of a rich flesh color; eyes bright and mild; ears somewhat large and thin; horns slightly curved, and rather flat, well set on; a long, broad, muscular neck; chest wide, deep, and rather projecting; shoulders fine, oblique, well formed into the chine; fore legs short, with upper arm large and powerful; barrel round, deep, well ribbed horns; hips wide and level; back straight from the withers to the setting on of the tail, but short from hips to chine; skin soft and velvety to the touch; moderately thick hair, plentiful, soft and mossy. The cow has the same points in the main, but her head is finer, longer, and more tapering; neck thinner and lighter, and shoulders narrower across the chine. In sections where the climate is moist, the food abundant and rich, some families of the Short-horns may be valuable for the dairy; but they are most frequently bred in this country exclusively for beef, and in sections where they have attained the highest perfection of form and beauty, so little is thought of their milking qualities that they are often not milked at all, the calf being allowed to run with the dam. This practice is more common with the stock-growers of the West.

As a fine specimen of the Short-horn breed we refer the reader to Fig. 11. This cut represents the Short-horn cow, Lady Aberdeen 3rd, owned by the Canada West Farm Stock Association, Brantford, Ont. This animal won the prize at the Fat-stock Show, Chicago, in 1881, in sweepstakes of any age or breed.

Texas Cattle. The large number of Texas cattle that are now grown in the Lone Star State, and in New Mexico, and find their way to seaboard markets, makes it important that a description of this peculiar breed be given in these pages. The Texas cattle are descendants of the old Spanish stock that were brought to Mexico and the other Spanish-American colonies. This ancient breed is thus described: They are about the size of our native cattle of forty and fifty years ago. They have large, coarse, long, wide-spread horns, mostly with a half or a full twist to them, and set back rather than forward, and the points turned outward. Their color is black, dark brown, reddish brown, light yellowish red, with some white on the throat and belly, with occasionally a dark roan or dark gray. The cows are nearly as large as the oxen, with the same style of horn. They are not good milkers. Their heads are long and rather fine. Herdsmen attend to them in droves, like the short-haired Scotch Colleys. In this description may be detected the origin of the Texas cattle, the latter having run wild for many generations, while the former are thoroughly domesticated. Texas cattle are a half wild race, and are made to serve the purpose of beef production through the persevering mastery of the herdsmen. Vast numbers of this variety of animals have for a century or more been herded by the Spanish inhabitants, and of late years American herdsmen have taken up the occupation, and have developed the Texas stock business to an enormous degree. The building of numerous trunk lines of railroad from the seaboard to the Missouri river, and reaching down into Texas and New Mexico, has given stimulus to cattle production in those regions, and at present there seems to be no limit to the extension of this industry. It is customary for the ranchman, as the owner or "herder" of a flock is called, to seek a place for his cattle that possesses the advantages of both pasturage and water. Here he locates his "ranch" (house or farm), sometimes purchasing, and sometimes only taking temporary possession of the premises. He generally provides a "corral," or yard in which to confine stock when necessary, but his farm implements are small, and most of his capital is invested in cattle. Once a year the herd is rounded up for identification, branding, and selecting out such as are fit for sale. The pure Texas breed is described as follows: They are tall, lank and bony, coarse-headed, with enormous horns. Their legs are long and coarse; they have much dewlap and little brisket; they are flat-sided and sway-backed; high in the flank, with narrow hips and quarters; have much offal in proportion to their consumable flesh, and are coarse all over. Their meat is necessarily tough, stringy and of coarse quality. A good lot of Texas steers, fattened for the market, will average from 1,000 to 1,200 pounds in weight. The color of Texas cattle is red, dun, yellow, brindle and roan, all mixed more or less with patches and stripes of white. Attempts have been made from Kentucky to improve the native Texas stock by crossing with Short-horns, but little has been done because of

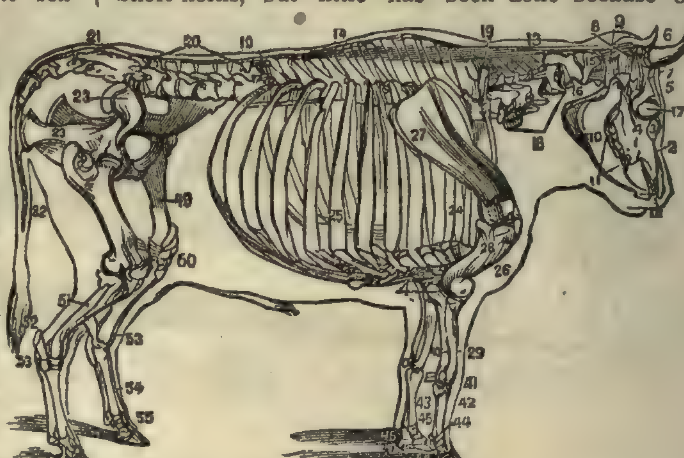


Fig. 15.—*Skeleton of the Ox.*

the wild and vagrant habits of the former. The plague has been a great bane to growers of Texas cattle, and legislation has been invoked on several occasions to prevent the carrying of infected animals into or through other States, so as to prevent the spread of contagion.

Anatomy. To enable the reader to become familiar with the bony structure of cattle we give an illustration, in Fig. 15, of the skeleton of the ox, with the correct names of the various parts. This will be

found valuable for reference, not only to the student in the veterinary art, but to every one who proposes to keep and breed cattle.

Explanation of Fig. 15—1. The upper jaw-bone. 2. The nasal bone, or bone of the nose. 3. The lachrymal bone. 4. The molar, or cheek-bone. 5. The frontal bone, or bone of the forehead. 6. The horns, being processes or continuations of the frontal. 7. The temporal bone. 8. The parietal bone, low in the temporal fossa. 9. The occipital bone, deeply depressed below the crest or ridge of the head. 10. The lower jaw. 11. The grinders. 12. The nippers, found on the lower jaw alone. 13. The ligament of the neck, and its attachments. 15. The atlas. 16. The dentata. 17. The orbits of the eye. 18. The vertebræ, or bones, of the neck. 19. The bones of the back. 20. The bones of the loins. 21. The sacrum. 22. The bones of the tail. 23. The haunch and pelvis. 24. The eight true ribs. 25. The false ribs, with their cartilages. 26. The sternum. 27. The scapula, or shoulder-blade. 28. The humerus, or lower bone of the shoulder. 29. The radius, or principal bone of the arm. 40. The ulna, its upper part forming the elbow. 41. The small bones of the knee. 42. The large metacarpal or shank bone. 43. The smaller or splint bone. 44. The sesamoid bones. 45. The bifurcation at the pasterns, and the two larger pasterns, to each foot. 46. The two smaller pasterns to each foot. 47. The two coffin bones to each foot. 48. The navicular bones. 49. The thigh bone. 50. The patella, or bone of the knee. 51. The tibia, or proper leg bone. 52. The point of the hock. 53. The small bones of the hock. 54. The metatarsals, or larger bones of the hind leg. 55. The pasterns and feet.

"POINTS" OF CATTLE. In the cut shown by Fig. 16 we give the various "points" or parts of cattle.

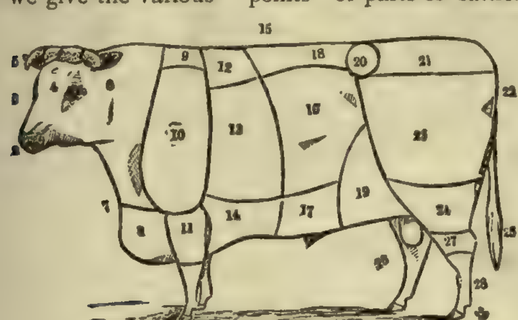


FIG. 16.—*Diagram of Points of Cattle.*

1, muzzle; 2, nostrils; 3, forehead and face; 4, eye; 5, horn and ear; 6, neck and throat; 7, breast; 8, brisket; 9, shoulder-point; 10, shoulder; 11, forearm; 12, crops; 13 fore-ribs; 14, fore-flank; 15, back; 16, back-ribs; 17, belly; 18, loins; 19, flank; 20, hip; 21, rump; 22, tail and seton; 23, quarters; 24, thigh; 25, twist (inside the thighs); 26 testes; 27, knee and gambrel; 28, leg; 29, hoof.

TEETH. Cattle have eight lower incisors and none upper. They have no canine teeth or tusks, but have 24 molars or grinding teeth; six on each side of the lower jaw, and six on each side of the upper jaw. The upper jaw has no incisors; but the skin upon which the lower incisors meet in the upper jaw are thickened, hard, and in aged animals almost horny. The teeth may be represented as follows, the figures above the line representing the upper, and the figures below the line representing the lower jaw:

Incisors, $\frac{0}{8}$, canines, $\frac{0}{0}$, molars, $\frac{6}{6}$ — $\frac{6}{6}$; total, 32 teeth.

AGE OF CATTLE. It is of the utmost importance to be able to judge of the age of a cow. Few farmers wish to purchase a cow for the dairy after she has passed her prime, which will ordinarily be at the age of nine or ten years, varying, of course, according to care, feeding, etc., in the earlier part of her life. The common method of forming an estimate of the age of cattle is by an examination of the horn. At two years old, as a general rule, the horns are perfectly smooth; after this a ring appears near the base, and annually afterward a new one is formed, so that, by adding two years to the first ring, the age is calculated. This is a very uncertain mode of judging. The rings are distinct only in the cow; and it is well known that if a heifer goes to bull when she is two years old, or a little before or after that time, a change takes place in the horn and the first ring appears; so that a real three-year-old would carry the mark of a four-year-old.

FIG. 17.—*Teeth at Birth.*

The rings on the horns of a bull are either not seen until five, or they can not be traced at all; while in the ox they do not appear till he is five years old, and then they are often very indistinct. In addition to this, it is by no means an uncommon practice to file the horns, so as to make them smooth, and to give the animal the appearance of being much younger than it really is. This is, therefore, an exceedingly fallacious guide, and cannot be relied upon by any one with the degree of confidence desired.

FIG. 18.—*Two Weeks Old.*

The surest indication of the age of cattle, as in the horse, is given by the teeth, but different markings are observed. While, in the horse the white, elongated figure in the center of the crown of the teeth, which grows rounder and of a darker color with age, in cattle the varying number, degree of wear, position, slant, etc., of the teeth are the points of observation; and while, therefore, it is comparatively easy to "bishop" a horse by disfiguring those simple figures in the crown of the teeth, and thus deceive purchasers as to his age, no clandestine art of the kind can be practiced upon cattle. It is therefore worth while to study the varying features of cattle's teeth.

The calf, at birth, has two front teeth—in some cases just appearing through the gums; in others, fully set, varying as the cow falls short of, or exceeds, her regular time of calving. If she overruns several days the teeth will have set and will have attained considerable size, as appears in the cut representing teeth at birth. During the second week, a tooth will usually be added on each side, and the mouth will generally appear as in Fig. 18. Before the end of the third week, the animal will generally have six incisor teeth, as denoted in the cut representing teeth at the third week; and in a week from that time the full number of incisors will have appeared, as seen in the next cut.

Fig. 19.—*Three Weeks Old.*

These teeth are temporary, and are often called milk-teeth. Their edge is very sharp; and as the animal begins to live upon more solid food, this edge becomes a little worn, showing the bony part of the tooth beneath, and indicates with considerable precision the length of time they have been used. The center, or oldest teeth show the marks of age first and often become somewhat worn before the corner teeth appear.

Fig. 20.—*One Month Old.*

At eight weeks, the four inner teeth are nearly as sharp as before. They appear worn not so much on the outer edge or line of the tooth as inside this line; but, after this, the edge begins gradually to lose its sharpness, and to present a more flattened surface; while the next outer teeth wear down like the four central ones; and at three months this wearing off is very apparent, till at four months all the incisor teeth appear worn, but the inner ones the most. Now the teeth begin slowly to diminish in size by a kind of contraction, as well as wearing down, and the distance apart becomes more and more apparent.

Fig. 21.—*Five to Eight Months.*

The temporary or milk incisors of horses differ in shape more from the permanent set than those of the ox. In the horse the milk teeth are altogether much smaller, but especially in the neck, which is constricted in them, whilst in the permanent set, which go on growing as they wear out, the diameter is nearly the same throughout. The former are also whiter in color, and have grooves or indentations on their outer surfaces, running towards the gum. Lastly, the mark on the table is much slighter than in the permanent teeth. The temporary molars are not distinguishable from the permanent teeth of that class.

As a consequence of this arrangement of parts, the teeth, as they wear down, present a different appearance according to the extent to which their attrition has reached.

Fig. 22.—*Ten Months Old.*

From the fifth to the eighth month, the inner teeth will usually appear as in Fig. 21; and at ten months, this change shows more clearly, as represented in Fig. 22, and the spaces between them begin to show very plainly, until about a year old, when they will ordinarily present the appearance as shown in Fig 23, showing absorption in all nippers except outside pair, and wear in these; at the age of 15 months, that shown in Fig 24, where the corner teeth are not more than half the original size, and the center ones still smaller.

Fig. 23.—*Twelve Months Old.*

The permanent teeth are now rapidly growing, and preparing to take the place of the milk-teeth, which are gradually absorbed till they disappear, or are pushed out to give place to the two permanent central incisors, which at a year and a half will generally present the appearance indicated by Fig. 25, which shows the internal structure of the lower jaw, at this time the two first permanent incisors (1 — 1), and next two pairs (2—2) and (3 — 3) growing and pushing upward toward the surface, also (4 — 4,) 5 — 5 and 6—6) showing absorption. At 8 — 8 is shown the alveoli, or cells for the teeth. These changes require time; and at two years old the jaw will usually appear as in Fig. 26, where four of the permanent central incisors are seen, and four temporary ones, absorption nearly complete; also marks of wear on the first two pairs. After

Fig. 24.—*Fifteen Months Old.*

this the other milk teeth decrease rapidly, but are slow to disappear; and at three years old, the third pair of permanent teeth are but formed, as represented in Fig. 27, showing six permanent nippers, and two outside temporary ones nearly gone; also wear on two central pairs. At four years the last pair of incisors will be up, as shown in the cut of that age (Fig. 28); but the outside ones are not yet fully grown, and the beast can hardly be said to be full-mouthed till the age of five years. But before this age, or at the age of four years, the two inner pairs of permanent teeth are beginning to wear at the edges, as shown in the cut; while at five years old the whole set becomes somewhat worn down at the top, and on the two center ones a darker line appears in the middle, along a line of harder bone, as appears in the appropriate cut (Fig. 29).

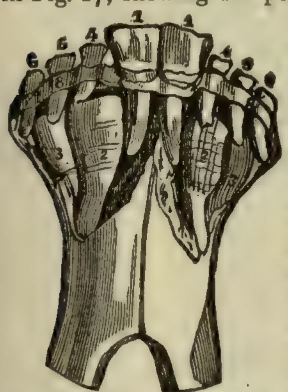


FIG. 25.—*Eighteen Months Old.*

Now will come a year or two, and sometimes three, when the teeth do not so clearly indicate the exact age, and the judgment must be guided by the extent to which the dark middle lines are worn. This will depend somewhat upon the exposure and feeding of the animal; but at seven years these lines extend over all the teeth. At eight years another change begins, which cannot be mistaken. A kind of absorption begins with the two central incisors—slow at first, but perceptible—and these two teeth become smaller than the rest, while the dark lines are worn into one in all but the corner teeth, till at ten years, four of the central incisors have become smaller in size, with a smaller and fainter mark, as indicated by Fig. 30. At 11, the six inner teeth are smaller than the corner ones; and at 12 all become smaller than they were, while the dark lines are nearly gone, except in the corner teeth, and the inner edge is worn to the gum. The age of the animal after this period is attained, is determined by the degree of shrinkage and wearing away of all the teeth in the order of their appearance, until the 15th year, when scarcely any teeth remain.

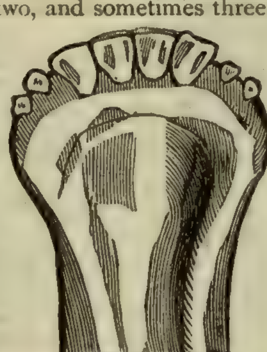


FIG. 26.—*Two Years Past.*

FIG. 27.—*Three Years Old.*

CUD. The situation, the structure, and the size of rumen, or the paunch, point it out as the first and general receptacle for the food, which received in the mouth only sufficient mastication to enable the animal to swallow it. When swallowed it is received by the rumen, and morsel after morsel is taken until this, the first of the animal's four stomachs, is comparatively full. A sense of repletion precedes rumination, during which act the animal generally prefers a recumbent posture. It is not to be supposed that all the food taken is again ruminated; it is only the bulky or solid portions that undergo the process. When the rumen is moderately full it will contract on its contents, and first squeeze out the fluid portions, which will pass into the third and fourth stomachs, while the solid part will be embraced by the œsophagus, or stomach pipe, and return to the mouth. By the term "loss of the cud" is meant a cessation of chewing the cud, which occurs as a symptom of most internal diseases of cattle.

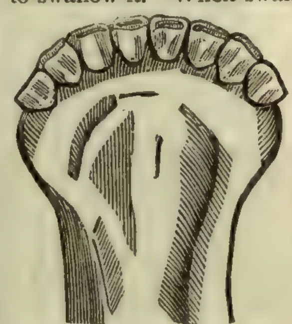


FIG. 28.—*Four Years Old.*

BREEDING. In the breeding of stock the farmer must understand the nature and adaptation of his soil, and its adaptability to certain crops and animals. In rocky, hilly, and comparatively barren regions, or where the soil suffers under drought, the farmer cannot compete either in the raising of beef cattle or in dairying, with the more favored, well matured countries of deep soils and flush pastures. Again, in a country noted for its short, sweet perennial pastures, and cold springs of water, the stock-breeder cannot compete with the dairyman. The feeder of cattle and hogs must be in a region where corn or other feeding grains can be cheaply and abundantly raised. Fortunately, such countries are well adapted to the meadow grasses, producing heavy crops of hay and pasture.

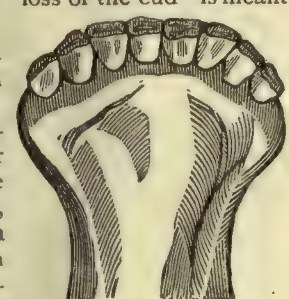


FIG. 29.—*Five Years Old.*

FIG. 30—*Ten Years Old.*

As to the general principles of breeding we refer the reader to the article on Breeding.

As to what breeds are best becomes a most important subject. In all that great region of the West, of gently undulating prairies or grassy plains, Short-horns

Fig. 3.—DUTCH-FRIESIAN COW.

and Herefords will be found the very best cattle to breed from, when only beef is the object. If labor and beef are wanted, the Devons and Herefords will be found the most valuable. If beef and milk are to be the products, the Duchess and Princess families of Short-horns, and Holsteins will give the best returns. If dairying is to be the chief industry, then, for butter, the Ayrshire, with a few Jerseys intermixed, will produce the best results. If for butter and cheese, Ayrshire and Short-horns. If cheese alone, the Holstein, and for quantity of milk given this latter breed will certainly carry the palm. If milk and butter, without reference to quantity, be required, the Jersey is the cow. All the breeds except the Jerseys will make good weights of beef and fatten readily when dry—the Short-horns, Holsteins, and Ayrshires making weight in the order named. For milk, we have not included the Devons; occasionally a cow will be found giving a large mess for her weight. Devons, however, are not dairy cows, at least, now-a-days, having been bred almost exclusively for their superior quality of marbled beef, and their uniform excellence, courage, and kindliness in the yoke.

It is evident that all farmers cannot become breeders of highly bred, pure stock. For this the animals must be isolated from all other breeds of the same race. At least the males must be strictly confined, so they may not intermix with others. Where farms join, divided only by fences, this will not be found practicable in a majority of cases. One's neighbors may fancy scrub stock. They are notoriously breachy. Once they intermingle with a pure breed the taint of their blood is not only found in the calves, but in the dams themselves. In the calves and their progeny, it may never be bred out.

As to the general utility of the stock the breeder cares not so much about a particular strain of blood, as he does to get certain characteristics that will furnish him, at the lowest expense, either the most beef, the best working oxen, or the most and best milk. Those who undertake breeding, or in fact any other business, in a hap-hazard way, always fail. The farmer, therefore, who undertakes the breeding of stock, with a view to the money they will bring from the butcher, or from sale of dairy products, must be guided by an entirely different set of rules from that of the breeder who breeds solely with a view to selling sires and dams to other breeders of pure stock. So particular, now-a-days, have breeders of this class become that some of them will breed only particular families. Some will not allow a Booth cross; others abstain from the Bates blood.

Many high-cast breeders are pretty well agreed that a top cross of what are known as Seventeens, and some other sub-families of later importations, and also of particular bulls of pure breeding, but which have been considered more or less coarse, must be rigidly excluded. They have their particular fancies. To gratify this fancy they will pay extraordinary prices, while the great mass of really superior and really pure Short-horns will be passed unnoticed. It would be unadvisable for the ordinary farmer, or even the Short-horn breeder, to buy these "terribly bred cattle." And the farmer must carefully discriminate. Let him get staunch, healthy cattle to start his herd, if beef be the object, and animals with good milk points, if milk be the object, rather than to strive for color. So long as the color of the animal is characteristic of the race, the beef points and milk points are what he should seek. The body in the beef animal, and the udder in the dairy cow, are what he wants.

Breeding in Line. Breeders of pure stock are especially particular in the selection of sires; so much so that many of them breed solely with reference to the strain of blood particular families contain, the selection often being without reference to the uniformity or quality of the animal selected. Really, however, breeding in line means the selection of males of a common type, and belonging to the same family. Thus, in breeding in the line, the expert, while he objects to going out of a sub-family, nevertheless seeks to couple animals together whose uniformity is identical, or, when one is weak in some essential, to improve it by coupling therewith an animal of superior excellence in this particular. Thus, if the head and horns be rather coarse in an animal, it is bred to one fine in head and horns, but not lacking in other essentials. It is one of the most fatal mistakes that can possibly be made in breeding, that to acquire one essential other disabilities be allowed to enter. Many breeders have committed irreparable injury to their stock by not understanding the necessity, while trying to improve one essential, of keeping all others intact. Therefore the sagacious breeder will pay more attention to those points indicative of heavy, succulent beef laid in the primer points and without an undue portion of fat, if combined with general symmetry, rather than style and carriage, connected with deficient characteristics in flesh. The one animal may be striking to the eye, while the other will bring the butcher's money. This is really all there is to beef cattle.

Breeding Grades. At the meeting of the American Association of Short-horns at Indianapolis, 1872, "pure-bred," "full blood," and "thorough-bred" were defined as being synonymous terms, and to indicate "animals of a distinct and well-defined breed, without any admixture of other blood." The following definitions were adopted by the Association:

"'Cross-bred'—Animals produced by breeding together distinct breeds."

"'Grades'—The product of a cross between a 'pure-bred' and a native."

"'High-grades'—An animal of mixed blood, in which the blood of the pure-bred predominates."

The product of a Devon and Short-horn would be a cross-bred animal. In-and-in breeding is considered to be the coupling of animals of the closest relationship, as the product of one sire and dam, etc. Close breeding is the breeding of animals together that are closely related; as animals one or two moves from the parent stock, in relationship. High breeding is sometimes incorrectly used in this connection; it is wrong.

Many of our most highly bred horses are not closely related, and the same may be said of our pure cattle. High breeding properly signfies the selection of the breeding stock, within the limits of some particular family, and within a definite standard of excellence and characteristics.

In the breeding of grades, select the best cows you can find, that is, those that come the nearest to the standard of excellence for the purpose wanted; then select a bull combining in the most eminent degree possible the points of real excellence for the outcome expected, not in fancy breeding, but in adaptability to the end sought. Thus, if for beef, he should be of fair size, not too large, certainly not too small, but of excellent fineness, combined with great loins, rumps and thighs, round-ribbed, and well ribbed, to the hip-bones, what a breeder would call a well bred, serviceable animal.

If for milk, the bull must have come of a line of uniform milkers, for here the udder and milk-veins are the essential part. In fact, the male must possess the peculiarities characteristic of the breed, and better if from a family of extraordinary excellence. Why? Such animals are prepotent; that is, they will impress upon their progeny the distinguishing characteristics and excellence of their race. By following the directions, in ten years one may have grades bred to such excellence that none but critical judges can tell them from pure-bred cattle.

Fat Cattle and Fattening. Whatever may be said about over-fed cattle in a disparaging way, there is no doubt of the fact that the butcher cannot sell anything but the best fatted beef, and of whatever size or shape a half-fatted ox may be, he is never selected by judges as fit for human food. Hence, a well-fatted animal always commands a better price per pound than one imperfectly fed, and the parts selected as the primest beef are precisely the parts which contain the largest deposits of fat. The rump, the crop, and the sirloin, the very favorite cuts—which always command from 20 to 25 per cent. more than any other part of the ox—are just those parts on which the largest quantities of fat are found; so that, instead of the taste and fashion of the age being against the excessive fattening of animals, the fact is, practically, exactly the reverse. Where there is the most fat, there is the best lean; where there is the greatest amount of muscle without its share of fat, that part is accounted inferior, and is used for a different purpose; in fact, instead of fat being a disease, it is a condition of the flesh, and necessary to its utility as food—a source of luxury to the rich, and of comfort to the poor, furnishing a nourishing and healthy diet to their families. A tendency in an animal to deposit fat is indicated by roundness of form. Rules have been laid down by which one may know whether a creature has a disposition to fatten. The first is tested by the touch. It is the absolute criterion of quality. The skin is so intimately connected with the internal organs, in all animals, that it is questionable whether even our schools of medicine might not make more use of it in a diagnosis of disease. The skin must be neither thick nor hard, nor adhere firmly to the muscles. If it is so, the animal is a hard grazer, and a difficult, obstinate feeder. On the other hand, the skin must not be thin, like paper, nor flabby. This is the opposite extreme, and is indicative of delicateness, bad, flabby flesh, and possibly, of inaptitude to retain the fat. It must be elastic and velvety, presenting to the touch a gentle resistance, but so delicate as to give pleasure to the sensitive hand, a skin which seems at first to give an indentation from the pressure of the fingers, but which again rises to its place by a gentle elasticity. The hair is nearly as important as the skin. A hard skin will have straight and stiff hair; it will not have a curl, but be thinly and lankly distributed equally over the surface. A proper grazing animal will have a mossy coat, but absolutely curled, and presenting a heavy inequality. It will also, in a thriving animal, be licked here and there with its tongue—a proof that the skin is duly performing its functions. The eye must be full, bright and pressed out by the fat below; because, as this is a part where nature always provides fat, an animal capable of developing it to any considerable extent, will have its indications here, at least, where it exists in excess. Of course there must be size in the animal where large weight is expected. Small animals are, however, somewhat more easily fed, and are therefore better adapted to second-rate feeding pastures. But beyond this there must be breadth of carcass. Perhaps this is indicative of fattening beyond all other qualities. The head must be small and fine, which is a sign of the quick fattening of the animal, and also of smallness of bone and shortness of legs. The beast should have his legs extend well towards the thigh bones or hips, so as to leave as little unprotected space as possible. There must be no angular or abrupt points; all must be round, broad and parallel. In selecting stock for fattening purposes the foregoing hints may serve a good purpose. That kind of stock most in conformity to them will be most sure to return a profit for the feed given. Probably the Short-horns are most abundant in these fattening qualities, while a well-bred Devon, Hereford or Ayrshire can be made profitable as meat-producers. The treatment of fattening cattle is a matter about which any intelligent farmer should have judgment. Plenty of nutritious food is a chief requisite, and enough good water is another. Regularity in feeding is indispensable, and the quieter and more comfortable the fattening animal can be kept the better. Stall-fed cattle should have a small yard in which to exercise, as that will promote digestion; but their exercising ground should not be too large, for that would give an opportunity for too much movement, and working off of flesh. One reason why so many persons fail to be successful in fattening stock is that they do not use due consideration in their treatment. The man who kicks and clubs his stock, or allows his hired help to do so, never yet produced a prize steer, and never will. Obesity and activity do not go together, neither will undue excitability allow of a steady in-

crease in fat. Hence the feeder, for the sake of his pocket, should see that fattening cattle are kept entirely quiet. For an excellent stall and appliances in which cattle may be kept we refer the reader to Figs. 4, 5, 6, 7 and 8 of the article on Barn. A safe and convenient manner of tying cattle in stalls is illustrated by Fig. 31. The chain is short, preventing the animal from getting entangled in it, and the ring around the upright is so large that it slides up and down readily.

FIG. 31. *Best Mode of Hitching.*

FEEDING AND CARE OF STOCK. Important as the kind and quality of breed is in the profitable production of live stock, yet feeding and care are equally important. The doctrine of the old farmers that "the breed is in the corn crib" is only half true, but that half is as necessary to the production of good stock as the other fraction of excellent pedigree. But whatever the breed, cattle should be judiciously cared for. The too prevalent custom of permitting cattle to care for themselves should be changed to a more profitable system. The common practice is to turn them upon pastures in the spring, after having been inadequately fed through the winter, and on the feed which that pasture affords they have to subsist, whether it be luxurious from frequent and copious rains, or parched and scant from long continued drought. Throughout the fall, stock is obliged to run the hazard of being overfed in the parched pastures, a shortage which is made worse by the early and later frosts. In winter too many farmers, at the East, oblige their stock to subsist on poor hay or straw, and in the West the practice is to turn cattle into the corn-field, after the corn is picked, where they must live, and if possible thrive, on dried corn-stalks. Notable improvement has lately been made on this slip-shod and inconsiderate method, but there is yet vast room for improvement. The secret of heavy weights in fat cattle, and growth and health of stock generally, is in constant feeding and uniform good treatment. Cattle are often in splendid condition in June on the pasture, but during the succeeding dry and hot months, when the pastures become short, they decline rapidly in flesh. They fatten up again in milder autumn, but if the farmer is late in gathering his corn, they become scrawny and ill conditioned before they are turned again into the cornfields or meadows. Here they cram themselves for the first few weeks, perhaps become almost fat enough for the butcher, and then begin a steady decline in flesh and condition, so that when grass comes again, they are scarcely able to walk to the pasture. The use of a corn-field, for a foraging ground, as practiced in the West, is of doubtful utility. Practical experience has demonstrated that there is money in high feeding at an early age. Calves, according to breed, may, as an average, be grown to the weight of 800 or 1,000 pounds at one year, and 1,200 to 1,500 the second year. The animal will also be as fully matured at two years old as at four under the meager system. It will require more than double the food to supply the waste of the system the second year that it did the first, and fifty per cent. the third. This explains the reason of the increased cost of putting live weight on animals as they grow older. It follows, then, that beef creatures should be sold at the earliest period of maturity required by the market. Profit, then, can only be expected from full feeding under the system of early maturity. An animal to be fully fed and satisfied requires a quantity of food in proportion to its live weight. No food is complete that does not contain a sufficient amount of nutritive elements; hay, for example, being more nutritive than straw, and grain than roots. The food, too, must possess a bulk sufficient to fill up to a certain degree the organs of digestion of the stomach; and to receive the full benefit of its food, the animal must be fully satisfied, since, if the stomach is not sufficiently distended, the food cannot be properly digested, and many of the nutritive elements which it contains cannot be properly assimilated. About one-sixtieth of their live weight in hay, or its equivalent, will keep horned cattle on their feet; but in order to be completely nourished, they require about one thirtieth in dry substance, four thirtieths in water, or other liquid. The excess of food above what is necessary to sustain life, will go, in milch cows, to the production of milk, or to the growth of the fœtus; but not in all cows to an equal extent; and in young cattle to growth, in beef cattle to the laying on of weight. In the breeding and rearing of stock great care should be taken to render cattle comfortable in summer and winter. A good farmer will always afford his stock abundance of nutritious feed and plenty of pure water. One of the best means of supplying water is an automatic stock-watering device, invented by J. G. Brown, Van Cleve, Iowa, and illustrated by Fig. 32. It is used for utilizing water from tile drain for all kinds of stock. It supplies clear, cool, running water without mud in summer or ice in winter.

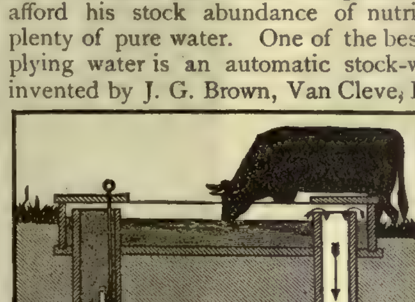


FIG. 32.—*An Automatic Stock-Watering Device.*

It can be attached to a drain at any desired point. It is made of wood, at a trifling cost, and any farmer can make it. The cut illustrates the principle upon which it works. When this is done, the means for the comfort of the animals should be at hand—shade in the summer, warm housing and yard shelter in the winter.

Fig. 4.—HEREFORD BULL.

It is useless to furnish abundance of feed unless cattle are kept warm and comfortable; for in winter, when cattle are exposed, much of their food goes to supply animal heat. To sum up a general statement about the care of stock, we have this:

1. Select the best breeds for the branch of stock-growing you wish to follow.

2. Provide ample, nutritious and constant food, the year round, for your cattle—of hay, or other long food, grain and roots, combined, if possible.

3. Feed abundantly and judiciously, when the animals are young, thus bringing to maturity as early as may be, and by this means secure the largest amount of profit in their growth.

4. House warmly in winter, and provide ample shade in summer, so that comfort shall be secured, and the growth, fineness of bone and flesh, docility of temper and economy of feeding enhanced. (For further treatment of the care and feeding of particular kinds of stock, see Bulls, Cows, Calves, etc.)

To prevent the wastage of hay or straw fed in lots a rack should be provided. Fig. 33 represents an old-fashioned but very handy feed rack. It is cheap and easily constructed. It may be made of poles, rails or stakes, of any kind and any length, which may be held in place by laying a pole in the rack, or each stake may be spiked to the horizontal pole.

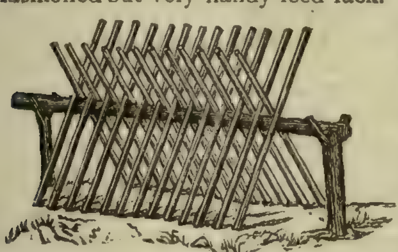


Fig. 33.—*Feed Rack.*

How to Buy and How to Sell. There are very many farmers who, by care and attention to details in feeding their stock, and by kindly treatment, have done so with profit to themselves. They have raised them from calfhood. Let them undertake to buy cattle for feeding their surplus grain and fodder, and they are very apt to overrate the weight and true value of the cattle purchased. One point should always be kept steadily in mind: never buy an old steer or cow for fattening. They never repay the cost and trouble they give. Thin cattle, ready for grass, if healthy, may give good returns on flush summer pasture, if bought at the price per pound that you expect to get in the fall. You will not only get the price of the flesh put on, but the cattle being thin and the muscles dry, your profits will be added to in the fluids absorbed, and the loss will lie with the former owner in making mere frames to build upon. So animals bought in the fall in common grass flesh, will increase wonderfully with good feeding and shelter. If you buy at $2.50 per 100 lbs., and so add 200 lbs. in flesh, and sell at $4 per 100 lbs., you not only get $8 for the flesh put on, but the difference between $2.50 and $4, or $1.50 per 100 lbs. on the original weight. That is, you buy steers at 1,000 lbs. each, feed 500 bushels of corn per head. and sell them weighing 1,200 lbs. average. They cost $25 and sell for $48, leaving $23 as the value of the corn fed and care given. The manure in any country will pay for the care taken; so, your corn will have netted you near 46 cents per bushel. From this, knowing the cost and price expected when fat, it will be easy to figure on profits, fluctuations and accidents excepted.

Estimating Weight. An expert judge will estimate from seeing and handling steers often within ten pounds of their live weight. The buyer will always underestimate weight, and in nine cases out of ten convince the inexpert owner that the guess is right; in fact, more than half the time the seller will be convinced that he has the best of the bargain. The only safe way in such cases is for the seller to weigh. Every man who makes a business of fattening cattle should own a proper scale. He may save the cost in a single year. The merchant, the manufacturer and the builder, who work by guess, always end in bankruptcy. The only reason why farmers do not, is, they have that generous bank, mother earth, which never fails to respond, even to indifferent managers.

In weighing cattle note carefully why certain ones weigh out of proportion to others, and study whether the weight is in the prime parts, a broad loin and hips, and good barrel, or in heavy fore-quarters, with thick neck and big head and horns. Study carefully the points as given in detail elsewhere in this article, and as carefully remember them for future use. Thus you may in time become yourself an expert judge of stock. If an animal is to be killed, estimate his weight alive, how much he will shrink in offal and hide. When the quarters are weighed, if the record is not as you expect, examine carefully wherein the discrepancy lies. It is an especially interesting study for the young man who expects himself to become a breeder and feeder of cattle. If a breeder, he must know how to sell; and if a feeder, he must know both how to buy and sell.

Estimating by Measurement. Many breeders have rules of estimating the weight by measurements. There is no rule that comes nearer than good guessing, and all guessing should be avoided, especially when the guessing is to lie on the part of the buyer; that is, the seller should avoid trusting to the guess of the buyer based upon measurement. No two animals will weigh alike according to measurement.

One rule, perhaps as good as any and for this reason given, is to find the superficial feet by multiplying the girth, just behind the shoulder-blade, by the length from the fore part of the shoulder-blade to the root of the tail. Thus an ox girthing seven feet nine inches and measuring six feet in length would contain seven and three-fourths times six, or 46½ superficial feet. For cattle grass fat, the following is given as the weight per superficial foot:

Girth less than 3 feet	11	pounds
" 3 to 5 feet	16	"
" 5 to 7 feet	23	"
" 7 to 9 feet	31	"

Thus the steer as per above measurements should

weigh 46.50 by 31, or 1,441 lbs. gross. Under this rule it is usual to deduct one pound in 20 on half-fatted cattle, from 15 to 20 lbs. on a cow having had calves, and if not fat an equal amount. The rule as above stated is of little or no value, except to those having no other means. In taking account of stock, this may may come somewhat near the weight. For buying or selling, the scale is the only true standard.

BUYING TO FEED. In buying cattle either to graze or to feed fat, choose cattle that are young, that is, that will not have become mature before ready for sale. If to be kept a year, three years old past to four years old for natives and Devons, and one year less for Shorthorns or Hereford grades. Buy no overgrown, leggy animals; they are hard feeders. Neither should they be under-sized, as this indicates want of thrift. The cattle for money, whatever their breed, are compact, smooth, fine-boned, meek-eyed, soft-haired steers, with skin of medium thickness; thick through the heart, round-barreled, well ribbed, with broad rump, and the twist well down to the hock. Such cattle, whatever their breed, will fatten easily and the meat will be of excellent quality. So far as age is concerned, the teeth must be the test. In this no person can err who has carefully studied the section on Teeth, pages 181-83.

HOW TO BUY BREEDERS. If the intention is to raise beef cattle, the same rule will apply as in buying steers. In no case should the cow be more than three years old, and it is better that she never had a calf. In breeding for beef, milk is not the first essential. It is necessary, however, that the dam give a fair amount of milk, since the proper sustenance of the calf is what lays the foundation of the future value of the steer. No calf starved when young can make a valuable cow to breed from, and as is the dam so naturally will be the produce. Whatever is to be the outcome, avoid at any price a vicious cow, or one with a wild eye, or having a dished shape. Her progeny will be sure to give you trouble and will not give you cattle that will fatten to a high standard.

BUYING FEEDING STOCK. The novice in buying stock should carefully note the shape and make-up. To the superficial eye the superior animals when thin will appear worse than the inferior ones; the bony parts will appear more prominent, and for this reason their breadth, when thin, will seem to be exaggerated; this, however, is only apparently so. An animal of no particular character may seem fairly smooth to the eye. Those accustomed to handling stock will know that superficial observation goes for little. The touch is what decides the value of an animal. The well-bred animal carries softer, smoother, and finer hair than the ill-bred one; its breadth from the shoulder to the rump gives it a bony appearance when thin, that in the scrub steer is partly concealed by the higher backbone and coarser hair. We are now speaking of no particular breed, but of all breeds and crosses that have characteristic points enabling them to lay on flesh.

PROPER SHAPE OF WELL-BRED FATTENING STOCK. Cut off the head, neck, legs, and tail, and well-bred beef cattle will present the appearance of an oblong square. Thus there is ample room for the legs and viscera through the width of the bosom and spring of the ribs, and this carries corresponding breadth behind, giving a broad loin and massive rump. Such an animal will feed heartily and kindly, satisfy the butcher when brought to the block, and be profitable to the feeder. There is no profit, however, to the feeder in cattle fattened to obese or immense weights; they are mere mountains of fat, and contain no more lean meat than animals fattened fairly ripe. There are few people who do not like well-fattened beef. Few, however, care to eat any but the lean. An animal, therefore, that is fattened just ripe is the heaviest in muscle, well marbled with fat. This is what the consumer wants and what feeders should seek to make. Smooth, fine-horned, medium cattle, according to the breed selected, are what give profits in this respect.

HOW TO BUY. In buying ordinary (that is native) cattle for pasturing and feeding fat during the summer and fall, always buy in the spring. If the grass is good at the time of purchase, as it should be, no matter how thin the stock, if healthy and hearty. The thin stock will weigh less, and you will have to pay less for it. The loss will be with the farmer who grudges his animals sufficient to eat in winter, rather than with the buyer. Generally all this class will sell cheaper in the spring than in the fall, and as a rule yearlings may be bought for less money in the spring than the same calves would have brought in the fall. If they have been fairly wintered they will be profitable to feed; if badly wintered, it will be questionable, unless the price paid is low enough to warrant the purchase. In any event the feeder must usually depend upon buying steers off of common keep. Good feeders are not apt to sell half-grown steers, nor those that one more season's keep will make ripe. The best money-making friends of the sagacious buyer are, after all, those who never read, and will not believe that anything in print relating to agriculture in any of its various departments can be of value. They do not know that as great advances have been made in agricultural art within the last thirty years as any other industry, and that the best practical talent in Europe, and within the last few years in America, have been earnestly engaged in elucidating and applying practical science to agriculture.

ADMINISTERING TREATMENT. That the farmer may form some intelligent basis of distinguishing disease and administering treatment to his cattle when afflicted, we give the following concise and accepted theories and modes of practice among the best veterinarians.

GRADUATION OF DOSES. As a rule cattle require one and a half times as much as horses; sheep and pigs require one-third as much. Professor James Law, of Cornell University, in his work, *Veterinary Adviser*, has presented the manner of graduation, frequency, and form of administering doses, in the following concise language:

The doses given may be held applicable to full-

grown animals of medium size, therefore some allowance must be made in any cases in which the patient exceeds or comes short of the average of his kind. A similar modification must be made as regards young animals, not only on account of their smaller size but also of their greater susceptibility.

The following table will serve as a guide:

DOSES OF MEDICINE FOR DIFFERENT ANIMALS.

Horses.	Cattle.	Sheep.	Swine.	
3 years.	2 years.	½ years.	15 months.	1 part.
1¼ to 3 yr's.	1 to 2 years.	9 to 18 months.	8 to 15 months	½ "
9 to 18 mo.	6 to 12 mo.	5 to 9 "	6 to 8 "	¼ "
5 to 9 "	3 to 6 "	3 to 5 "	3 to 6 "	⅛ "
1 to 5 "	1 to 3 "	1 to 3 "	1 to 3 "	1-16 "

Allowance must also be made for a nervous temperament, which usually renders an animal more impressible; for habit, or continued use, which tends to decrease the susceptibility for individual drugs; for idiosyncrasy, which can only be discovered by observing the action of the agent on the particular subject, and for the influence of disease when that is likely to affect the action. Thus, in most diseases of the brain and spinal cord, and in some impactions of the stomach, double the usual quantities of purgative medicine will be necessary; while in influenza, and other low fevers, half the usual doses may prove fatal. In acute congestion of the brain, stimulating narcotics (opium, belladonna, hyoscyamus) would aggravate the symptoms, etc.

Frequency of Administering. Anodynes, antispasmodics, narcotics, sedatives and stimulants may generally be repeated once in four or six hours in order to maintain their effect. Alteratives, diaphoretics, febrifuges, refrigerants and tonics, may be administered twice daily. Purgatives should only be given when necessary, and should never be repeated until from the lapse of time we are assured that the first dose remains inoperative.

Form of Doses. Drugs may often be given as powder or solution in the food or water; they may be made into a soft solid with syrup and linseed meal, rolled into a short cylinder and covered with soft paper; they may be converted into an infusion with warm or cold water, or into a decoction by boiling; or they may be powdered and suspended in thick gruel or mucilage. They may be given in a liquid form, from a horn or bottle; or as a short cylinder or pill, which may be lodged over the middle of the root of the tongue; or, as a sticky mass, they may be smeared on the back of the tongue; may be given as an injection into the rectum; or, finally, in the case of certain powerful and non-irritating agents, they may be injected under the skin.

No agent should be given until sufficiently diluted to prevent irritation, if retained a few minutes in the mouth, and irritants that will not mix with water (oil of turpentine, Croton oil, etc.) should be given in a bland oil, in milk, or in eggs after being thoroughly mixed.

How to Give Medicine. Few things are so awkwardly done, as a rule, as giving medicine to farm animals. In the hands of a careful and expert person, a strong glass bottle is good. A better instrument is a flattened bottle of block tin, which for cattle should hold two quarts. The most usual instrument, and on the whole the best for ordinary operations, is the horn. Select one of which the point turns down and the large end up; form this of the proper size and fashion so the opening will be oblique.

Drenches should always be thoroughly mixed, and well shaken before they are given. If a fit of coughing ensues, free the animal at once and until it be ended. In operating with cattle do not irritate the animal unduly. Always operate from the right or off side. Pass the left hand over the head, and in front of the horn, seize the upper jaw firmly in front of the grinders, turn the head firmly back, the operator standing well braced, the back firm against and as well forward of the shoulders as possible. Thus, having the animal with one side against a wall or the side of the stall, it must be a very vicious cow or bull that a strong, expert man cannot handle. If, however, the operator does not stand well forward and well braced, he may be severely kicked, since an ox, like a deer, can reach well forward with its hind feet. The usual quantity for an ox is from one to two quarts at a dose, if liquid, of ordinary decoctions and solutions.

Injections, or Clysters. A large number of medicines, both liquid and solid, may be as easily administered per rectum as by the mouth. In administering injections, it is not necessary that much pressure be used. The intestinal canal of the animals is lower than the opening. Thus fluid substances will fall by their gravity. A good instrument for use may be a pail, with a tube extending from the bottom connecting with a half-inch rubber hose, of suitable length, so that the pail may hang just high enough above the animal to be out of its reach in moving about. Oil the end to be inserted into the rectum, and the fluid may be passed into the gut, as much or as little as may be desired, and with much better effect than when strong pressure is brought to bear on the fluid.

Vapors, Spraying and Fumigation. These are medicaments drawn in with the breath. Chloroform and ether may be administered by means of a sponge filled with the agent and held to the nose. Vapors are easily produced from liquid substances by means of an atomizer, sold by all druggists.

Steaming is often of great benefit. Hot water, either plain or medicated, may be held under the animal's nose, and the steam strongly driven off by plunging a hot iron into it at intervals. A hot bran mash, in a nose bag, readily gives off steam.

When an anæsthetic is used, it should not be held to the nose continuously, since, if undiluted with air, it is fatal. Watch carefully and suspend the use of the anæsthetic as soon as unconsciousness is produced, to be renewed from time to time as may be necessary. They should not be used unless under the advice of a surgeon or physician, since the need can hardly be expected except for the performance of some intricate surgical operation. The following is

endorsed by high veterinary authority: 1 ounce alcohol, 2 ounces chloroform, 3 ounces ether. Shake the bottle well before using it; pour a teaspoonful or more at a time on a sponge; hold it to the nostril. Two or three moments should be enough to overpower the strongest ox.

BLISTERING. Blistering is a valuable remedy, when it is required to ease the absorption of deposit, to stimulate the vessels to effect organic change, as hastening the ripening of an abscess, or the reduction of an enlarged gland; they should be entirely confined to cases where the acute inflammatory symptoms have ceased. Blisters do no good in deep-seated inflammations. Yet the quack, if he *suspect* internal inflammation, claps on a blister, which only agonizes the dumb brute, and generally leaves a permanent blemish. When a blister is found necessary, before applying, always as an ointment or fluid, and never as a plaster, cut or shave the hair from the part, wash and dry thoroughly, and apply with strong friction for several minutes. The following, if thoroughly applied, will raise a blister, and will not leave a blemish:

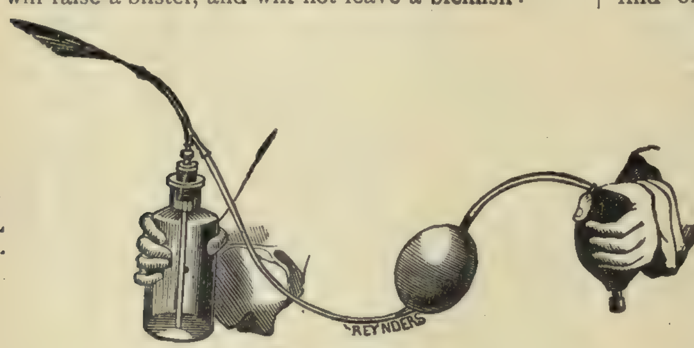


FIG. 33.—*Atomiser.*

1 ounce powdered cantharides, 12 ounces lard, heated to 212° Fahr. Mix well together and stir until cool.

A sweating blister of medium strength to be used to produce irritation and a watery discharge without raising a full blister, and which may be applied separately to the same spot and without removing the hair, is made as follows:

1 ounce powdered cantharides, 1 pint alcohol.

Add neither corrosive sublimate, arsenic, acids, nor turpentine to blistering agents. They are not useful, are often injurious, and always give unnecessary pain.

As a rule, sufficient irritation can be produced on cattle by mustard and hot water, well rubbed in, and this form should be used except in particular cases. The following rules should be carefully remembered:

1. Never blister more than one or two spots at the same time.
2. Be careful about blistering in hot weather.
3. Never blister an inflamed part when there are symptoms of mortification.
4. There is always danger of producing strangury in horses from blistering.
5. When a blister causes great nervous irritability, loss of appetite, or difficult urination, wash the blistered surface with strong soapsuds of soft soap, dress it with sweet oil, and give a full dose of opium.
6. The second day after a blister has been applied, foment the part with warm water, and dress it with lard or oil.
7. An animal that has been blistered should be prevented from biting, rubbing, or otherwise irritating the blistered part.

FIRING. The actual cautery is most valuable in bone diseases, or chronic lameness. In certain diseases it cannot be successfully replaced by any other counter-irritant. The iron should be at a full red or white heat, and used with a light hand, so that a distinct impression is made. More than one leg should not be operated on at one time. It should never be performed by inexpert hands. The hair must be closely shaved, and the animal securely fastened. A better way for the novice is to cut a piece of bacon rind with some of the fat attached. The iron, which should be flat or slightly hollowed, is to be heated to a dull read heat. Place the bacon rind on the sprain or tumor, and apply the iron firmly for two or three minutes, and afterwards more lightly, until the rind is dried or burned. This may be repeated at intervals of two or three days. The influence will be potent, and will leave no scar. It should never be used on cattle, except in the case of a tumor, where the animal is valuable.

SETONS. Setons are used in cases of bone disease, in the healing of old fistulas, by producing a new and healthy inflammation in its sides. They should be inserted the whole length of the canal.

Setons are composed of tapes, threads, or fine wires, pushed just underneath the skin by means of a seton needle, entering at one point and coming out at another. Fasten the ends, to prevent dropping out, smear with irritant salve and turn every day or two to keep up a constant irritation and discharge. The following will be found good ointments for smearing the setons: 1 part powdered cantharides, 8 parts oil of turpentine, 8 parts Canada balsam. Put the two first in a bottle and keep warm for two days and add the balsam. A simple ointment would be: 3 parts citrine ointment, 1 part oil of turpentine. Mix.

ROWELS. These are wounds made with rowel scissors or a bistoury, and kept open with a pledget of tow or other substance, smeared with ointment, as used for setons. They are rarely used now by good surgeons, and are not to be recommended, since their action is that of the seton.

SEWING UP WOUNDS. The bleeding of wounds having been checked and properly cleaned, the edges are brought together and held in position by means of stitches or sutures. The interrupted suture is made by carrying a suture needle, armed with white silk or white linen thread, through the two edges of the wound and cutting off, leaving about three-inch ends on each side of the cut; bring together and tie. So

Fig. 5.—HEREFORD COW.

proceed until you have the wound nicely closed, the lips of the wound or skin being carefully brought together.

The twisted suture is better in inexpert hands when it can be used. Bring the edges of the wound together, press a strong pin through to hold in place, and twist a fine wire or lace a strong thread across the protruding ends of the pin to hold the edges of the wound firmly together. So proceed at intervals of three-eighths of an inch until the wound is closed.

The wound thus sewed, dress with a plaster or ointment and bandage to prevent threads or pins from being torn out. Remove them as soon as the surfaces have united, which should be in four or five days.

FOMENTATIONS. These are applied by wrapping the part to be treated with flannel bandages or woolen cloths, keeping the wrappings constantly wet with hot or cold water, or mixed with any appropriate addition, as vinegar, laudanum, etc. They are used to cleanse or soothe irritable wounds, to reduce internal inflammation, or relieve external inflammation. Unless persistently used for hours and kept constantly wet, they had better not be attempted. After the operation is finished, rub dry and clothe warmly, to prevent chill, which will surely occur. As an additional precaution, a little mustard rubbed in would be beneficial. When it can be applied, a sheepskin with the wool on, wrung out of hot water, makes a good agent for fomentation.

THE OPERATION OF BLEEDING. There is no operation in veterinary practice that has been more abused by quacks and other persons ignorant of the true necessity, than bleeding. It should never be performed except by those who have been instructed in the operation, and only in those cases where by common consent of the profession it is allowed. If a decided impression is to be made, as in apoplexy, from five to seven quarts should be taken from an ox, according to the conditions. If the jugular vein is pressed up just below where the incision is to be made, it will soon show prominently. Use a thumb lancet in preference to a fleam. When sufficient has been taken, raise the two lips of the wound, and bring them together between the thumb and finger, pass a common small pin through the edges and weave thread across and over to keep all in place.

RECOGNIZING AND DISTINGUISHING DISEASES. The following explicit rules for recognizing diseases in animals, should be carefully studied. Any one who would become expert in recognizing diseases in animals, must study them carefully in the healthy state, and make himself thoroughly familiar with their habits, appearance and general physiology. He must practice feeling their pulse and the heart, listening to the sounds of their lungs in breathing, and taking their temperature, by feeling the skin and also by using a properly constructed thermometer. He should watch the appearance of the eye and tongue, and note the positions assumed when asleep and awake. He should observe the character and frequency of their appetite. For it is in the variations from health in these particulars that the veterinarian discovers the guides which lead him to the recognition of the particular disease he has to treat. We will examine each of these items separately, and assure our readers that if they will verify our statements by practice on the living animals, they will soon be in a position to take charge of them when sick, quite as well and often a great deal better than the average farrier, as he is to be found in this country.

The Pulse. The pulse differs very much in the domestic animals. In the full grown horse at rest, its beats are about forty per minute; in the ox, from fifty to fifty-five; and in the sheep and pig, about as in man, that is, averaging seventy to eighty beats to the minute. In calves and colts, and in animals well advanced in years, the pulse increases, in health, to about twice these figures; and it is also increased by hot, close stables, full feeding, and the condition of pregnancy.

The pulse may be felt wherever a considerable artery passes over a bone. It is usually examined in the horse on the cord which runs over the bone of the lower jaw, just in front of its curved portion; or on the bony ridge extending upward from the eye, or inside the elbow. In cattle, it is easily reached over the middle of the first rib, or beneath the tail. There is a marked difference of force in the pulse of the two species; that of the horse being full and rather tense, while in the ox it is soft and rolling.

When the pulse differs materially from these conditions in any direction, it is a sign of disease. If rapid, full and hard, there is high fever or acute inflammation; if rapid, small and weak, there is low fever, loss of blood, or weakness. If very slow, we may suspect brain disease; if irregular, now fast and in a few seconds slow, we should look for a diseased condition of the heart.

In the sheep, the pulse is felt by placing the hand on the left side, where the beating of the heart can be felt; or at about the middle of the inside of the thigh, where the femoral artery passes obliquely across the bone.

The Breathing. The breathing is next in importance. If the ear is applied to the throat of a healthy horse or ox the air will be heard passing through the windpipe with a regular, steady, blowing sound; if applied to the chest a soft rustling murmur will be heard, like a gentle breeze in the tree-tops, caused by the air passing in and out of the fine tubes and vessels of the lungs. But where the lungs or throat is diseased, these sounds are very much changed and in many directions, which it is not necessary to dwell on here, but which will at once indicate the presence of something amiss with these important organs.

If the forefinger of the left hand is placed firmly on the chest and smartly tapped with the ends of the three first fingers of the right hand, the sound will be noticed to be more resonant and clear than when the same procedure is practiced on the solid thigh. This is becau e the lungs are not solid, but are always, in health, well expanded with air. But in various dis-

eases, as pneumonia and pleurisy, they fill up with fluid and become solid; then the sound given out, by thus percussing them, as it is called, is like that on any other solid part of the animal. Hence this is another very important indication of disease.

By practice on healthy animals the character and boundaries of these sounds can be learned so closely that any variation from them will be at once detected, and will sometimes reveal the presence of an unsound condition when nothing else will.

The rapidity with which the act of breathing is performed can easily be counted by the heaving of the chest. In health in the adult horse at rest it is from 8 to 12 times a minute, and in the ox a little faster. Any great increase without obvious cause, is a positive sign of diseased condition.

The Animal Heat. The temperature of animals can be ascertained, to a slight extent, by the feel of the skin, the ears, and the legs. A hot, dry skin in a horse generally accompanies a feverish condition. Cold ears and legs are a sign of serious disease. But the only scientific, that is, accurate plan, is to use what is called a "clinical thermometer," namely, one the bulb of which can be bared and inserted into the rectum. After it has remained there two or three minutes, the mercury will accurately indicate the temperature of the blood. This in health is 98 degrees, and any deviation from this, even of a few degrees, is a certain sign of disease. Those veterinarians who have practiced sufficiently with this instrument to become skilled in its use, declare it invaluable in their business, as affording them grounds for opinions about diseases which no other symptoms could.

The Skin and Hair. The skin in its general feeling and appearance is an important guide to the condition of an animal. A dry, scurfy appearance is a system of indigestion, and liability to joint affections. What is called "hide-bound" is a symptom of a general state of poor nutrition, arising from indigestion, improper food, worms, or a want of proper exercise. The skin feels stretched and hard, as if too small for the body. The condition known as "staring coat," when the hairs stand out like bristles, is often the only symptom of a low state of health. Whenever an animal is disposed to shiver, with shedding of the coat, when exposed to moderate cold, or without such exposure, it is on the verge of some disease. A persistently staring coat, without other symptoms of disease, often indicates the approach of an attack of farcy or glanders; and when with this are repeated shivers or chills, we may expect the strangles, weed, or other diseases with suppuration. When in an attack of disease the skin becomes covered with a cold sweat, the life of the animal is in great danger.

Special Signs in Cattle. In cattle, the horn at its root yields, by the sensation it imparts to the hand, a rough idea of the temperature of the blood, and the cow-leech generally feels it as the doctor does the pulse, as a part of the indispensable programme of a professional visit. If the temperature is natural, he concludes there is no fever; if cold, and the tips of the ears also cold, it is a sign of some serious internal congestion, the blood no longer circulating in natural force through the extremities.

The muzzle is another part he takes note of. In health this is moist, covered with "dew," as the saying is; but in disease, especially fever, it is dry, hotter or colder than natural, and sometimes changed in color, paler or injected with blood. By looking at the flanks, the regularity of the respiration is noted, rapid and irregular heaving there betraying the disturbance of the important function of breathing. In ruminants, also, the second mastication of the food is among the first of the vital processes to become disturbed in disease. When a cow or an ox "loses the cud," as it is called by herdsmen, that is, ceases to ruminate without apparent cause, there is sure to be a feeling of sickness about the animal which is thus interfering with one of its processes of digestion.

Diseases. The dumb beast, like his master, man, is subject to a multitude of physical ailments. This fact often becomes a matter of serious difficulty and loss to the farmer. How to avoid disease and relieve the animal when attacked should receive no small share of his attention. He should first endeavor to keep his stock in a healthy and growing condition, but should disease or accident afflict any of them he should be prepared to restore them to their normal condition in the quickest possible time. This should be done before the animal becomes run down, or the disease chronic. The object of this treatise is to enable the farmer to care for his stock properly, and to ward off disease, and to cure the animal when afflicted.

In the treatment of diseases and description of symptoms we will not go into a learned discussion on the nature and pathology of diseases, but in the plainest and simplest language describe the diseases and the kind of treatment that should be resorted to. Great care and attention should be given to the first symptoms, as also to good nursing. Discard all strong physics and heroic treatment by purging, bleeding and the surgery of main strength. Good care and nursing is the most important means of cure. Of the non-contagious and local diseases every farmer should seek to make himself acquainted with the symptoms, so that ready means may be used for the relief of suffering animals.

In treating of these diseases and their remedies we will begin with the head.

Inflammation of the Frontal Sinuses. This disease results from an inflammation of the membrane lining the cavity called the frontal sinuses, which extend from the angle of the eye to the foramen through which the brain escapes from the skull to the very tip of the horn. The symptoms of the disease is a weak cough and slight nasal discharge, the beast becoming dull and drooping, and carrying his head to one side. Grubs or worms have crept up the nostril and become a source of irritation there, or common cold has extended along the cavity, being more intense in some parts than others, and matter is generally thrown out about the root of the horns. The remedy is to open

the skin at the root of the horn, or cut it off at the root. A pint or more of pus will sometimes escape, and the inflammation will be relieved by the bleeding that follows. The opening should be speedily closed after the escape of the pus. The ox often suffers from a species of fly, which creeps up the nose and lodges in the region of the sinuses.

Fracture of the Horn. If only the bone of the horn is broken, and the external covering is not displaced, nothing is necessary but to fix splints to the part, and bind well up, so that the fractured edges shall be kept securely in place, and healing will soon commence. When the horny covering is torn off, it will be best to let nature do the healing. The blood will flow freely, and, coagulating, will form a hard covering for the horn. A dense, flexible substance will begin to form at the base of the bone, which will rapidly thicken and harden, and take on the nature of good horn. This formation gradually grows up the bone to the point of the horn, and the restoration is thus complete. When the tearing off of the horny covering fractures the bone, the broken parts must be brought carefully together, in exact opposition, bound up, and confined with splints, or strong bandages. The fractured parts will speedily join, new horn grow over, and scarcely a sign of the injury will remain. When the bone of the horn is wholly separated the bone will never be reproduced, but a rude mass will be formed, half bony and half cartilaginous. In such case saw off the horn below the fracture, and pass a hot iron over the smooth end of the stub. This will generally prevent reproduction of substance. If slight formation should take place it can be destroyed by cauterization. Bind up the end as soon as possible after the operation, to prevent the ingress of air. This should be done with several layers of tar-cloth. Thus inflammation of the brain and lock-jaw may be prevented.

Diseases of the Ear. The ears of cattle are not greatly subject to disease. The passage into the internal ear is tortuous and guarded with hair. The ears of cattle are, however, much exposed to contusions that produce swelling, abscess and deafness. Wash with warm water, or soap and water, and an application of a weak solution of Goulard, while much inflammation remains, and a still weaker solution of alum when the inflammation has subsided. Simple inflammation in the ear is a rare disease in cattle, and is known by the animal carrying his head a little on one side. Bleeding from the neck vein, a dose of physic, and fomentation of the part, will usually give relief; and afterwards a lotion composed of a drachm of the extract of lead and the same of laudanum added to four ounces of water; a little of this may be poured into the ear, and the organ gently squeezed so that the lotion will find its way to every part of it.

Itching of the ear and dry scurfiness, which causes it, may be relieved by an ointment composed of four pounds of lard, one of resin, and one of calamine powder, rubbed fine. Tumors in the ear must be opened, and fungus granulations cut down with a knife. Nitrate of silver must be applied to the exposed surface, and an alum wash, not too strong, afterwards used.

Diseases of the Eye. When a beast is wounded in the eye, there should be no probing, but fomentations, bleeding and physic.

Bony tumors about the eyes of cattle occasionally bend toward the eye and press upon it, thus interfering with the vision. If the tumor is on the upper part of the orbit, and is attached by a kind of pedicle, it may be sawed off and the root touched with the cautery. These tumors are often obdurate and impossible to cure. When they spring from the back of the orbit no cure can be effected. When the eye becomes painful and begins to protrude, the only course is to destroy the animal. External bony tumors frequently ulcerate, and the bone becomes carious or decays. Humanity then dictates the speedy killing of the beast.

Cattle are subject to a pustular eruption on the edges of the eyelids, accompanied sometimes by great soreness and ulceration. The first remedy is the mild nitrate ointment of mercury, but it does not always yield to that; yet on the approach of winter it frequently yields spontaneously. It indicates a foul habit of body, and is often connected with mange. Purges of sulphur will be found useful, and a course of alterative medicine will do good.

A "haw," or flat piece of cartilage, of a semi-circular form, is found in the corner of the eye. This part is disposed to disease, inflammation and swelling sometimes taking place, causing the haw to protrude over the eye.

If the disease is connected with the inflammation of the eye, generally it will subside with that inflammation. If the part itself is diseased, the zinc lotion may be used (2 grains of white vitriol dissolved in an ounce of water, and the vitriol gradually increased to 4 grains, the application confined as much as possible to the part, and the liquid not suffered to get to the sound part of the eye). A perseverance in the zinc wash will work marvels. If it becomes necessary to extirpate the part, the beast must be cast. Keep open the eye with the fingers, pass a needle threaded with strong silk through the cartilage, and draw out the part as far as possible, and then with a pair of crooked scissors the haw may be removed. Proper care will restore the part to soundness.

To cure ophthalmia, give bleeding and physic as the constitutional treatment, and fomentations, cold lotions, opium in tincture, saturnine lotions, as local applications, the opium during the acute stage, the lead as soon as the inflammation begins to subside, and the zinc when the inflammation is nearly subdued.

Abortion. Abortion may be said to take place in cows when the fœtus is expelled 35 days before the normal period. It may occur from a variety of causes, and is much more common during the first half of the normal period than during the latter.

Symptoms. The cow, in this condition, is somewhat off her feed, she is listless and dull, the milk dimin-

ishes or dries up, the motion of the fœtus becomes more feeble, and at length ceases altogether, there is a slight degree of enlargement of the belly; and a little staggering in her walk. As the abortion approaches, a yellow or red glairy fluid runs from the vagina (this is a symptom which rarely or never deceives), her breathing becomes laborious and slightly convulsive. At length labor comes on, and is often attended with much difficulty. Among the causes may be mentioned fright, blows, falls, overdriving, the eating of grain, hay or grasses containing ergot, nauseating smells, mow-burned or rusty hay, etc. A cow that has once aborted is liable to do so again. When a cow in a herd has aborted, others are liable to follow. Remove the aborting cow, together with the calf and the afterbirth, from the field or stable, and disinfect the stall with chloride of lime or a strong solution of copperas. With a view of prevention it is necessary to ascertain the cause. If due to ergot, grass, or other deleterious plants, remove the cows to other pasturage. When due to musty or bad hay, discontinue its use.

The bull should not go loose among cows that are in calf. *The fœtus must be got rid of immediately.* It should be buried deep, and far from the cow pasture. Proper means should be taken to hasten the expulsion of the placenta. A dose of physic should be given; ergot of rye administered, the hand should be introduced, and an effort made, cautiously and gently, to detach the placenta. The parts of the cow should be well washed with a solution of chloride of lime or carbolic acid, which should be injected up the vagina, and also given internally. The cow when beginning to recover, should be fattened and sold. This is the first and grand step toward the prevention of abortion, and he is unwise who does not immediately adopt it. Should the owner be reluctant to part with her, two months, at least, should pass before she is permitted to return to her companions.

ANBURY OR ANGLE BERRY, a sort of fleshy excrescence to which cattle and some other animals are subject under different circumstances, and are supposed to proceed from a rupture of the cutaneous vessels, which give vent to a matter capable of forming a sarcoma or fleshy excrescence. They frequently appear upon the belly and adjacent parts hanging down in a perpendicular manner and may be removed by means of ligatures being passed around their base or by the knife. After removal, apply caustic to effectually destroy the parts from which they arise.

APOPLEXY. This is a determination of blood to the head. Animals attacked with this disease are generally in a plethoric condition. The usual symptoms are coma (a sleepy state), eyes protruding, respiration accelerated; finally the animal falls, struggles and dies.

Treatment. Treat the case, by way of prevention, with low diet. No treatment, however well directed, is of any use when the disease has once manifested itself. Life is prolonged a few hours by blood-letting, but no cure can be effected.

APHTHÆ OR THRUSH. This is an eruption in the mouth similar to small bladders, and is often mistaken for a contagious disease called epizootic aphthæ. The cause is irritation in the mouth of young cattle from teething.

Treatment. If treatment is at all necessary a weak mixture of vinegar and cold water will answer, or a solution of alum (alum water) applied to the mouth twice a day, will be all that is needed.

BLACK-LEG, JOINT FELON, QUARTER EVIL. A malignant and rapidly fatal disease, the first symptoms of which are lameness, sometimes in the fore, sometimes in the hind leg; puffy and blood-shot swelling of the shoulder or hinder parts, as though the animal had been beaten with a heavy, dull instrument. Young steers, up to the age of three years, are most liable to the disease, particularly those which have become suddenly fat. The great difference between the temperature during the day and night at this season favors the development of the disease. The cattle should be removed to an elevated dry ground. If the hay fed is from marshy ground, or from ground upon which animals have recently died, it should be replaced by hay you are sure contains no traces of the disease. The water supplied should be pure and sweet, and not derived from surface drainage nor charged with decomposing organic matter. The hay should be sprinkled with a solution of carbolic acid to the amount of 1 dram of the acid daily to each animal. The following draught may be given night and morning for some time: Nitro-muriatic acid, 60 drops; iodide of potassium, ½ dram; water, 1 pint. Should the nights be cool, it might be advisable to provide comfortable sheds for the stock.

BLACK TONGUE: see Bloody Murrain.

BLACK WATER. This is an exaggerated stage of what is known as Red Water, to which the reader is referred.

BLAIN, ANTHRAX, GLOSSITIS. When bloody murrain attacks the tongue it is called blain. In the case of blain it is recommended to open the pustules freely from end to end, with a sharp lancet, before the poison has been absorbed. Treat the same surface freely with the following: 20 grains of chloride of lime, 1 ounce water. Mop the parts freely. Sulphuric or nitric acid, nitrate of mercury, lunar caustic and other strong caustics are equally good. When it may be accomplished, burning with a hot iron is advised.

BLOODY MURRAIN. Contagious anthrax, known also as charbon, black leg, black quarter, black tongue —is so called because the parts turn black, owing to decomposition of the blood. It arises undoubtedly from contagion, eating bad food, pasturing on swamp lands in summer, drinking stagnant water, etc. Whatever the poison, it is certain that it has wonderful tenacity of life; every part of the animal will carry it, even the excrement. Flies will carry it; a yoke worn by a deceased ox retains it. Even alcohol is said not to be able to kill the poison. Fortunately it rarely occurs in its truly malignant form. There are many types of the disease, attacking particular parts. In the tongue it is known as black tongue, or blain; in the

Fig. 6.—JERSEY COW.

throat as putrid sore throat. When it attacks the bowels it is called Bloody Murrain.

In this disease it must be remembered that in its malignant form it attacks not only cattle and horses, but all the other herbivora, swine and birds. It is communicable to other and different animals by inoculation, showing itself in different forms, but all characterized by the breaking down of the globules, rupture of tissues and letting out blood and albuminous fluids, with gangrene, yellow or brown mucous membrane, enlargement and sometimes rupture of the spleen, and a very high death rate.

Preventives. Upon the first intimation of the disease the animals of the herd should be removed to clean, new pasture, where there is pure water. Avoid all bleeding, purging, and lowering medicines. The animals must be kept up. So all local applications to the swellings seem useless. A seton, composed of a yard of broad, coarse tape, inserted in the dewlaps, turned every day and smeared with irritating ointment, might prove beneficial. This should remain in from four to six weeks. Youatt and others advise the following: 2 to 4 drachms chloride of lime, 1 ounce prepared chalk, 2 drachms laudanum.

Mix and give in a pint of warm gruel every two or three hours.

Recent French authors, in treating the malignant form of the disease, recommend quinine, 1 or 2 drachms, repeated every two or three hours in severe cases. Also hypodermic injections of a solution of iodine as follows: 2 grains iodine, 5 grains iodide of potassium, 1 ounce water.

Use a syringe full every hour in severe cases. In extreme ones, it is advised that this be thrown directly into the veins; also that the strength be kept up by stimulants; among those recommended most strongly is carbonate of ammonia.

BRONCHITIS. This is inflammation of the windpipe, extending often to the lungs themselves. Bronchitis, and throat and chest diseases in cattle, are insidious and deceptive, for the ox does not, even under the most severe forms of these, exhibit fever, high pulse, irritation, loss of appetite, etc., which are shown at once when attacking the horse. Not until the disease has made considerable progress does the ox or cow show symptoms of disease. Careful observation and close attention is demanded on the part of farmers to discover the early symptoms of this disease. When anything in the least unusal is discovered, such as a very slight grating sound in the windpipe when the ear is steadily applied, the cow should immediately have some iron, or tonic powders, and all will be well in a few days. Farmers, if you study the sounds in the windpipe, both in the sick and well animal, then you will not only be able to detect those insidious diseases in the beginning, but can apply the remedy also. In this way you can prove to your neighbors that cattle diseases are not so difficult to cure after all; and while they are brooding with sour, sullen minds over their losses, and the ignorance and inefficiency of cow doctors, you have obtained a mastery of the situation.

Bronchitis is a disease which rarely attacks one animal only, but usually most of the herd will have been attacked before it leaves the place, and then it will leave when there are no more victims to seize. These epizootic diseases depend upon what is called atmospheric causes. Such conditions are usually manifested in the spring of the year, and sometimes early in the summer. The peculiarity of the air causes irritation of the fauces, the mouth, throat or windpipe, and, as before stated, sometimes extends to the chest and lungs themselves.

Symptoms. In a week or so after the attack, a slight husky cough, with weeping from the eyes, and a watery discharge from the inner corner of the nose, will be seen; and by applying the ear to the course of the windpipe, a slightly rough and grating sound will be heard. This sound, however, can be heard in twelve hours after the attack. According to the amount of serum poured out, and whether the cow be in calf, and how far she is gone in calf, so will the quickness and depth of the breathing be. Bronchitis is a forerunner of pleuro-pneumonia.

Treatment. If the disease is discovered within 48 hours from the attack, take from four to five doses of the tincture of aconite root, 25 drops to a dose, and give one dose every four hours. If there be uncertainty as to whether the disease has extended longer or shorter, to save time, the aconite may be given along with the following powders, three times in the day: Powdered sulphate of iron, 3 drachms; powdered gentian root, half an ounce; powdered ginger root, half an ounce; powdered sulphate of soda, half an ounce; mix, and make a drench, to be poured down the mouth out of a strong bottle. This medicine is to be continued (omitting the aconite after the fifth dose) till the animal is well, or looks brighter, and eats all it gets. If it be a milch cow, the usual quantity will be given. In addition to the above medicines, give, once or twice daily, half an ounce of commercial sulphuric acid, largely diluted or mixed in half a bucket of cold water. In feeding, care should be taken not to give too much, so as to bring on dangerous indigestion. Cold water and pure air are indispensable agents in the treatment of this and all diseases of horses and cattle.

Choking is most commonly brought about by the cows feeding on roots, especially round and uncut ones, such as the potato.

If not too large, the obstruction may often be removed by the introduction of a hollow, flexible tube. If low down, a pint of linseed or olive oil will aid the operation, which must be very cautiously performed for fear of lacerating the gullet. In case of great swelling, a dose of chloride of lime or ammonia should be given after the removal of the obstruction.

FIG. 35.—*Probang.*

When a cow is choked with a nubbin of corn, turnip, pumpkin rind, or any other thing, the obstructing

article should be pushed down into the paunch with a probang (Fig. 35), which is simply a wooden rod with a cup-shaped excavation at the end opposite the handle. One should be kept at hand on the premises.

CONSUMPTION. This affection is the termination of the chronic disease of the lungs. These organs become filled with many little cysts, or sacs, containing a yellowish-white fluid, which in time is hardened, producing a condition of the lungs known as tuberculous. These tubercles in time undergo another change, becoming soft in the center and gradually involving the whole of the hardened parts, which, uniting with adjoining ones, soon form cysts of considerable size. Like consumption in individuals, it is very seldom, if ever, cured, and it is better if the animal is not too poor in flesh, to have it slaughtered.

CORYZA, or nasal catarrh, commonly called a cold in the head, is not very common among cows. The animal will be observed to sneeze often; cough sometimes accompanies; there is also a discharge from the nose. Neglect to attend to these early symptoms frequently occasions disease of a more serious nature; in fact, coryza may be regarded as the forerunner of all epizootic, pulmonary disorders.

Treatment. The animal should be kept on a low diet for a few days; the nostrils occasionally steamed, and one of the following powders given night and morning, which, in most cases, will be all the medicine required: nitrate of potassa, 1 ounce; digitalis leaves pulverized and tartrate of antimony, of each 1 drachm; sulphate of copper, 2 drachms; mix and divide into eight powders. Should the disease prove obstinate, give for two or three days 2 ounces of Epsom salts at a dose, dissolved in water, three times a day.

COW-POX. This is a simple affection of the skin of the udder, which has claimed much notice on account of the valuable benefit conferred by it upon the human family, in furnishing the material for vaccination. The cause of this disease is at present unknown. It is a contagious eruption, running a fixed course, and accompanied by slight fever.

Symptoms. Teats painful, slightly swollen, a faint blush upon the udder, and in about three to four days red, hard spots are seen, succeeded by red patches, which, in from a few days to a week, form bladders containing the true vaccine lymph..

Treatment. Foment the teats well with warm water and Castile soap, after which, wipe the bag dry, and dress with citrine ointment. Iodine is also recommended; or, to 1 pint of glycerine add 1 drachm of fluid carbolic acid.

CROUP. Stridulous croup in animals is rare, but it is seen occasionally in milch cows, and is very fatal, from the fact that it is situated in the larynx, which speedily causes suffocation, unless the windpipe be opened with a knife to admit of the act of respiration till the swelling of the head of the windpipe has passed off.

Cause. Cold attacking the head of the windpipe, followed by inflammation, and the development of false membranes.

Symptoms. Loud, stridulous noise or murmur, quickened breathing, fever, and threatening suffocation of the animal, cough and distress.

Treatment. Place the animal in the open air, if in summer time, in the shade, and give aconite, in the form of tincture, 25 drops to a dose. This will allay the excitement, fever and irritation. If this gives relief, repeat the dose in a few hours again. But on the contrary, there being no relief in half an hour, give no more aconite, nor indeed anything else. There will be but one of three things to be done; either to kill the beast, if it be in good condition, and fit for market; or wait for the animal to die, or have the boldness to cut out a hole in the windpipe, about the middle, on the front of the neck. In case the latter is preferred, tighten the skin on the front of the windpipe, and make a clean cut far down the center, and through the skin; when the white, shining windpipe is brought to view, have an assistant to hold the edge of the skin back out of the way, till a hole is cut out of the cartilages of the tube, as large as a fifty-cent piece. This will give instantaneous relief. The hole will gradually fill up, and close again without any trouble whatever.

CUD, LOSS OF. In most internal diseases of cattle, the functions of the organs of digestion become more or less impaired, whereby the natural act of re-mastication, more commonly known as "chewing of the cud," becomes temporarily suspended, and which is called "losing the cud." Treatment must necessarily vary with the nature of the ailment which produces this symptom of impaired digestive functions. The treating or attempting to treat one of the symptoms of any disease, which may be remote from the digestive organs, would lead to nothing but loss of time and risk of the life of the animal, if the original disease happens to be a serious one. The administration of a laxative dose of salts would in most cases prove beneficial, and at all events would do no harm, such as a pound of Epsom salts dissolved in a quart of hot water, and to which solution may be added a pint of molasses and an ounce of ground ginger.

DIARRHŒA is brought on by a sudden change from dry to green food, sometimes by impure water or poisonous plants. If slight, it need not be checked; if prolonged, a mild purgative may assist nature. A few ounces of pulverized charcoal will sometimes check diarrhœa. Half a pound of Epsom salts, with a little gentian and ginger, will be sufficient for a moderate-sized animal. This may be followed in a day or two by an astringent composed of 2 drachms of powdered catechu, 1 drachm powdered opium, 4 drachms of powdered ginger, 1 ounce of powdered oak bark, and 2 ounces of prepared chalk. Mix together and give in a quart of warm gruel.

DYSENTERY. This, when seated, is a troublesome and dangerous disease. The cow strains painfully to pass her dung. This is slimy, thin, olive-colored and offensive. Bubbles form on the top, carrying slime on them. The animal is quite restless. When the hair stands out from the body the disease is generally fatal. It is frequently brought on by poor feeding in the winter

Fig. 7.—JERSEY BULL.

and exposure to sudden changes of temperature. Good nursing is needed, and much the same treatment as in the case of diarrhœa.

ENTERITIS. This is an inflammation of the external or internal coat of the intestines, sometimes attended with violent purging, especially when it is confined to the internal coats. Oxen in good condition are more subject to this disease than are cows. It most frequently occurs in dry, hot weather.

Symptoms. The animal is dull and not disposed to move about; the muzzle is dry, and the coat staring; the animal yields, on pressure of the loins; a weak, staggering gait when forced to move; eyes red, full and fiery; head protruding; mouth, ears and horns hot; appetite bad; the bowels become constipated, the animal moans continually and froths at the mouth. Cause, exposure to cold, or drinking cold water when overheated with work; exposure to hard work in sultry weather; the use of stagnant, impure water; the crowding of animals into a confined place.

Treatment. First give 30 drops of tincture of aconite every four hours for one day, then give 1 ounce of cardamom, 1 ounce of sulphuric ether, 1 ounce of tincture of gum catechu, 1 ounce of pulverized chalk, 1 ounce of charcoal, in linseed tea. In severe cases of purgation 1 ounce of barberry bark may be occasionally added.

EPIZOOTIC APHTHÆ, although a contagious febrile disease occurring in cattle and sheep, and communicable by transmission to swine and even man, it is fortunately rarely fatal, and is characterized in animals by an eruption of small blisters in the mouth, between the clefts of the hoofs, and along the upper margin of the coronet. It is a specific poision of obscure origin, remaining in the system from one to four days before producing its characteristic symptoms.

Symptoms. There is an increase of temperature in the body, followed by an eruption of small blisters, of the size of a dime, situated on the tongue, the roof of the mouth, inside the lips, and occasionally on the udder. The blisters in the cleft of the hoofs and around the coronet and heels, are identical with the others, but smaller. Diseases of this class have the same relation with inferior animals that epidemic diseases have to man. They occur at all seasons of the year, but more generally prevail in the spring and fall. The period of their duration varies from months to years. They are at times mild in their attacks, and yield readily to proper treatment. At other times they become painful pestilences, destroying everything in their course when once fairly established in a place. It is almost a certainty that all cattle will take it, some developing it sooner than others. To save time and expense, immediately inoculate every one of them. By producing the disease in this way a week or two will see the last of it, and by good care not much time or loss will have been incurred. The milk of cows affected with this disease is poison. Calves by drinking such milk will perish in great numbers.

Treatment. Apply to the sores a lotion of 2 drachms of sulphate of zinc in 1 pint of water.

FOUL IN THE FOOT. FOUL CLAW. A local affection, consisting of sores or ulcers, first appearing between the claws. Sometimes a swelling shows itself near the top of the hoof. The cruel practice of drawing a rope back and forth over the affected parts ought to be abandoned. A knife is all that is needed to remove the loose matter; the parts should then be carefully washed with a sponge. Where the case has been allowed to go far, and the pasterns are tender and swollen, the parts should be dressed with an ointment composed of 1 part of sulphate of iron to 4 parts of molasses. Apply on cotton batting and tie over the affected parts. If there is any fungus or other morbid growth, sprinkle equal parts of alum and powdered bloodroot on the sore. Some administer a dose made of 2 ounces of burdock, 1 of powdered sassafras bark and ½ an ounce flowers of sulphur. Steep in boiling water, and when cool, strain. If the flow of pus is not checked, wash, morning and evening, with solution of 1 tablespoonful of common salt in 1 pint of water. Or, take oil of tar and tincture of arnica, 4 ounces each, and 1 drachm of carbolic acid, fluid, mix well and apply three times a day.

GARGET is an inflammation of the internal substance of the udder. One or more teats, or whole sections of the udder, become enlarged and thickened, hot, tender and painful. The milk coagulates in the bag, and wherever deposited, causes inflammation accompanied with fever. It is most frequently met with in young cows after calving, especially when they are in too high condition. The secretion of milk falls off, and in some cases stops altogether. The milk is sometimes thick and bloody. In severe cases, the hind extremities, as the hip-joint, hock or fetlock, are swollen and inflamed to such a degree that the animal cannot rise. In mild cases, the simplest remedy is to put the calf to its mother several times a day. By restoring the flow of milk this will often remove the congestion. Sometimes the udder is so swollen that the cow will not let the calf suck. If the fever increases, the appetite fails and rumination or cud-chewing ceases. When this is the case a skillful veterinary surgeon should be called in. Usually, in mild cases, a purgative and frequent washing of the udder dispel the trouble. The physic should consist of 1 pound of Epsom salts, ½ an ounce of ginger, ½ an ounce of nitrate of potash, dissolved in a quart of boiling water; add a gill of molasses and give to the cow lukewarm. The diet should be moderate: bran and, in summer, green food. The udder should be frequently examined and any matter found forming there be at once released. The causes to which this disease is most frequently attributed are: exposure to cold and wet, or want of proper care and attention to the cow during parturition. Hasty drying up of a cow often gives rise to inflammation and hardness of the udder, which is found difficult to remove. Another is failure to milk a cow clean.

Treatment. While the cow is suffering from this complaint, the calf should be permitted to run with her often, and the cow milked as clean as possible at least twice a day. In case the udder is feverish and hot, a

wash may be used, 2 ounces of camphorated spirit and 8 ounces of vinegar; the whole thoroughly mixed and applied just after milking and washed off carefully before milking again. In extreme cases, iodine ointment, containing 1 drachm of hydriodate of potash to an ounce of lard, well mixed, may be used. A piece the size of a pigeon's egg to twice that amount should be well rubbed into the swollen parts, morning and night. When milk forms in the bag before calving, so as to swell the udder, it should be milked away; a neglect of this precaution frequently leads to violent attacks of garget. The liability to this disease engendered by the mixing of the old milk with the new secretion is one of the main reasons for letting the cow run dry a month or so before calving, if there is any likelihood of an attack from the opposite course being followed. Fat induced by high feeding after drying off is a frequent cause of this disease; it should, therefore, be avoided.

GASTRO-ENTERITIS arises from eating the buds of oak, young ash and other trees which are of a very highly stimulating or irritating character.

Symptoms. Loss of appetite and suspended rumination; mouth hot and frothy; skin dry; pulse from 60 to 70; swelling and pain of the belly; fæces hard and covered with blood; urine of a strong odor, highly colored.

Treatment. Bleed and administer a strong purgative. Follow by aconite and belladonna as in enteritis. Injection of Castile soap and water should be used; also mustard, hartshorn and water to the belly.

HOOSE IN CALVES. This is a common disease in breeding districts, and is very fatal in its results, attacking young calves. It is a parasitic disease.

Cause. The presence of minute worms in the bronchial tubes. These worms are called *filaria bronchi*, and inhabit the windpipe of cattle, sheep and lambs.

Prevention. Keep calves, sheep and lambs on dry land, where there is no marsh, wet land or meadow.

Symptoms. Constant husky cough; difficulty in breathing; emaciation, and loss of appetite. Thus the disease goes on from bad to worse, until death takes place in from two to three weeks, depending much, however, upon the age of the beast.

Treatment. Linseed oil, 2 ounces; oil or spirits of turpentine, ½ an ounce; mix these well together This dose is for a calf six months old. It should be repeated every two days. Give the calves good feed, such as oil cake, etc. Another form, and a good one, which is generally used in sheep to save expense and trouble, is to get them together, and drive them into a pretty close house or shed, no larger than will hold all the affected ones. Then procure an earthen bowl or basin, containing one ounce each of common salt and oxide of manganese, and pour over this mixture, say, water, ½ an ounce; sulphuric acid, 1½ ounces; stir with a stick, and chlorine gas will be evolved. When sufficiently stirred, leave the place and close the door. Repeat the inhalation for two or three times, and let two days pass before each subsequent inhalation. If the animal is much weakened by the parasites, mix caraway and fenugreek in their feed, of each a quarter of an ounce, once a day for a week or so.

HOOVE, OR HOVEN, IN CATTLE, is flatulent colic and caused by eating too much wet grass, especially clover. Fermentation takes place and generates carbonic acid gas in large quantities, and if not relieved speedily, will end fatally in a few hours. To get rid of the gas, give every half hour: 1 ounce chloride lime, 1 ounce hypo-sulphite soda, 1 qt. water. The common soda will do where the hypo-sulphite can not be procured. If this fails to give relief, which it seldom will, resort must be had to the trocar, Fig. 36, which every farmer should be provided with.

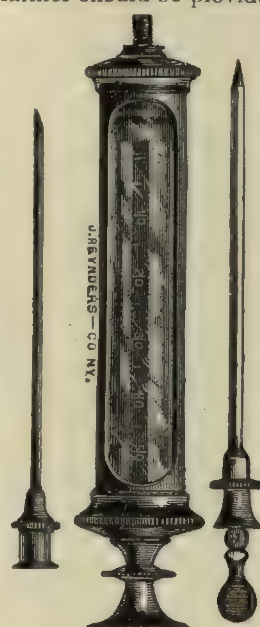


FIG. 36.—*Trocar.*

Thrust it into the left flank half way between the short ribs and the haunch bone, and midway from the top of the back to the belly. A common knife will do in the absence of the trocar. Fig. 34 represents a hypodermic syringe and canula, with the trocar.

INFLAMMATION OF THE BLADDER. The symptoms of this disease are frequent efforts to stale, passing but few drops of urine at a time; pulse full and rapid; eyes bloodshot; appetite lost; moaning, and walking with a staggering gait.

Treatment. Inject into the bladder one quart tepid water, and from one to two ounces of tincture of opium mixed together in slippery elm bark water. Give internally one of the following powders every hour until relieved: nitrate of potassa, one ounce; tartrate of antimony, and pulverized digitalis leaves, each one drachm; mix and divide into six powders.

INFLAMMATION OF THE LIVER. Diseases of the liver are of very common occurrence, a fact with which all beef butchers are familiar. Perhaps no organ in the animal economy is so liable to disease. The obscurity of the symptoms and the good condition of the animal prevent its discovery, as a general thing, during its lifetime. When, however, the disease assumes an active form, known as the yellows, jaundice or inflammation of the liver, the symptoms are more readily detected.

Symptoms. A yellowish color of the eye will be observed; skin, urine, etc., highly colored; soreness, on pressure, on the right side; loss of appetite; dullness; constipation of the bowels, etc.

Treatment. Calomel is the most reliable medicine known to practitioners for diseases of the liver. Its abuse, however, has brought it into disrepute. Yet, as

with ordinary care it may be advantageously used, we will prescribe it as that upon which the most dependence is to be placed, and in doing so, will endeavor to have it used safely. Bleeding has been recommended by some, but no good result has ever been obtained. Give Epsom salts in doses of four ounces each, with one scruple of calomel, until the animal is relieved. Mustard and water should frequently be applied to the right side, and well rubbed in.

JAUNDICE, ICTERUS. This is a common disease in the ox, from the fact that he is supplied with a gall-bladder, and gall in great quantity. Jaundice may be properly biliary intoxication, or distribution of bile throughout the whole circulation of the blood.

Causes. Closure of the biliary ducts in the liver, and the consequent absorption of the bile into the stomach. The bile duct may be closed from gall-stones.

Symptoms. In the white skinned oxen, jaundice is seen at once from their yellow color. In dark-colored animals we are satisfied to examine the lining of the mouth, nose and eyes, for this yellow appearance. In addition to these signs, we have dullness, and costiveness, while the dung is of whitish or straw-colored look.

Treatment. If the symptoms be not very prominent, the animal may be left with safety to the powers of nature, which can be assisted by giving slop food or placing it upon bare pasture for a few days. If the case be more of an acute kind, give a dose of purgative medicine, as follows: Epsom salts, one pound; table salt, half a pound; ginger, half an ounce, mix, and dissolve in four bottles of water, sweetened with molasses.

LICE. Cattle are often subject to lice, particularly when they are neglected, half starved and in poor condition. Good care and good feeding, in connection with the treatment recommended in Mange, to which the reader is referred, will comprise all that is requisite.

LOCK-JAW. Kill the beast and dress it for market as soon as it is known that it is lock-jawed.

MALIGNANT CATARRH. Caused by feeding in damp, cold situations, and feeding on marshes in peculiar seasons. Low, wet river bottoms are most apt to give it to stock. The disease somewhat resembles the Russian cattle plague, but is not usually contagious. Professor James Law gives symptoms and treatment as follows:

Symptoms. A slight diarrhœa may be followed by costiveness, the dung being black, firm and scanty. The hair is rough and erect; shivering ensues; the head is depressed; the roots of the horns and forehead hot; eyes sunken, red, watery, with turbidity in the interior and intolerance of light; muzzle dry and hot; mouth hot, with much saliva; the membranes, mouth, nose and vagina blush-red; pulse rapid; impulse of the heart weak; breathing hurried; cough; urine scanty and high-colored, and surface of the body alternately hot and cold. In twenty-four hours all the symptoms are aggravated; the nose discharges a slimy fluid; forehead is warmer and duller on percussion; the mouth is covered with dark red blotches, from which the cuticle soon peels off, leaving raw sores; appetite is completely lost; dung and urine passed with much pain and straining, and there is generally stiffness and indisposition to move. From the fourth to the sixth day ulcers appear on the nose and muzzle, swelling takes place beneath the jaws, chest and abdomen, and on the legs the skin may even slough off in patches; a fœtid saliva drivels from the mouth and a stinking diarrhœa succeeds the costiveness. Death usually ensues from the eighth to the tenth day, preceded perhaps by convulsions or signs of suffocation.

Treatment. Clean the bowels with the following: 1 pint olive oil, 1 ounce laudanum; mix. In eight or ten hours, if it does not operate, give another. Follow this with diuretics—sweet spirits of nitre in half-ounce doses; and also with antiseptics, potassa chlorate, in doses of one-quarter drachm. Wet cloths should be kept on the head; the mouth and nose sponged with quite a weak solution of carbolic acid. Give as food only soft mashes.

MANGE. Mange, or leprosy, is one of the most unpleasant and difficult diseases to manage of all the ailments to which cattle are subject, requiring the nicest care and attention to render it easy of cure. An animal badly nursed will not, under the most skillful treatment, quickly recover. Its causes are, in the main, due to poor food, which produces a debilitated condition of the system, and, in connection with a want of cleanliness, causes a development of the acari, or minute insects, exciting very great irritation upon the skin and causing the cow to rub herself against every object with which she comes in contact. The hair falls off, a scurfy appearance of the skin is perceptible, and the animal is poor in condition and milk. The great trouble in treating this disease springs from its contagious character; for no sooner is the animal, ofttimes, once free from the acari than it comes in contact with some object against which it has previously been rubbing, when the acari which were left upon that object are again brought in contact with the animal and the acari and the disease are reproduced. If, immediately after the proper applications are made, the animal is removed to other quarters, and not allowed to return to the former ones for six or eight weeks, there is, generally speaking, but little trouble in treating the disease.

Treatment. Take the animal upon a warm, sunny day, and with a scrubbing-brush cleanse the skin thoroughly with Castile soap and water; when dry, apply in the same manner the following mixture: white hellebore, 1 ounce; sulphur flowers, 3 ounces; gas-water, 1 quart; mix all well together. One or two applications are generally all that will be required.

Give internally one of the following powders in the feed, night and morning: flowers of sulphur, 2 ounces; black antimony, 1 ounce; nitrate of potassa, 1 ounce; mix and divide into eight powders.

MILK FEVER. Milk fever occurs from the first to the third day after calving,—rarely after the third day. It is seldom met with before the fourth calving,

Fig. 8.—HOLSTEIN COW.

then attacking chiefly cows of select breeds, and good milkers. Milk fever consists in inflammation of the womb, which sometimes even extends to the bowels.

Symptoms. Loss of appetite; chewing the cud, or rumination, ceases; staggering gait; wild look; fall and cannot rise. If the disease is not checked the brain will soon be affected also, when the cow will dash about with her head and horns plowing the ground.

Cause. Undue determination of the blood to the womb from over-feeding before and immediately after calving, and from sudden changes of the weather at the time of calving.

Prevention. Give, one week before calving, 1 pound Epsom salts, ½ pound of table salt, and ½ an ounce of ground ginger, mixed in 4 bottles of cold water and sweetened with molasses. Let the cow's feed be of the lightest kind, such as hay and thin slop mashes, and no meal, grain or solid food. This measure will lessen the tendency to interruption of the circulation, and will improve the health and tone of the whole system. To avoid, as much as possible, the effects of sudden changes of weather, have the cow brought into the barn. When the milk fever is anticipated, give, a few hours after calving, 25 drops of tincture of aconite root, which may be repeated every six hours, till four doses have been given.

Treatment. When the disease is present, give at once 30 drops of tincture of aconite root, and ½ an ounce of pure opium in powder, in a bottle of thin gruel. The aconite must be repeated every 4 hours without the opium, until 4 or 5 doses are given. Place chopped ice in a bag on the forehead, and attach it to the horns, renewing it when wanted. This being done quickly, at more leisure get Epsom salts, 1 pound; table salt, 1 pound; ginger, ½ an ounce; mix and dissolve in 4 bottles of cold water, with a little molasses to sweeten it, and give at one dose. After this medicine has been given, turn the cow from side to side every 4 hours, or when the aconite is given, which will save labor and unnecessary excitement to her. She should be left as quiet as possible, and her legs and body kept warm, thereby relieving the womb to that extent. Do not deny pure air, nor plenty of cold water to the afflicted animal, for she not only needs them, but they are indispensable to sure and perfect recovery in most diseases, and as much so if not more in a disease of this kind.

Murrain. The proper meaning of this word is, to die; but it and the term Cattle Plague are applied indiscriminately to diseases by many cow doctors in order to mystify the farmers. They may give the name of murrain to any disease or diseases, however different the one may be from the other in sign, symptom and result, providing the beast die. It will be observed, however, that if the animal should live, murrain cannot be its proper name. Murrain, as applied to cattle diseases, conveys no idea of the nature or seat of the disease. In some parts of the world murrain is applied to epizootic aphthæ, a disease affecting the mouth and feet, and not deadly or fatal. Without fatality there can be no murrain, and the absurdity of the name will be apparent to every farmer; and they should not permit themselves to be mystified by veterinarians applying this name and that of cattle plague to diseases they know nothing about.

Navel-Ill. Inflammation of the navel in calves occasionally occurs, causing redness, pain, and sudden swelling in the part affected. This disease, if not promptly attended to, speedily carries off the creature.

Treatment. Foment the part well with warm hop tea; after which, the application of a cloth, well saturated with lead-water and secured by bandages, should be applied. Internally, doses of Epsom salts, of 2 ounces each, dissolved in a pint of water, should be given until the bowels are acted upon. After the inflammation has subsided, to counteract the weakness which may follow, give a bottle of porter two or three times a day.

Phrenitis. Inflammation of the brain is one of those dreadful diseases to which all animals are liable. It is known to the farmer as frenzy, mad staggers, etc. The active symptoms are preceded by stupor; the animal stubbornly stands in one position; the eyes are full, red and fiery; respiration rapid; delirium soon succeeds; the animal, bellowing, dashes wildly about, and seems bent on mischief, rushing madly at every object which comes in its way. The causes of this disease are overwork in warm weather, a plethoric condition of the system, and stimulating food.

Treatment. As this is attended with considerable risk, unless it is taken prior to the frenzied stage, bleeding almost to fainting should be resorted to, and followed by a brisk purge. Take 1 ounce of Barbadoes aloes, and 10 to 15 drops Croton oil; mix the aloes with 1 pint of water and the oil, using the mixture as a drench. One pound Epsom salts will answer the purpose very well, in cases where the aloes and oil cannot be readily obtained. Application of bags of broken ice to the head is very beneficial. Spirits of turpentine, or mustard, together with spirits of hartshorn and water, should be well rubbed in along the spine from the neck to the tail.

Pleurisy. This is an inflammation of the pleura, or the serous membrane which lines the cavity of the cow's chest, and which is deflected over the lungs. Inflammation of this membrane rarely occurs in a pure form, but is more generally associated with inflammation of the tissues of the lungs. If this disease is not attended to at an early period, its usual termination is hydrothorax, or dropsy of the chest. The same causes which produce inflammation of the lungs, of the bronchia, and of the other respiratory organs, produce pleurisy.

Symptoms. The respiration is quick, short and painful; pressure between the ribs produces much pain; and a low, short, painful cough is present; the respiratory murmur is much diminished,—in fact, it is scarcely audible. This condition is rapidly followed by effusion, which may be detected from the dullness of the sounds, on applying the ear to the lower part of the lungs. The febrile symptoms disappear; the animal for a few days appears to improve, but soon be-

comes weak, languid, and often exhausted from the slightest exertion.

Treatment. The same treatment in the early stage is enjoined as in inflammatory Pneumonia, which the reader will consult, counter-irritation and purgatives. Bleeding should never be resorted to. When effusion takes place, it is necessary to puncture the sides with a trocar, and draw away the fluid, giving internally one of the following purges three times a day: rosin, 8 ounces, saltpeter 2 ounces; mix and divide into eight powders. Half-drachm doses of the iodide of potash, dissolved in water and given three times a day, are good.

Pleuro-Pneumonia. This disease, which has lately excited so much attention in the United States from its violent outbreaks in the Atlantic States, and the well grounded fear that for the lack of national legislation it might overrun the whole country, is the most malignant with which the farmers of the country have had to deal. Once fairly established in the West, there will be no possible means of eradicating it. It will remain a fixture forever.

Unfortunately veterinary science has never yet discovered a remedy. Its attack is so insidious, and often occupies so long a time in the stage of incubation, that a whole herd may be infected almost before it is known. As in the case of all German plagues, nothing is known of its origin; but just as soon as it is apparent that a case is being well developed, the only safe plan is prompt killing, deep burying of the carcass, skin and all, and the free use of quick-lime (a barrel to the carcass) before being covered up.

Definition. The definition of this disease is given as follows: It is a specific contagion peculiar to cattle, and manifested by a long period of incubation (ten days to three months), by a slow, insidious onset, a low type of fever, and by the occurrence of inflammation in the air-passages, lungs and their coverings, with an extensive exudation into the lungs and pleuræ.

That the infection is carried by the animals wherever they go is certain. That it is carried in the air to a very considerable extent seems altogether probable. That it is carried by inoculation is well demonstrated; and also by contact of diseased portions of an animal with the membranes of a well one, is as certain as that the contagion is carried by attendants on sick animals, and is proved almost beyond controversy. That the contagion will hold in stables for months, even after being thoroughly cleaned and washed with disinfectant liquids, is proved just as clearly as that it may be carried by the many. That it may be taken in pastures and with fodder is too well authenticated to leave room for doubt.

Vitality of the Virus. There is much difference of opinion with regard to the power of the virus to resist ordinary destructive influences. In many cases the free exposure of an infected place for three or four months to the action of the air has purified it so that fresh stock have been introduced with impunity. On the other hand, instances can be adduced in which cattle have been infected by being placed in stables in which cattle had not been kept at least four months previously. Other things being equal, it will be preserved longest where it has been dried up and covered from the free access of the air. Thus in very dry and close buildings, in those having rotten wood-work, or deep dust-filled cracks in the masonry, and in those with a closed space beneath a wooden floor, it clings with the greatest tenacity. Again, when the buildings contain piles of lumber, litter, hay, fodder, or clothing, the virus is covered up, secreted and preserved for a much longer time than if left quite empty. In these last it is preserved just as it is in woolen or other textile fabrics, and carried from place to place by human beings.

As carried through the air, the distance at which the virus retains its infecting properties varies much with varying conditions. When a sick herd was separated from a healthy one by not more than 15 yards and a moderately close board fence of seven feet high, and in the absence of all inter-communication of attendants, the exposed herd kept perfectly sound for six months in succession. On the other hand, infection will sometimes take place at a much greater distance without any known means of conveyance on solid objects. Roll quotes 50 to 100 feet, while others claim to have seen infection at a distance of 200 and 300 feet. But it may be well questioned whether in such cases the virus had not been dried up on light objects, like feathers, paper, straw or hay, which could be borne on the wind. This, from being in thicker layers, would escape the destruction that would have befallen it had it been carried in the air only as invisible particles.

How long a Diseased Animal is Infectious. Proof is wanting as to the infectious nature of the disease during the incubative stage. If negative evidence were of any value in a case like this, it would be easy to adduce cases in which the removal of an animal as soon as it showed symptoms of the plague had apparently saved the rest of the herd. In other cases the malady has been eradicated from a herd by careful watching and the prompt removal of every animal as soon as sickness appeared. The period of greatest virulence is that at which the fever runs highest, and when the lung is being loaded with the morbid exudation. The following rules should be observed when the disease is suspected:

1. Remove all litter, manure, feed and fodder from the stables; scrape the walls and floor; remove all rotten wood.

2. Take chloride of lime, ½ pound; crude carbolic acid, 4 ounces, and water 1 gallon; add freshly-burned quick-lime till thick enough to make a good whitewash; whitewash with this the walls, roof, floors, posts, mangers, drains and other fixtures in the cow stables.

3. Wash so as to thoroughly cleanse all pails, buckets, stools, forks, shovels, brooms and other movable articles used in the buildings; then wet them all over with a solution of carbolic acid ½ pound, water 1 gallon.

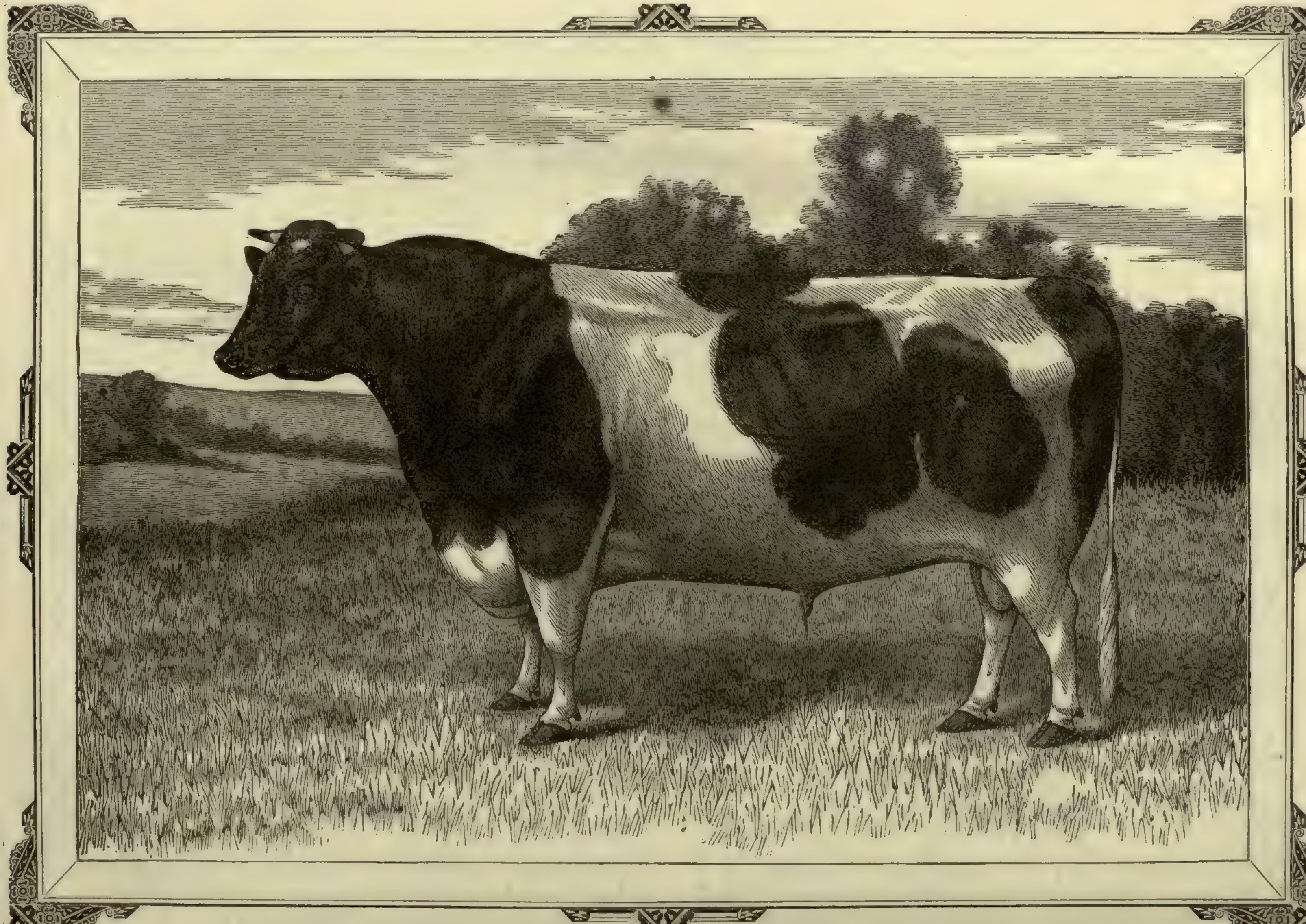


Fig. 9.—HOLSTEIN BULL.

4. When the empty building has been cleansed and disinfected as above, close the doors and windows, place in the center of the building a metallic dish holding 1 pound flowers of sulphur; set fire to this and let the cow shed stand closed until filled with fumes for at least two hours. The above should suffice for a close stable capable of holding 12 cows. For larger or very open buildings, more will be required.

5. The manure from a stable where sick cattle have been kept, must be turned over and mixed with quicklime, two bushels to every load, then hauled by horses to fields to which no cattle have access, and at once plowed under by horses.

6. The pits, where the manure has been, must be cleansed and washed with disinfectant fluid ordered for the building.

7. The surviving herd should be shut up in a close building for half an hour, once or twice a day, and made to breathe the fumes of burning sulphur. Close the doors and windows, place a piece of paper on a clean shovel, lay a few pinches of flowers of sulphur upon it, and set it on fire, adding more sulphur, pinch by pinch, as long as the cattle can stand it without coughing. Continue for a month.

8. Give 2 drachms powdered copperas daily to each cow in meal or grains, or, divide 1 pound copperas into 50 powders, and give one daily to each adult animal.

9. Do not use for the surviving cattle any feed, fodder or litter that has been in the same stables with the sick. They may safely be used for horses and sheep.

Symptoms. The symptom most easily known in the early stage is an increased temperature of the body. If a clinical thermometer be introduced into the rectum of a beast in an infected district, and an abnormal heat is ascertained, it is safe to suspect the disease; therefore send for a veterinarian at once. Next, a slight cough will show itself; the hair will be erected along the back; there may be shivering and always tenderness of the back when pinched; the breathing and pulse is accelerated; the bowels are costive; rumination is irregular; the urine is scanty and high-colored, the appetite fails, the milk-flow is diminished, the nose will be alternately moist and dry. The horns and other extremities will be alternately hot and cold. In the field, the sick animals will separate from the herd. All the symptoms become more and more apparent until the animal remains in a fixed posture, the head rigidly extended, the mouth open, at every inspiration a moan, until at length the animal succumbs, a loathsome and noxious mass of cantagion.

Treatment. A resort to remedies should not be had unless the animals are taken early in hand, and can be isolated in a building far from any herd. It will not pay except in the case of thorough-bred or otherwise valuable stock. This is especially the case in the West, if that section should be unfortunate enough to import the disease. Prof. Gamgee, who made an elaborate report for the Government in 1871, strongly and wisely condemns purgatives and bleeding, but believes the disease may be checked, if taken in time, by isolating the whole herd, and depending on active internal astringents. He advises daily doses of sulphate of iron, ½ to 1 drachm to the bullock, mixed with an equal weight of linseed and coriander seeds, given in bran to disguise it; this he has found to mitigate the cough, followed by the disappearance of the disease.

In the second stage of the disease, he advises light but nutritious food, copious warm-water injections, and the following stimulant: ½ ounce carbonate of ammonia, 1 quart linseed oil; mix and give this dose 2 or 3 times a day. When only one lung is involved, recovery occasionally takes place; when both are involved, there is little or no hope. For cough and debility during convalescence, he advises the following tonic; ¼ ounce oxide of magnesia, ½ ounce iron filings, fine, 1½ ounce tincture gentian, 1 pint water; to be given daily. Another prescription is recommended: 1 drachm carbolic acid, 1 pint water; to be given as a dose three times a day. The reader will see upon a careful study of the foregoing, that but one prescription, killing, is the only safe plan.

PNEUMONIA. There are two conditions of the lungs known as pneumonia: one the inflammatory, and the other the congestive stage. The former may follow an attack of bronchitis, or it may have a spontaneous origin. The congestive is generally the result of cold suddenly applied to an overheated animal, causing a determination of blood to the lungs, which sometimes causes death by suffocation.

Symptoms. The disease is preceded by a shivering fit; dry skin; staring coat; clammy mouth; short cough; Schneiderian membrane of the nose very much reddened; respiration hurried or laborious. In the congestive stage, upon applying the ear to the sides no sounds will be detected, while in the inflammatory stage a crackling or crepitating sound will be distinctly heard.

Treatment. In the congestive stage, plenty of pure air will be necessary. Bleed freely, and give in drench 1 pound of Glauber salts, with 2 drachms Jamaica ginger. Nothing more will be required by way of treatment. In the inflammatory stage, bleeding should seldom be resorted to, except where the animal is in fine condition. Apply the following blister to the sides, well rubbed in: oil of turpentine, 1 ounce; Croton-oil, 12 drops; aqua ammonia, ½ an ounce; linseed oil, 4 ounces; mix all together. Give internally 1 pound of salts in drench, and follow with one of the following powders every 4 hours: nitrate of potash, 1 ounce; tartrate of antimony and pulverized digitalis leaves, of each 1 drachm; mix all together and divide into 8 powders. Or the following may be given, with equal advantage: nitrate of potash, 1½ ounces; nitrate of soda, 6 ounces; mix and divide into 6 powders, 1 to be given in wash or gruel every 6 hours.

RABIES, OR HYDROPHOBIA, in cattle, is the result of the bite of a rabid dog, from which bite no animal escapes. The effects produced by the wound made by the teeth of such an animal, after the virus is once absorbed into the circulation of the blood, are so

Fig. 12.—SHORT-HORN BULL.

poisonous that all treatment is absolutely useless. *Symptoms.* The animal separates itself from the rest of the herd, standing in a kind of stupor, with the eyes half closed; respiration natural; the slightest noise agitates, causing the eyes to glare and exciting bellowing; the bark of a dog produces the most violent effects; the animal foams at the mouth and staggers as it walks; if water is offered, the muzzle is plunged into it, but the victim cannot drink; in making the effort, the most fearful consequences are produced. The animal now seeks to do mischief, and the quicker it is then destroyed the better.

Treatment. This must be applied quickly, or not at all. The moment an animal is bitten, that moment the wound should be searched for, and when found, should be freely opened with a knife, lunar caustic, caustic potash, or the permanganate of potash at once applied to all parts of the wound, care being taken not to suffer a single scratch to escape. This, if attended to in time, will save the animal.

Red or Black Water, as it is called, is not a disease, but a symptom of other disease. The color of the urine varies according to the intensity of the disease, and the particular organ affected; hence should not be treated as a disease, but the cause carefully sought out and treated.

Simple Fever. This is increased arterial action with or without any local affection; it may also arise from sympathy of the system with the diseased condition of some particular part. The former is pure or idiopathic fever; the latter is symptomatic. Pure fever often occurs in cattle.

Symptoms. Dry muzzle; slow rumination; quickened respiration; the horn hot at the root, and frequently cold at the other extremity; constipation; coat bristling, and the cow usually seen separated from the rest of the herd. Where the attack is slight, a purge of salts, sulphur and ginger will be sufficient. If neglected or improperly treated, it may turn into pleurisy or inflammation of the lungs or bowels. In the latter case, an experienced veterinary surgeon should be called. Symptomatic fever is generally the result of an injury, the neighboring parts sympathizing with the injured part. The symptoms are similar to those given above. Unless promptly relieved, the animal dies. The treatment must begin with purging. Salts are the surest and safest remedy. A pound to a pound and a half with ginger and sulphur is a dose, dissolved in thin gruel. If this does not operate in twelve hours, give half the dose, and repeat once in twelve hours until the bowels are freed. The animal is relieved after the operation. Then sedatives, such as bloodroot, 1 drachm; powdered nitre, 2 drachms: this should be given two or three times in thin gruel.

Splenic Fever: see Texas Fever.

Strangulation of the Intestines. This disease in cattle, popularly styled Knot, or Gut-Tie, in consequence of the peculiar arrangement of the abdominal viscera, is of very rare occurrence. When, however, it does occur, the symptoms accompanying are those of inflammation of the intestines. No kind of treatment will be successful, and the poor brute must suffer until death comes to its relief.

Texas Fever. This disease, now called Splenic Fever, resembles in some of its phases the rinderpest of Asiatic Russia, but it is far less malignant and less contagious. It also disappears with the frost, being effectually stamped out during the winter, not to be again seen until re-introduced by the passage of Texas cattle. So, again, it is not given by our Northern cattle to other beasts. The disease has its home on the coast of Texas, but how it originated is not clearly known. After death the spleen is found greatly enlarged and softened, the kidneys broken, dung and blood fluid.

Symptoms. The period of incubation extends over four or five weeks after the poison has been introduced. The fever will at first be moderate, the temperature, as shown by a clinical thermometer introduced into the rectum, will be 103° to 107°. Then follows dullness, cough, trembling, jerking of the muscles, dropping of the head, arching of the back. The horns are hot, rumination ceases, and the appetite not good. The eyes become glassy and watery, the urine deep red or black from the blood contained, the dung is hard and coated with blood; the mouth and rectum will be a dark red or copper color; and the animal dies in a stupor or convulsions.

Treatment. Put the animal in a roomy stable with good ventilation, and give soft food. As an internal remedy give ½ ounce chlorate of potash, 1 ounce tincture of chloride of iron, 1 quart water. Mix and give as a dose, to be followed two or three times a day. The most dangerous symptoms being passed, give plentiful food and the following tonic: ½ ounce sulphate of iron, 1 ounce tincture of ginger, 1 quart water. This amount twice daily. Professor Gamgee does not regard medical treatment as being hopeful. In addition he advises that the limbs be well rubbed, and the bowels moved by injections. During the first two or three days he recommends ounce doses of laudanum, and later as a stimulant the following: ½ ounce sulphuric ether, 4 ounces of acetate of ammonia. Give in a quart of linseed tea three times a day.

Thrush in the Mouth. Aphthæ, or thrush in the mouth, is a vesicular disease of the mouth, sometimes occurring as an epizootic. It is often mistaken for blain, inflammation of the tongue, or black tongue, and usually occurs in the winter, or early in the spring. It appears in the form of vesicles or pustules all over the mouth, occasionally extending to the outside of the lips. These pustules break, discharging a thin sanious fluid, leaving minute ulcers in their places. This disease yields readily to treatment. 3 ounces Epsom salts, once a day for three or four days, should be given in drench; wash the mouth well with a solution of alum, tincture of myrrh, or vinegar and honey, and it will disappear in a few days.

Trembles, or Milk Sickness. Dreadful disease, prevalent in uncleared, heavily timbered Western re-

gions, caused by eating the white snakeroot (Eupatorium ageratoides), a plant of the boneset genus. This peculiar disease disappears from the region as it becomes cleared, cultivated and seeded down with the natural grasses. Where it exists the cattle should be sheltered at night. Their food should not be left exposed on the ground, as the action of the dew renders it deadly to young cattle if fed to them in the morning. Symptoms, spasms, trembling, convulsions, quick pulse, coated and swollen tongue, high-colored urine, fetid breath and constipation. In the last case, 1 drachm each powdered ginger and golden seal to 10 ounces of Glauber salts, in 1 quart of warm water, may be given. If the breath be fetid, give, three or four times a day, a wineglassful of a mixture composed of 4 ounces glycerine, 2 ounces of pyroligneous acid and 1 quart of water. The trembling, where curable, may be relieved by administering 2 drachms of tincture of Indian hemp in a little water, twice daily, or 1 ounce of laudanum and 4 drachms of tincture of assafœtida.

Typhoid Fever is generally considered the second stage of intense inflammatory action. Diarrhœa usually accompanies this kind of fever. The cause is not determined. Abundance of oatmeal gruel with tincture of cayenne, ½ ounce golden seal, bran diet, warmth to the body and pure air are essential in the treatment of this disease. Nature should be helped to regulate the animal system by rousing the digestive organs to their natural action, by light food, or, if necessary, a mild purgative followed by light stimulants. Epsom salts, linseed oil and sulphur are the chief purgatives.

Bull, Cow, Ox and Calves are treated under their respective heads.

Cattle, The Law as to Sales of. If a seller makes a willful mis-statement as to the condition of the property, or sells it as other than he knows it to be, or conceals a defect which the buyer could not by examination ascertain, it becomes a case of fraud, and the seller is liable to an action for damages. Concealment of the fact that a bull sold was impotent, or that a cow had ceased to breed, would be a fraud unless they were sold to a butcher, as every animal of that character is assumed to be fit for the ordinary purpose of of its existence. An affirmation in the bill of sale that a bull was a good and sure breeder would be a complete express warranty that he was such; and if the seller at the time he sells makes such a statement verbally, it is a warranty; and if the bull proves on trial to be impotent, the purchaser can in either case recover back the price paid for him, and any damages he has sustained. A statement made by a seller of a cow "that she was all right," was decided to be enough to let the case go to the jury for them to say whether it amounted to a warranty or not, and they said it did; and the cow being proved to be unsound, damages were awarded against the seller. An animal is sound which is free from hereditary disease, is in possession of its natural and constitutional health, and has such bodily perfection as is consistent with its natural formation. It is free from vice when it has no bad habits that make it dangerous, or that are injurious to its health, or that in any way diminish its natural usefulness. A cow under this definition could not be considered sound which had aborted more than once, or had failed to be with calf after several services, or milked from only three teats; nor a bull which had become impotent, or, from too free use when young, failed to serve in two cases out of three. A kicking cow is vicious, as well as one that runs at and attempts to hook any one with her horns.

Cattle, happily, are not subject to the many diseases which render horses unsound, but such complaints as chronic asthma, cough which may degenerate into bronchitis, catarrhal fever, thick wind and broken wind, they are likely to have occasionally; and these are breaches of warranty of soundness. Lameness, whether temporary or permanent, is an unsoundness in a horse and would be in cattle. So is diseased liver, as well as all diseases of the lungs. A mangy animal is unsound, or one liable to paralysis or rheumatism. And any complaint or accident which has in any way impaired, or is likely to impair, the quality or usefulness of the bull, cow, ox or calf, is an unsoundness. A description, in a bill of sale of an animal, of its pedigree would constitute a warranty that it was of the breeding so represented.

When sales are made at public auction or privately by printed terms of sale and catalogues, these form part of the contract and will be binding upon the parties. If between the publication of these terms and the sale any accident occurs to the animal, or if a cow aborts or calves, notice should be given of the fact, or the purchaser may, on discovering the change, repudiate the bargain and recover the price he paid or damages, and in certain cases both. In taking a warranty it is safer to have everything expressed, such as the pedigree, age, freedom from vice, and soundness, which the buyer desires to be assured of; and let the affirmations be positive. A bill of sale of "a horse four years old, constantly driven and used in a plow; warranted," was held to be a warranty of soundness only, and a bill of sale of a horse in which he was stated as "considered sound" was held not to be a warranty of soundness. As soon as the purchaser discovers that there has been a breach of warranty he should give notice, offer to return the animal, and demand his money back, if he desires to be reinstated in the position he occupied before the sale.

In sales at auction the secret employment of "puffers," or fictitious bidders to enhance the price unduly, is a fraud on the purchaser, who would avoid such a sale. The owner of an animal sold at auction has no right under the usual conditions of a sale—that the highest bidder shall be the purchaser—to employ any person to bid on him for the purpose of enhancing the price. It is just as true in horse and cattle dealing as in other business, that constant and permanent success depends on character as well for honesty as for judgment. A man sells a bad animal for advan-

Fig. 11.—A FATTED SHORT-HORN COW.

tage; but he knows that if chargeable with an intention to deceive he is at once classed with the knave in the business.

The best way to sell a horse, bull or cow which you want to get rid of is to tell the truth about it. A frank acknowledgment of faults will often obtain credit for a counter statement of good qualities. Let the fault of an animal be what it may, it will suit some purpose, and will find a purchaser at its fair value. Many persons will buy an imperfect animal at a reasonable price, taking the risk of curing and getting a good bargain.

Caul, or **Omentum**, the membrane covering the lower intestine. "Caul fat" is that which grows upon this membrane.

Cauliflower, a garden vegetable of the cabbage family. In cultivation pursue the same course as with cabbage; manuring rather heavier and hoeing oftener. It wants the cool, moist weather of the fall months to perfect itself. It is prepared and eaten as cabbage.

VARIETIES. *Early Paris.* A standard.

Extra Early Dwarf Erfurt. One of the best cauliflowers.

Fitch's Early London. The best strain of this standard English sort.

Nonpareil. One of the earliest varieties; resembles Early Paris.

Lenormand's Short-Stemmed Mammoth. Dwarf, large and fine; one of the largest and most reliable for general cultivation.

Italian Early Giant. Fine, large, white-headed and early.

Carter's Dwarf Mammoth. A premium English variety; very early, with heads remarkably large for such a dwarf.

Large White French, *Dwarf Early Le Maitre* and *Stadtholder* are other good varieties; and *Gerry Island*, *Berlin Dwarf*, *Late Algerian* and *Henderson's Early Snowball* are new varieties which promise to supersede some of the old.

CAULIFLOWER, TO COOK. Cut the stalk close and trim the leaves from a nice white cauliflower. Lay it in cold salt water for one hour, then tie in a piece of thin muslin and put it, flower downward, into equal parts of milk and water, with a little salt. Cook only until tender, which will be in about 20 minutes, more or less, according to size. When done, place on a hot dish, flower side up, and pour over it sauce.

Caustic, burning; said of a drug which burns or corrodes flesh or vegetable tissue. Potash and silver nitrate are the most prominent examples. "Lunar caustic" is silver nitrate in sticks, convenient for certain purposes. For ordinary cases, a solution of silver nitrate, ten grains to an ounce of water, is the most in vogue.

Cauterize, to burn or sear with a hot iron or caustic drug, as morbid flesh.

Cautery, a burning or searing, as of morbid flesh, by a hot iron, or by caustic drugs which burn, corrode, or destroy any solid part of an animal body. Burning by a hot iron is called "actual" cautery, and that by a drug, "potential" cautery.

Cavity, of an apple, is the hollow around the insertion of the stem.

Cayuga, a breed of ducks: see Ducks.

Cedar: see Forestry, Landscape Gardening, etc.

Celery. This is a garden salad of the parsnip order, but the stems only are eaten, they being blanched (whitened) by covering with earth during cultivation. There are two methods of culture.

1. Sow the seed early in a hot-bed. When three inches high, transplant to a bed in the garden, about four inches apart, and cover them frosty nights. When about eight inches high, remove the suckers, strip the leaves and transplant to a previously prepared trench, 18 inches deep, three-fourths filled with well rotted manure and muck, thoroughly mixed. The trenches should be five or six feet apart, and the plants should be set about ten inches apart in the row, with the earth carefully packed about the roots. Instead of the first transplanting, many transfer them at that age directly from the hot-bed to the open trench. The object of the trench is to allow hilling up (Fig. 1) toward fall for the purpose of blanching. In that situation the plants also have a more even temperature. A three-inch tile running along under the plants affords a good method of applying salt water and liquid manure. The tile and trench should pitch a little, so as not to hold standing water; for while the celery should be kept moist, it should also be kept drained. This tile supply is easily controlled, as there is a hopper tube at the upper end and a gate at the lower.

FIG. 1.

To blanch celery (that is, whiten the leaf-stems), draw the earth up around it from time to time, taking care not to cover the center shoots. This process is continued until in October, by which time the plants are covered to their tips, and just before the ground freezes they are ready to be covered with dry leaves and evergreen boughs (Fig. 2) for wintering. But another process of wintering is to take them up with as much earth as possible attached to their roots, and set them in rows close together, leaving only space enough to prevent the plants from touching, and packing the earth firmly around them, leaving only an inch or two of the tops sticking out; then covering either with boards, placed so that the water cannot penetrate, or with cornstalks thickly bent over and fastened. Drains should be dug around the celery to

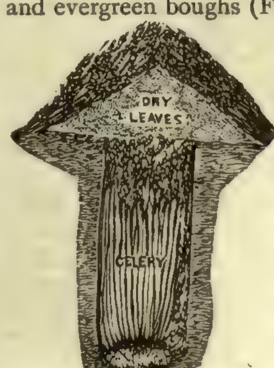


FIG. 2.

carry off the water. It may be kept in this way until May and well blanched. It is well known that stalks of celery stood in spring water under a shed, where it is not likely to be frozen, will become white and tender. But it is only a few persons who can have the spring water at hand for this use. Celery can be perfectly blanched and preserved by packing the roots in wet earth and keeping them in a cellar. Large boxes are obtained and a few inches thick of earth placed on the bottom and made as wet as possible. The plants are then packed upright, side by side as close as they can stand, until the boxes are full. The upper leaves are of course exposed, and attempt to grow a little by the encouragement given to the roots by the wet earth causing growth enough to blanch the whole.

2. The other method of raising celery differs from the foregoing only in transplanting to level ground instead of trenches. It requires less labor, but also correspondingly less good celery.


FIG. 3.—*Boston Market Celery.*

If planted in July, nothing is to be done but to keep the ground clear of weeds until September; by that time the handling is to be begun, which consists in drawing the earth to each side of the celery, and pressing it tightly to it, so as to give the leaves an upward growth preparatory to blanching for use.

VARIETIES. *White Solid.* A standard sort.

Carter's Crimson. Dwarf, solid and crisp; a first-class variety.

Sandringham Dwarf White. Most dwarf of all; very solid; white.

Turnip-Rooted. The root of this is eaten; also called celeriac; does not need to be earthed up.

Turner's Incomparable Dwarf. White, solid. In dwarf habit next to the Sandringham.

Boston Market. Short, compact and solid; very popular.

Crawford's Half Dwarf. A new variety with a rich, nutty flavor and great vigor of growth.

TO PREPARE CELERY FOR THE TABLE, cut off all the little roots, and shave off all the external dark covering of the bulb of the root; slice the root transversely in sections of one-fourth or one-eighth inch thick; remove the outer stalks; cut another section from the root close up to the attachment of the next row of stalks; remove the stalks by pulling gently sideways, and it will separate at the joint; cut the center piece into two or three pieces, or not, as you choose; put all in a pail of cold water; use a brush to clean each piece, using plenty of water; cut off the largest stalks just above the two lower leaves; place the long stalks outside in the celery dish, the center piece in the middle, and finish out with sections of roots, etc; then fill the dish with water and send to the table.

Another method: Wash the roots free from dirt, and cut off all the decayed leaves; preserve as much of the stalk as you can, removing any specks or discolored parts. Divide it lengthwise into quarters, curl the top leaves, and place it with the roots downward in the celery glass nearly filled with cold water.

Cellar: see Residence and Hygiene.

Cement. No cement is of any value unless, in its preparation, all dirt is excluded. The receipts given below will be found to answer every reasonable demand, if properly prepared.

FOR CISTERNS. Take equal parts of quick-lime, pulverized baked brick and wood ashes. Thoroughly mix the above substances and dilute with sufficient olive oil to form a manageable paste. It immediately hardens in the air and never cracks beneath the water.

Another: Take 1 part ordinary brick dust, made from hard-burned and finely pulverized bricks; 1 part of lime and 2 parts of sand; mix together, dry, and temper with water in the usual way.

FOR GLASS AND CHINA WARE. Take white (fish) glue, 1 pound 10 ounces; dry white lead, 6 ounces; soft water, 3 pints; alcohol, 1 pint. Dissolve the glue by putting it into a tin kettle, or dish, containing the water, and set this dish into a kettle of water to prevent the glue from being burned; when the glue is all dissolved, put in the lead and stir and boil until all is thoroughly mixed; remove from the fire, and when cool enough to bottle, add the alcohol, and bottle while it is yet warm, keeping it corked.

Another: Two measures of litharge, and 1 each of unslacked lime and flint glass; each to be pulverized separately before mixing; then to use it, wet it up with old drying-oil. Water hardens it instead of softening.

Another: Sifted air-slacked lime, mixed with white of an egg. Or boil 1 ounce of glue with 1 gill of milk, or in that proportion, and it will resist the action of water when used.

FOR FURNITURE AND WOODEN WARE. To mend marble, wood, glass, china and ornamental ware, take water, 1 gallon; nice glue, 3 pounds; white lead, 4 ounces; whisky, 3 quarts. Mix by dissolving the glue in the water; remove from the fire and stir in the white lead, then add the whisky, which keeps it fluid, except in the coldest weather. Warm and stir up when applied. Or, powdered chalk and common glue.

FOR IRON AND STONE. Glycerine and litharge, mixed into a paste, furnish an extremely firm cement for iron and stone. The material hardens very quickly and must therefore be used at once. It is insoluble in water, and attacked only by concentrated acids. Articles joined with it can be used in a very few hours afterwards. Sandstone blocks joined by this cement, have broken a fresh fracture, rather than at the point

of the union of the original surfaces. Very dry litharge does not form so good a cement as that which has absorbed a considerable amount of water. Only the purest material is to be used.

FOR STEAM AND HOT-WATER PIPES. White lead paint, with over half as much iron borings.

FOR STOVES, FLUES, ETC. Common wood ashes and salt, made into a paste, with a little water. With this mixture, an aperture through which the fire or smoke penetrates may be closed in a moment. Its effect is equally certain, whether the stove is hot or cold. Or, iron borings or filings, with salt water and a very little sal ammoniac.

FOR CHIMNEYS, *outside*. 3 parts ashes, 3 parts clay, and 1 of sand: said to make a cement as hard as marble, and impervious to water.

FOR MENDING RUBBER. Cut virgin or native India rubber with a wet knife into the thinnest possible slices, and with the shears divide these into threads as fine as fine yarn. Put a small quantity of the shreds (say one-tenth or less of the capacity of the bottle) into a wide-mouthed bottle, and fill it three-quarters full of benzine of good quality, perfectly free from oil. The rubber will swell up almost immediately, and in a few days, especially if often shaken, assumes the consistency of honey. If it inclines to remain in undissolved masses more benzine must be added; but if too thin and watery, it needs more rubber. A piece of solid rubber the size of a walnut will make a pint of the cement. This cement dries in a few minutes.

FOR CANNING FRUITS. Resin, 1 pound; lard, tallow and beeswax, of each 1 ounce. Melt and stir together; and have it hot, ready to dip into when canning.

Center of Gravity, that point in a body or mass of matter around which all parts exactly balance each other.

Cereal, grain from which breadstuff is made; also, of or pertaining to such grain. For a few years past there has been great rivalry in the preparation of wheat, oats, barley and corn in various forms for puddings, mushes, cakes, gruels, blanc mange, bread, etc., each party branding his article with some fancy name, as "Snowflake Corn," "Prepared Wheat," "Cereal White," "Pearl Hominy," etc., all of which articles are good enough when fresh. Steam-cooked oats are the most convenient for a hasty dish, as it will sufficiently swell up, in boiling water, in five to ten minutes.

Cerebro-Spinal Meningitis (ser′-e-bro spi′-nal men-in-ji′-tis), spotted Fever; which see.

Cess-Pool. Any pool or mud-hole which becomes foul by the reception of the sediment of drains, etc. Such a thing is unsightly and unhealthful, and no farmer should permit such a thing upon his premises.

Chaff, the seed husks of the smaller grains and of grasses. Valuable for mulching, covering vegetables and fruits to keep over winter, conservatories, etc.

Chafing, irritation of the skin. It generally affects stout and fleshy persons, especially in warm weather. Alum dissolved in water and applied with a clean linen rag, is an excellent remedy. Flour or corn-starch is also very good.

Chafing Dish. A dish or vessel to hold coals for heating anything set on it; a portable grate for coals.

Chairs, like shoes, are nearly all made wrong, for either comfort or health. They are so made as to force an inconvenient and unphysiological curving of the spine; and rockers and "easy chairs" have their backs at the top turning from the head, instead of projecting forward a little, to support the head. Solid-wood-bottom chairs, or "Windsor" chairs, as they are sometimes called, in the winter time are often too cold for use. Sitting in them tends to bring on pains in the back and loins, neuralgia, and various other ailments in the region of the hips.

Challenge, in hunting, is the opening and crying of hounds at first finding the scent of their game.

Chamomile, or camomile (cam′ o-mile), a pleasantly scented fennel, used in sweating medicines. The herb is easily raised in the gardens of this country.

Champagne, (sham-pane′), a kind of brisk, sparkling wine. The name is also given to many imitations of that popular beverage. One imitation is made by mixing tartaric acid 1 ounce, 1 good-sized lemon, ginger root 1 ounce, sugar 1½ pounds, water 2½ gallons, and yeast 1 gill.

Another: Raisins 7 pounds; loaf sugar 21 pounds; water 9 gallons; tartaric acid 1 ounce; honey ½ pound; ferment with sweet yeast 1 pound or less; skim frequently, and after fermentation is nearly over, add coarse powdered orris root, 1 drachm, and orange-flower water, 3 ounces; lemon juice ¼ pint. Rack it, and in three months fine it down with isinglass ½ ounce; in two weeks bottle it, putting into each bottle a piece of double-refined sugar the size of a pea.

CHAMPAGNE, SUMMER. To 4 parts of Seltzer water add 1 of Moselle wine (or hock), and put a teaspoonful of powdered sugar into a wineglassful of this mixture; an ebullition takes place, and you have a sort of champagne which is more wholesome in hot weather than the genuine wine known by that name.

Chapping, cracking of the skin, by exposure to dry or cold winds. To keep the hands from chapping, see that they are perfectly dry before they are exposed to cold air. Taking off the mittens or gloves out-doors on a cold day exposes the hands to chapping; then apply a little honey, glycerine or raw linseed oil; rub it well into the cuticle.

If nothing is done to prevent, and the person is obliged to have his hands frequently wet and dried, the cracks will often get deep and be painful. Corn-husking, particularly, is the cause of sore hands in this way.

As both a precaution and a cure for chapped hands, wash the hands (and the face also, if it is inclined to chap), with borax water, and afterward rub with an

ointment made by melting mutton tallow (or suet), and then gradually adding an equal quantity of glycerine, stirring the two together until cool. For the hands, this mixture can be best applied at night, using it freely and warming it in by the fire, after which an old pair of gloves can be put on to keep the bed clothes from being soiled, and also make the skin of the hands softer. An excellent glycerine ointment for chapped hands is made by melting, with a gentle heat, 2 ounces of sweet oil of almonds, ½ an ounce of spermaceti, and 1 drachm of white wax. When melted, remove from the stove and add gradually 1 ounce of glycerine, and stir until the mixture is cold. The ointment may be scented with any perfume to suit the fancy. Keep in wide-necked bottles. To keep the hands from getting sore during harvest, use camphor dissolved in alcohol. Rub it on the hands, morning, noon and night, directly after washing.

For chapped lips, some one of the preceding; or honey, cream and rose of lavender.

Charbon (shar′ bon), in farriery, is a small, black spot or mark remaining in the cavity of the corner tooth of a horse after the large spot or mark has become obliterated. The word is also a name of a disease of cattle and horses, known further by the names, "anthrax," "bloody murrain," "black quarter," "spotted fever," etc. See Bloody Murrain, page 223.

Charcoal, such portion of the woody fiber as has escaped complete combustion in burning vegetable matter. To make it in large quantities, cut the timber (oak, beech and maple are best) in the winter and let it stand until summer; then, if sufficiently dry, cut it into small billets; throw up the ground a little higher than the surrounding surface; beat it so as to form a hard, dry, solid floor; in the center of this area, place a circle of sticks, adjoining each other, and composing a vertical, hollow cylinder from three to four inches in diameter and about six feet high; around the cylinder are ranged successive circles formed by pieces from one to ten inches in diameter; several flues must be formed through the pile so that it will kindle in a short time and burn equally. The outermost circle is composed of brush-wood and chips. A coat of turf must now be laid on, the grass side to the wood; heap dry earth around the bottom of the pile and well ram it to prevent admission of air. Now kindle by dropping lighted chips down the hollow cylinder in the center, then close the top of the cylinder and pierce a row of holes at the base about two inches in diameter, by which the requisite quantity of air is supplied and a passage afforded for the smoke and vapor. When the white smoke is succeeded by thin blue and transparent smoke, the holes are all closed up and the pile is covered over with earth till the fire is completely extinguished. The fire is now allowed to cool, which requires many days. It remains long red-hot in the center, and if opened before perfectly cool, it will burn with fury. Charcoal burns away very quickly, requiring constant renewal, and is expensive; but it is the best fuel where a regular heat is required.

Animal Charcoal is made from the bones of animals, and is used to decolorize vinegar and other vegetable liquids, etc. To make it for this purpose, fill a crucible with the most compact parts of ox and sheep bones; lute the cover, leaving only a small opening at the top; place the crucible on a forge fire, and heat it gradually until red; when the flame from the oily and gelatinous parts has ceased, diminish the opening and suddenly raise the fire; when the charcoal has become cold, reduce it to fine powder.

As an Antiseptic, wood charcoal possesses extraordinary powers, in checking decomposition, as well as in deodorizing animal substances which have begun to decay. Meat, before or after it is cooked, may be preserved a considerable time, even in warm weather, by being placed in a clean vessel and surrounded with charcoal. Water is immediately deprived of its bad smell by charcoal.

Antiseptic Poultice of charcoal is made by taking linseed meal, ½ pound, charcoal powder, 2 ounces, and hot water sufficient to give it the necessary consistency. Besides purifying and healing, it counteracts the offensive smell arising from putrid sores.

Warning: Remember that in order to exercise its powers as a disinfectant, deodorizer and bleacher, it should be fresh burned and carefully preserved, out of contact with the air. Again, although it gives no smoke, its combustion can not go on without the formation of carbonic acid gas, which, being heavier than the atmosphere, generally occupies the lowest place in the apartment; yet a certain portion can not fail to mingle with the air and render it unwholesome to breathe. The air arising from the burning being clear and transparent we have no warning, as in coal. The first sensation, when it has become dangerous, is a slight sense of weakness, next, slight giddiness, then drowsiness; the subject falls on the floor insensible, and breathes strong as in apoplexy. *Remedy:* Cold water to the head and mustard or hartshorn to the soles of the feet. Give out-door air constantly and thoroughly, at any expense.

Charge, in farriery, is a sort of plaster or ointment.

Cheat, the name of a grass: see Chess.

Check, in commerce, is an order upon a bank to pay on demand to the person named in the check, or to his order, the sum of money specified in the body of the check, in writing. All such checks require a two-cent revenue stamp to be placed upon them.

Check Ease, same as Check Rein of the next paragraph.

Check Rein, the rein by which the horse's mouth is drawn back toward his throat, with the object of raising his head, and giving a graceful curve to the neck. See Bridle.

Check-Rower, a corn-planter which plants the corn in check-rows without a previous marking or furrowing of the field. The wire check-rower operates by a wire which is stretched across the field. See Corn-Planter.

Cheese. All the chief dairies in this country now make good, honest cheese, having waked up to the fact that they are in competition with England and the continent of Europe, and even with the independence of the public in the United States, who are ready to do without cheese altogether rather than use a poor article. The instructions here given are therefore not designed for extensive cheese-makers, but for farmers generally, and for beginners in the art. Where large quantities are to be made, it is generally advisable to take advantage of the facilities for production afforded by the factory, for the following reasons: Unless sufficient male help is at hand, the labor of cheese-making on a large scale is much too severe for the women of the household. The cheese made at the factory is more uniform in flavor and commands a better price than the home-made article. A larger amount of cheese can usually be made from a given quantity of milk at the factory than elsewhere. But to those who have either no desire or no opportunity to avail themselves of the services of the factory, the following observations and directions will be found valuable.

The various kinds of cheese are made in three ways: 1st. From the entire milk. 2d. From a mixture, one-half of which is new, the other half having stood from 10 to 12 hours, and from which the cream rising in that time has been removed. 3d. From milk which has parted with nearly all its cream. Of this last kind it is hardly necessary to speak: it is as unprofitable as it is unwholesome. The second kind is of tolerable flavor and moderately healthful. The first kind, when properly and carefully made, is rich and of fine flavor. For the making of cheese on a small scale, a cheese hoop about ten inches in diameter with a follower, a new wash-tub and a press are required. These articles are to be had cheap. A good press, however, can be made in a few hours from a 12-inch plank and a few pieces of scantling. One foot from either end of the plank set up two short pieces of scantling 4½ inches apart. Fasten them firmly to a plank with bolts or pins. The lever may be a joist 4x4x6, and 14 feet long. One end is secured by uprights at one end of the plank. A weight hung at one end of the lever completes the press. The cheese is pressed by putting the hoop containing the curd near the end of the press-beam, which is fast, placing blocks on the follower and letting down the beam. The curd may be cut with a large bread knife or a long, thin, wooden one.

The milk having been taken to the house in a sweet and pure condition, perfectly free from dust and foul odors, it should be strained in the usual manner through a cloth into a cheese tub. One gallon of milk should yield one pound of cheese. The precise quantity used at a time should be noted. Part of the milk should be placed in kettles or larger pans containing a little water to enable the dairyman to increase the temperature of the milk without scorching it. Enough must be warmed to bring the whole, when in the tub, up to a temperature of 83°. The next operation is the curdling of the milk. This is done by adding rennet. It is procured from the fourth stomach of the calf, which should not be washed, but turned, carefully wiped with a cloth, sprinkled with pure salt, and dried at a moderate temperature in the open air. The Scotch put about two handfuls of salt into and outside the maw, or bag, roll it up and hang it near a fire to dry. It is said to improve by hanging a year or longer before being infused. When prepared for use it is steeped in either whey or brine. Whey is preferred by some; but it should be first boiled and strained. Some steep the rennets a week, during which time they should be squeezed and rubbed so as to extract the active principle. The Scotch method, which is highly spoken of, is to cut the rennet up into small pieces and put into a jar with a handful or two of salt. Soft water boiled and cooled to 65° is added. If the rennet is that of a new-dropped calf, three pints will suffice; if the calf has been fed four or five weeks, two quarts may be used. When the infusion has remained in the jar about three days, the liquid is strained and may be bottled for use. If a dram glass of any ardent spirit is put into each bottle, the infusion may be used immediately, or kept as long as convenient.

Fig. 1.

Fig. 1 represents a spout made for the purpose of conducting the milk from the weigh-can to the vats. The tube on the end can be extended any length, but if over two feet long should be an open trough.

Another method is to put ten rennets, properly prepared, into ten gallons of blood-warm water; churn or rub them often during 24 hours; then rub and press them to get the strength; stretch, salt and dry them as before. They will gain strength for a second use. Make the liquor as salt as it can be made, strain and settle it, separate it from the sediment, if there is any, and it is fit for use. Sometimes two ounces of common sage, two ounces of cinnamon, two ounces of cloves and six lemons are added to the liquor, to quicken its action and preserve its flavor. It should be kept cool in a stone jar, and it will keep sweet and of uniform strength. Stir before dipping off. The English method is to steep the rennets in brine strong enough to bear an egg. Six rennets, 1 sliced lemon, 1 ounce of saltpeter to 2 gallons of brine. The brine liquor is usually prepared one or two months before

being used. It is believed that this age improves its coagulating qualities. Poor milk requires more rennet than rich. Too much injures the cheese; too little retards the work and makes the cheese sour and hard. It should be constantly borne in mind that milk is one of the most sensitive of all fluids to noxious influences. Therefore, the most scrupulous and constant cleanliness should be maintained in every step in cheese-making. All vessels used should be scalded with *boiling* water, *not simply with hot* water, as soon as they have been emptied of their contents. The pastures of the cattle, their food and drink, should be kept free from all putrefactions and from fermentations of whatever kind. Consequently, stagnant water and sour land, as well as moldy food, should be carefully avoided. In parts of England the contents of the calf's stomach are sometimes salted by themselves, and, after a short exposure to the air, are fit for use. In parts of Scotland the curds are left in the stomach, and both are dried together. It is generally held that rennet, as usually prepared, is not fit for use until about a year old. The following method of curing rennets, although it differs in some important particulars from what has just been said, is given, both on account of the extreme importance of the subject of rennet in cheese-making, and of the authority of the gentleman from whom it comes, who is employed by the Eastern Ontario Dairyman's Association in the making and curing of cheese:

First. A rennet that is taken from a calf that has never been suckled or fed is rank poison, and should never be saved. The calf should be at least three days old before killing. (2.) They are usually in their best condition when the calves are from five to ten days old, but they do not vary much in strength so long as the calves live entirely on milk. As soon as they begin to live upon solid food, the strength of their stomachs, as rennets, begin to abate. The stomachs of calves five days old are generally preferred by cheese-makers to those of older or younger.

To obtain the best rennets, the calf should be allowed to suck or to be fed a moderate meal twelve hours before killing. It is a good way to give the last meal at night, and kill the next morning. Fifteen hours is not too long, but in going too long without being fed the stomach becomes inflamed and congested with blood, giving it a dark reddish appearance, and the disturbed condition thus occasioned is carried with the steepings of the rennet into the cheese, and affects it very unfavorably. The calves should live till the curd from their last meal is nearly dissolved, and no longer. As the curd disappears the coagulating agent accumulates, not in the juices of the stomach, as might be supposed, but is deposited on the inside of the stomach, forming a delicate coating, faintly flesh color and very tender, which breaks off in thin flocculent scales upon slight friction.

As this coating contains the concentrated strength of the rennet, it is desirable to preserve as much of it as possible. To this end, the sack, when taken from the calf, should be handled with great care. The contents should be emptied out carefully, sack turned inside out, and any specks of dirt or hairs that may appear on it, picked off. If further cleaning is necessary, it may be carefully wiped with a moist cloth; *water* should never be used in cleaning. When sufficiently dried and lightly salted, it is ready for drying, which may be done in any convenient way, so that it shall not waste by dripping or injure by tainting. It may be stretched on a crutched limb, its ends may be tied and inflated, or it may be cut open and laid on a dried board, which will aid in drying by absorbing its moisture. These modes of preserving are very much better than salting in pickle or filling with salt.

If exposed to too much heat, rennets lose strength quickly; 120° F. heat will kill the strength entirely; therefore they should never be dried on plates or tins round the stove.

When annatto is used for coloring purposes, it is used at this stage of the operation. It is commonly dissolved in hot milk, the quantity used rarely being more than one ounce of annatto to one hundred pounds of the curd. It is a commodity largely adulterated, sometimes with lead or mercury, and its use might be advantageously discontinued.

The milk having been brought to a temperature of from 80° to 83°, enough rennet is stirred into it to produce coagulation (curding) in about 40 minutes. As soon as the curd is firm enough, which may be known by its breaking smoothly when the finger is passed through it, it is cut with curd knives into squares about ¼ to ½ inch in diameter. Some break the curd gently with the hands. It is then allowed to stand from ¼ to ½ an hour, when the whey is expelled and the curd becomes quite firm. Part of the whey is then dipped off and heated. The mass of curds is then gently lifted and broken into minute pieces; warm whey is added until the temperature is raised to 98°, the contents of the vat being gently stirred to prevent the packing of curds on the bottom. It is then allowed to stand about half an hour, and the operation is repeated until the curd is firm and easily falls to pieces when pressed in the hand.

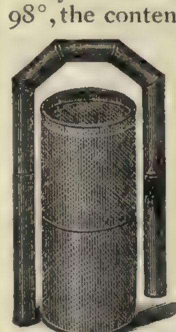


FIG. 2.—*Whey Strainer and Siphon.*

The whey is then either dipped off, or drained away by a spout in the vat, down to the curd. One end of the vat is raised in order to facilitate the drainage. Or, use a whey strainer and siphon, Fig. 2, which is a great convenience.

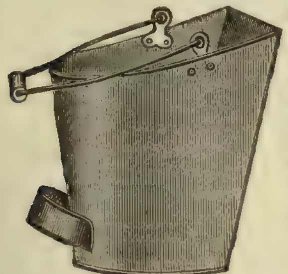


Fig. 3.—*Flat-Side Curd Pail.*

The curd is then put into the strainer on a basket or hopper, the bottom of which is made of slats. By some it is at once placed in the cooler, broken into flakes or cut up with curd knives. The metallic-head curd knives, perpendicular and horizontal, of tinned steel, Fig. 4, have no wood about them except the handles; hence there is no danger of the blades becoming loose from the shrinkage and swelling of the wood between the blades as in the old styles, nor can filth accumulate in the joints, as where wood is used. The blades of these knives are of steel, ground to a keen edge, and the metal is nicely tinned over to prevent rusting. They are the finest knives for the purpose.

Fig. 4.—*Metallic-Head Curd Knives.*

It is then spread out until the temperature falls to 70°. In about 20 minutes it is turned over and left until it assumes the flaky and mellow condition well known to the experienced eye. When nearly dry, salt may be added, in the proportion of 4 or 4½ ounces to 10 pounds of curd.

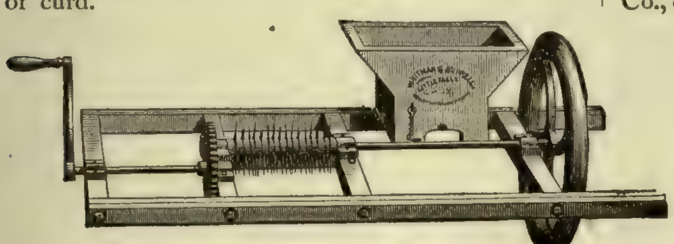


Fig. 5.—*Patent Knife Curd Mill.*

The whole is then thoroughly mixed with a curd mill. The use of curd mills has become quite general among the best cheese-makers of the country, as it is found that by the little additional labor involved in grinding the curd before pressing, a much better product can be obtained. Let the whey run off while it is sweet, then pack the curd in the vat, cover it up and let it remain until the heat and action of the rennet expel most of the moisture, and also until the curd itself becomes slightly acid, then cut or break it up into pieces, and run it through a curd mill preparatory to salting. Much better cheese with less skill can be made by the use of them.

The seamless bandage (Fig. 6) saves the time and labor of cutting and making bandages; it saves cloth taken up in the old way by seam; it saves expense for thread; it saves cloth taken up in the old way by variation in the depth of cheese; it secures perfect uniformity in the size of cheese; it secures perfect uniformity in the size of box required. Every box can fit perfectly; consequently there is no trouble in removing it at any time desired; no trouble, perplexity, or loss caused by seam, as there is no seam to rip; no chance of skipper fly depositing eggs in seam, as is not infrequent in the old way of bandaging; it is a better and stronger bandage every way, at no greater expense. The bandage is made to perfectly fit cheese pressed in 13, 13½, 14, 14½, 15, 15½ and 16 inch hoops.

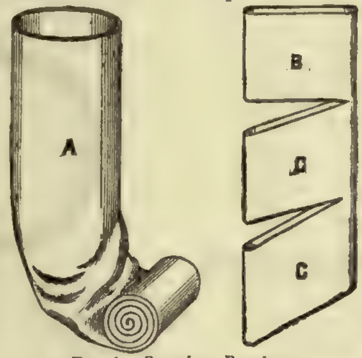


Fig. 6.—*Seamless Bandage.*

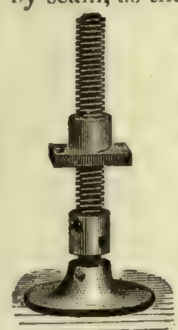


Fig. 7.—*Cheese Press Screw.*

The boxes are then placed in the press, and the pressure applied by lever and screw.

With such material as represented by Figs. 8 and 9, furnished, for example, by Chas. P. Willard & Co., of Chicago, every dairyman can make his own cheese boxes. This material is furnished of all sizes and dimensions desired.

Fig. 8.—*Galvanized Iron Cheese Hoops.*

The rings are now indispensable articles with all good cheese-makers. They keep the curd from pressing up around the follower of a cheese hoop, take the place of press cloths, and prevent the bursting of the bandage at the edge in the second pressing, an experience that has always heretofore troubled cheese-makers.

The cut (Fig. 9) represents a cheese hoop cut perpendicularly. A represents the cheese hoop; B, the follower; C, the cheese; E and F, the rub-

ber rings. One of these rubber rings is placed on the inside of the cheese hoop, resting on the press board, below the curd or cheese. The other is

FIG. 9.—*Patent Rubber Press Rings.*

placed above the cheese, directly under the follower. As soon as the pressure is applied it causes the rubber rings to expand and fit tight to the hoops, preventing the curd from pressing either up around the follower, or out underneath the bottom of the hoops.

FIG. 10.—*Butter and Cheese Trier.*

By using these rubber rings, the followers may fit the hoops very loosely. They are more convenient than press cloths, are more readily cleaned, and will last much longer. They are made beveling, so as to leave a nice edge on the cheese and save all trimming. These rings have been much improved in quality, and they now answer their purpose perfectly. A trial will remove all doubt as to their effectiveness.

Fig. 10 is a cut of a utensil for trying or testing butter and cheese, to ascertain the internal composition—whether it comprises lard, tallow, etc.

After the curd has remained in the press from two to four hours it should be turned and again put into the press. The next morning the cheese may be taken out and rubbed with a little melted butter, which should be fresh and used while warm. The cheese should be rubbed thoroughly and turned every day until cured. Should the rind get dry, butter should be applied as just explained. In the case of large cheeses, a tight cloth bandage should be put around the edges, but for small cheeses this is unnecessary. Should the farmer's daily milk supply be insufficient to make a good-sized cheese, he may use the milk obtained in two or three days; that got each day may be treated as though it were enough for the purpose, until the curd is ready for the press, except that but little salt should be used. The curd made each day should be kept in a cool place in the cellar. When enough has been secured, the curds previously made may be treated with warm whey, broken up, drained, mixed with that just made, and all salted together and pressed. The mixing should be thorough. Thus good cheese may be made by farmers who keep only one or two cows. Great care should be taken or even after all this work the cheese will spoil. It should be kept in a cool, light room, on clean shelves, and should often be carefully examined. All cracks that may appear should be filled up with cheese crushed so that it will spread like butter. Thin, strong, well-oiled paper should be placed over these cracks. The shelves should be washed occasionally with hot whey and kept perfectly clean. The whole surface of the cheese should be thoroughly well rubbed every time it is turned. By this means flies are prevented from depositing their eggs on the surface, and what is more important, in the cracks which may appear. These eggs soon hatch into "skippers"—maggots—which ruin the cheese. If any mischief has already been done by them, the parts attacked should be cut out and destroyed. If detected early, they may be forced to the surface by a piece of well-oiled paper plastered over the part of the cheese in which they have settled; they can then be easily taken and destroyed. This paper should be used two or three times. The introduction of skippers may be prevented by the following process: After the curd has been pressed six or eight hours, take the cheese from the hoop. From the bandage cloth cut an exact cover for the top and bottom. Cut the bandage for the outside wide enough to lap over the two circular pieces about two inches. With a strong thread baste the edges on both sides. The cheese then will be wholly covered. Place it again in the hoop and press it until the next morning. The second pressing forces the cloth into the cheese so that the spaces between the threads are filled with cheese. Apply the common dressing at once. In this way there is no chance for the flies to deposit their eggs. They cannot get inside of the cloth.

Good cheese, if properly made, is generally fit for the table in from four to six weeks after it has been pressed. It will, however, gradually improve in quality for several months.

The curing of cheese is quite as important as any other process in its manufacture. The perfect curing of cheese involves the action of the atmosphere, inasmuch as it has been proved beyond question, that cheese, while curing, is constantly absorbing oxygen and giving off carbonic acid gas.

The curing progresses according to the quantity of rennet used. When it is desired to make a cheese fit for use in 30 to 40 days, and have keeping quality to last from four to six months, rennet enough should be used to cause coagulation or curding to begin, in night's or morning's milk mixed, in 15 minutes, at 90°, provided it is to be cured at 70° in air of average moisture. The amount of moisture in curd affects the time for curing cheese, since whey contains four or five per cent. of milk sugar, which is liable to be turned into acid and retard the curing. If there be too little moisture in the curd, the action of the rennet will be retarded, and the curing also. The drier the curd, all other conditions being the same, the slower the curing and the longer the lifetime of the cheese. The life of a cheese may be prolonged to almost any extent by simply reducing its moisture, with but little variation in other respects. A cheese which is a very long time in curing seldom cures as evenly and perfectly as when cured more rapidly. Another important point in cheese-curing is the temperature. There is always some particular temperature at which a cheese, according to its make, cures best. A cheese with a tight, rubber-like rind must be cured slowly, or more gas will be forced into it than can escape through its rind, and it will puff. A cheese full of fat must also cure more slowly to prevent over-heating. The inside of a cheese cures faster than the outside. Skim cheese requires a little warmer room than one made from whole milk. A perfect curing room puts all the other curing agencies under the control of the maker. The supply of air and the amount of its moisture must be controlled. The best curing for cheese is a basement half above and half below the ground, with walls and floor of concrete. Such a room, with close-jointed double doors and windows, would give the maker the greatest control over the temperature, air and moisture within it. Concrete walls exclude heat and dampness, and are impervious to air. The worst curing rooms are those covered with a single thickness of rough boards with the cracks covered with narrow battens. This leaves the cheese at the mercy of the wind and sun. The loss from this cause alone is enormous. Upper stories are not good places for cheese-curing, especially if they are at all open. The abundance of air in such rooms develops flavor in advance of quality. A maker who wishes to produce a mild-flavored cheese with plenty of quality—suited to the general taste of the consuming public—after using proper skill in the make-room, will put his cheese to cure in a room with walls tight enough to allow of his controlling the ventilation, temperature and moisture. He will keep the temperature at 70°, so as to develop the quality and check the admission of fresh air with a view of retarding the development of flavor. The cheese will thus become ripe and rich without getting too strong flavored. If such a curing cannot be obtained, it will pay the cheese-maker handsomely to use sheathing paper or boards on the walls—or even both—to make them double and even triple, if necessary, until the temperature can be kept within a range of 20°, and as near 70° as possible.

Adulteration of Cheese. No artificially prepared food escapes adulteration; and as cheese affords a good opportunity for disguising foreign substances, we may look for adulterated cheese the world over. The means are numerous. Bad milk, doctored milk, lard, tallow, etc., for the body, and annatto, red lead, ochre, burnt sugar, turmeric, for the coloring, besides the cheap and poor processes of manufacture employed, and the various drugs mixed in to preserve the flavor or disguise the other ingredients, not to say anything of the foul decay which perverted tastes enjoy and many encourage, all go to make up a disgusting mass of unhealthful matter.

Cheese, Toasted. Take a good quantity of cheese, and having pared it into extremely small pieces, place it in a pan with a little milk, and a small slice of butter. Stir it over a slow fire until melted and quite smooth. Take it off the fire quickly, mix the yolk of an egg with it, and brown it in a toaster before the fire.

Cheese, Head. Boil a hog's head thoroughly done, take off all the meat with the skin, mince it and season it with salt and pepper. It will keep good and sweet for several weeks, or, in cold weather, even months.

Cheese, Ox Cheek. *Time, four hours.* Split an ox-head in two, take out the eyes, crack the side bones, and lay it in water for one whole night. Then put it in a saucepan with sufficient water to cover it. Let it boil very gently, skimming it carefully. When the meat loosens from the bones, take it from the water with a skimmer, and put it into a bowl. Take out every particle of bone, chop the meat very fine, and season it with a teaspoonful of salt and half a teaspoonful of pepper; add a tablespoonful of powdered thyme. Tie it in a cloth and press it with a weight. When cold it may be cut in slices for dinner or supper. The gravy remaining will make a rich broth if a few vegetables be stewed in it.

Cherry. The cherry is one of our most valuable fruits, being the best tonic and anti-bilious article of diet in existence. The gum of the tree is almost identical with gum arabic, and marvelous stories are told of its nutritive properties. The wild cherry-tree, also, affords the most valuable wood for cabinet work. The cultivated varieties are too short-lived in the Northwestern States to furnish good lumber for cabinet-ware. The general characteristics of the cherry are too well-

known for us to describe here, and we will proceed immediately to consider the cultivation and the varieties of orchard cherries.

Cultivation. The very best soil is one which is dry, somewhat sandy or gravelly, and mellow. Such a soil will of necessity have good under drainage, that is, there will generally be a gravelly sub-soil. Wet or heavy clay land produces a rank growth of the tree, and it soon decays at the heart; and being thus rendered weak, it is easily blown down by the wind. Deep, warm valleys are liable to spring frosts, and in such places it is safer to plant the cherry on the north side of the hills.

The cherry is generally propagated by budding and grafting, the former method generally being considered better. The choice of stocks on which the budding or grafting should be done are in the following order: the Mahaleb, the Morello and the common black Mazzard. The latter used to be the only stock selected, but in the West it seems to be the poorest of all, except when the roots are planted deep beyond the reach of frosts. Grafts on Morello stocks bear earlier, and sometimes they do better than those on Mahaleb, which latter are tender and somewhat short-lived. To prevent excessive sprouting it is recommended that the budding or grafting be done on seedling stocks and not on suckers. To raise these stocks the cherries should be gathered when fully ripe and allowed to lie two or three days together, so that they may be partially or wholly free from the pulp by washing them in water. They should then be immediately planted in drills, being covered about an inch deep. They will vegetate the following spring, and in good soil will be fit for planting out in the nursery rows in the autumn or following spring, at a distance of 10 to 12 inches apart in the row. The practice of leaving the cherry-pits boxed in sand until spring is too precarious, as their vitality is so delicate that if left only a day or two too long they will die. After planting in the nursery rows the seedlings are generally fit for budding in the month of August following; and in order not to have the weaker stocks overpowered by the more vigorous, they should be assorted before planting, placing those of the same size in rows together. Under good conditions the buds will make shoots six or eight feet high the first season after the stock is headed back. Grafting the cherry should be done early in the spring before the frost is thoroughly out of the ground. Although the dwarfing of cherry-trees is not practiced much in the West, we would mention that Mr. Downing recommends for this process the selection of Mahaleb stock, and that the trees should be headed back the second year in order to form lateral shoots near the ground.

The cherry as a standard tree requires but little cultivation further than to supply old trees occasionally with a little manure to keep up their vigor, pruning out the dead or crossing branches, and washing the trunk with soft soap when it becomes hard and bark-bound. It is not well to prune the cherry very much, as the practice causes the tree to throw out gum, which produces decay. Pruning is best done in mid-summer, as then the least gum will issue. Above all trees in the orchard, the cherry should not be barked or bruised, as the gum it throws out becomes filled with microscopic organisms, which prevent healing. It is best, also, not to spend much time with old trees which show signs of decay; supplant them at once with new trees. The cherry is a rapid grower, and in the stormy West generally run their course in 10 to 12 years. In the East there are remarkable examples of size and longevity, as well as of productiveness. A few trees have attained the full forest height, measuring 10 to 15 feet in circumference and yielding 20 to 40 bushels of fruit in a single season.

"Training" the cherry is but little practiced or esteemed as yet in utilitarian America, and therefore the subject requires no treatment here.

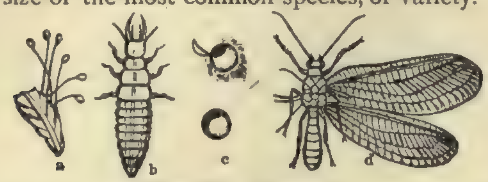
In gathering cherries for market, they should always be picked with the stems attached and when perfectly dry. For the table it is well to place the fruit in a refrigerator for an hour or two, so that it can be brought to the table cool and with dewdrops standing upon it. For every one who has five or more good bearing trees it will pay to buy a "cherry pitter," which costs but a dollar or two.

The heart or sweet cherries rarely succeed in the West. A crop is scarcely ever realized, and when there is a crop the fruit is wormy or defective.

The obstacles to cherry-raising in the West are, in the order of their extent: 1. Wet, cold, prairie soil; 2. Birds; 3. Winds; 4. Curculio; 5. Leaf-blight. As to the first trouble it is advisable not to plant at all unless a slope or well-drained piece of ground can be found upon the premises. As to birds, chase them away by scarecrows or otherwise. It seems still to be a debatable point whether we should let certain birds of the thrush and woodpecker family live or not. These are the birds which do the most mischief to our orchards. Some persons plant the trees near the house, dwarf them or keep the tops low, with the branches near the ground, and then depend upon good cats to scare the birds away. This is indeed an effectual method. As to high winds, of course we can do nothing more than to set the trees in sheltered situations; that is, on the south or east side of dense groves, large buildings or steep hills. In exposed places it might pay to stay the top with strings woven through them and attached to stakes around. The curculio is worse on the plum than on the cherry, and we treat more fully of this dreadful pest under the head of that fruit. The leaf-blight is caused by a microscopic fungus which might be termed the "white mildew of the cherry." Almost everybody has noticed a white powder covering cherry-leaves, especially those in the shade and on young shoots; but scarcely has suspected that that had anything to do with the leaf-blight; yet such is ascertained by botanists to be the fact. That white substance is a real fungus (a plant of the toadstool kind), and first makes its appearance in mid-summer in the form of gossamer. These fine threads break up and contract into small granules, at

which time the surface of the leaf presents a mealy appearance. This mealiness is increased by the raids of a small maggot working through it, the fungus being food for a surface-feeding parasite, which may be destroyed by dusting the leaves with air-slacked lime and flowers of sulphur, or smoking with burning coal tar and cigar stumps.

The accompanying cut illustrates an insect friendly to the cherry-tree, as it devours only certain plant lice which infest the tree. The engraving gives the natural size of the most common species, or variety.



Golden Eye. (Chrysopa.)

a, The eggs, mounted on their slender thread-like stems. *b*, The larva, with its long, sharp, sword-like jaws. *c*, The singular, small cocoons in which the pupa resides; one showing the opening and lid through which the insect has escaped. *d*, The perfect insect, showing the wings on the right side only.

The black knot sometimes infests the cherry, especially the Morello, as well as the plum, and the only remedy lies in cutting off the affected twigs and burning them.

Warm, wet weather in fall, of course, affects the cherry tree deleteriously, as it does all other fruit trees. It causes the fruit-buds to swell and grow, and then the succeeding cold snap kills the germ. Cold, wet weather in the spring, also, at the time of blossoming, will kill the fruit, or wash away the pollen before its proper function is performed.

VARIETIES. *Belle de Choisy.* Best, middle of June, or directly after the May Duke. Fruit round or slightly depressed; skin very thin and translucent, showing the net-like texture of the flesh beneath; pale amber in the shade, but in the sun finely mottled with yellowish red, the fruit fully exposed becoming a bright carnelian red; flesh amber-colored, very tender and melting, of a delicate sweet flavor; stem rather short and swollen at the upper end. Tree hardy, head upright, and a moderate bearer; leaves dark.

Black, Large or English Morello. Best, last half of July. Twice the size of the common cherry, round or obtusely heart-shaped, dark red, becoming nearly black when fully ripe; flesh dark, purplish red, tender, juicy and of a pleasant subacid flavor when quite mature. This is a standard cherry for the Northwestern States. It is second in hardiness, a splendid fruiter, and does rather better on " poor " land.

Black Tartarian, Fraser's Black-Heart, Ronald's Heart, etc. Best; middle of June. Large, heart-shaped, irregular and uneven on the surface, glossy, bright, purplish black; flesh purplish, thick, half tender, juicy, very rich and delicious; stone very small. Tree the hardiest of all the heart cherries; leaves large; head upright.

Early Richmond, Early May. Good; rather small, round, slightly flattened, lively red, tender, very juicy, acid, tree of rather dwarf habit, and two or three years later coming into bearing. This has been the most popular cherry in the Northwest for many years, more on account of hardiness, productiveness, etc., than intrinsic qualities of the fruit. Downing thinks that the two names at the head of this paragraph are of different sorts of cherry. Some think this variety does better grown on its own roots, living longer and bearing better crops. This cherry may also be propagated by layering. The Early Richmond is a little more juicy than the Kentish, not as acid, is more pleasant to the taste, ripens two or three weeks earlier, and on the whole a better fruit; it has also a smaller stone.

Governor Shannon is a fair variety for Western cultivation.

Governor Wood. Very good to best, middle of June. Large, roundish, heart-shaped, light yellow, shaded and marbled with bright red; suture half round; flesh, nearly tender, juicy, sweet, rich and delicious; stem an inch an a half long and inserted in a broad cavity. Tree vigorous, forming a round, regular head, and very productive.

Hipp is the local name of a variety of cherry which does well in some localities.

Kentish, Early Richmond. See Early Richmond.

Late Kentish, Common Red. Good, especially for pies, and the most common sort, ripening about the middle of July. Medium size, round, flattened, deep, lively red, tender and very sour.

Lieb, or *Leib*, is a variety favorably spoken of in the West.

May Duke. Very good, first part of June. Fruit roundish, or obtuse heart-shaped, growing in clusters, lively red, then a rich, dark red, tender, melting, juicy, and of excellent flavor. It is generally picked before it is fully matured, as it begins to color long before it is perfectly ripe. The head of the tree is upright from its youth up. Some of the branches produce fruit which ripens much later than that of most of the branches.

Northwest. A seedling originated by Mr. D. B. Weir, of Marshall county, Ill. Hardy, more symmetrical than the Early May, and is a regular and abundant bearer. Fruit the size of the Early May, but in shape it resembles the May Duke. The flesh is firmer and richer than the Early May.

Plumstone, Plumstone Morello. Good, last of July and first of August. Large, roundish, inclining to heart-shape, deep red, tender, juicy, and when well matured, is of a sprightly and agreeable flavor; stone long and pointed. Tree of slow growth, productive and hardy; makes a fine pyramid.

Reine Hortense. Good, last part of July. Very large, roundish, elongated, bright, lively red, somewhat marbled and mottled; suture distinctly marked by a line without any depression; tender, juicy, very slightly subacid, and delicious. Tree a handsome grower and productive.

TO CAN OR DRY cherries, see Canning and Drying.

TO BOTTLE cherries, have ready some wide-mouthed bottles quite clean and dry; cut each cherry from the stalk into the bottle; be sure not to pull them

off. To every bottle of cherries put three ounces of powdered sugar, then tie them tightly over with bladder. About nine o'clock at night put the bottles into a lukewarm oven and close the door. Take them out the first thing in the morning, and put them in a dry place for use.

Cherry Brandy: see Brandy.

Chess or **Cheat.** This foreigner is a well-known pest among crops of wheat and rye,—and occasionally appears in the same fields for a year or two after the grain crop; but being an annual, it is soon choked out by the perennial grasses, and the fallen seeds remain, like myriads of others, until the ground is again broken up, or put in a favorable state for their development. The best preventive of this and all similar evils, in the grain-field, is to sow none but good, clean seed. Among the curious, vulgar errors which yet infest the minds of credulous and careless observers of natural phenomena, may be mentioned the firm belief of many of the farmers (some of them, too, good, practical farmers) that this troublesome grass is nothing more than an accidental variety, or casual form, of degenerate wheat, produced by some untoward condition of the soil, or unpropitious season, or some organic injury, though it must be admitted, by the most inveterate defender of that faith, that in undergoing the metamorphosis, the plant is surprisingly uniform in its vagaries, in always assuming the exact structure and character of Bromus. It is needless to say it is a botanical impossibility, as much so as that wheat could turn to Indian corn.

This grass has been cultivated within a few years as Willard's Bromus, and the seed sold at a high price. The farmers found that they not only did not get a valuable grass, but were really propagating a worthless and pernicious weed, being thus doubly cheated. The principal varieties are as follows: B. secalinus: panicle speading, even in fruit; spikelets ovate-oblong, eight and ten flowered; florets pubescent; awn short, sometimes very short or none; known as Cheat, Chess, Brome-grass. B. racemosus: panicle erect, contracted in fruit; lower palea decidedly exceeding the upper, bearing an awn of its own length; known as Upright Chess, Smooth Brome-grass. It is a worthless species found in grain-fields, as is B. mollis, which resembles the preceeding, but has long-awned flowers which, as also the leaves, are downy, and the spikelets are closely imbricated. By some, the two are considered as forms of the same species. There are two native species of the genus, of no agricultural value. All the varieties of chess are of but little value in agriculture, and should be treated as weeds, and, in fact, are so treated by intelligent farmers in all sections.

Chestnut, a tree of the oak family valuable for its timber and for nuts. When full-grown it is one of the loftiest trees of the forest. It is common in the eastern parts of the United States and Europe, does best on high, dry ground, and is therefore more perfect in the Eastern and Middle States than when grown in the Western. The crops even in the East are sometimes lamentably short. The timber is almost as good as catalpa for posts, rails, etc. The chestnut is propagated by grafting or by planting the nuts. Several English varieties have been grown in this country, of which the Downton is considered the best.

Chewing the Cud: see pages 209 and 226

Chewing Gum is made by taking paraffine or spermaceti and dissolving either of them in olive oil and glycerine by means of gently heating them. It is stirred on cooling and gently compressed. The sweetening and flavoring is of course according to taste.

Chiccory. This plant, also called succory and wild endive, is a naturalized foreigner, and, being hardy where it gets hold, is a very troublesome weed. Endive, in Europe, is esteemed and used as a salad plant, when about a foot high, the tops being tied together, over the heart, and the sides earthed up, in order to blanch them. The seed should be sown early in the spring in drills, 16 inches apart, covered three-quarters of an inch deep, and thinned, when large enough, to six or eight inches in the row. The cultivation and blanching of Endive is precisely similar and the plant is a much nicer bitter salad than chiccory. The principal use of chiccory is in the roots, which when sliced and kiln-dried, are used in adulteration of ground coffee. It is raised by sowing the seeds upon very rich, deeply-trenched ground, in drills 18 to 20 inches apart, keeping the rows clear of weeds, and thinning to about six inches in the row. In the autumn the tops are cut and the roots raised by a peculiar plan, which cuts the tap-root some 18 inches below the surface, slightly lifting the roots; or by a plan which turns the roots out of the soil, at the same time covering the cut tops, the plan being to go around the field, one row being removed before the next is worked. With the sub-soil lifter, however, the earth is not turned, and this plan is preferable. The cultivation of chiccory has been introduced into the United States several times, and abandoned. It is to be hoped it never will prove remunerative, since its cultivation is simply for use as an adulterant of coffee. While its use can not be distinctly stated as injurious, it is nevertheless a fraud upon the buyer of coffee when mixed therewith. If the good wife chooses to furnish chiccory as a family beverage, well and good. The pure chiccory can be bought or raised, since its cultivation is as easy as that of the parsnip or carrot.

Chick, or **Chicken,** the young of birds, especially of the domestic fowl. See Fowl, Domestic.

Chicken Pox is a mild eruptive disease, and seldom occurs more than once in a person's lifetime. There is but little indisposition; slight chill, cough, fever and bad appetite. It comes on in four or five days after exposure to the contagion. The eruption differs from small-pox by coming out in successive crops, by not suppurating or being depressed in the middle, and by not going deep into the true skin.

Treatment: Cooling drinks, often administered, to-

gether with some good aperient to keep the bowels regular and open, are all that is necessary.

Chiffonieres (shif-on-eerz'), portable closets. These are boxes or little bureaus, with ornamental finish, and are a great convenience about any house. Many styles can be found, under various names, in good furniture stores, and simpler ones can be readily devised and made at home, with a little ingenuity.

Chilblains, an inflammatory swelling, of a purple or lead color, particularly on the feet or hands, produced by the action of cold. Children and elderly persons are generally most liable. Holding the hands and feet to the fire after exposure is a common cause.

Treatment: On its first appearance, bathe the part affected in the water in which potatoes have been boiled, as hot as can be borne. On the first attack, this bath affords immediate relief. Common copal varnish has been found most efficacious, by applying it to the part affected. If this fail, make use of pig's-foot oil. Or, apply with a small brush, or feather, three or four times a day all over the affected parts, liquor perchloride of iron: a dime's worth (2 ounces) will be amply sufficient to cure a score of cases. It acts like a charm. Hundreds of other remedies have been published.

Children. We first wish to say a few words to parents and guardians in reference to the right treatment and moral culture of their children—their duty toward them and the most efficient and pleasant way of performing it. Then we wish to address ourselves to the children, not only to the very young, but also the boys and girls as well,—those about to enter upon the stage of active life. We know it is easy to preach; it is a pleasure to preach; therefore more time and space are taken up with preaching than with rendering scientific reasons. We will try and avoid this common rut and not occupy space with moral lecturing, but merely compile, in a condensed form, the substance of what the philosophers of the day wish most to emphasize for this age.

1. We all act out our natures despite preaching and our creeds a great deal more than we think we do,—more than most persons imagine, and we assimilate to our moral selves only that moral food which we naturally like. A work, for example, like Watts on the Improvement of the Mind, is appreciated most by those who need it least, and appreciated least by those who need it most. An individual in whose nature it is to discipline himself, will do so, while a person wanting such a disposition, cannot be made to train himself, or be trained by others to a great extent.

2. To lay the foundation for a good character as deep and thorough as possible, hereditary laws must be regarded: the sounder the parents, the sounder the offspring, physically, mentally and morally.

3. In infancy children should never be teased, tickled, either on the feet, ribs, or elsewhere, tossed up and down, rocked or swung, dosed with medicines except when a good physician sees it is necessary, or fed upon bad food. On hot, sultry days they should be thinly dressed, and in cooler weather more heavily clothed, and uniformly. The feet, legs and arms need particular attention, as fashon is such that they are particularly exposed. A cross child in hot weather can generally be pacified by taking off some of the clothing and bathing its head with cold water.

4. As children grow up, no precept, especially a maxim, should be repeated to them in a rasping manner, nor even often repeated in any style. Repetition of precepts and principles of duty sours most children, and engenders a disposition in them to do the opposite. They do not like to be "sawed" any more than grown-up people.

5. Be patient in complying with the demands of the child's inquisitiveness, but discourage all that may take a foolish direction. So far as practicable, tell all that may be of benefit to the child in any way, and try to satisfy scientific curiosity; also, encourage him to think for himself. A parent should try to sympathize with the various irregular growths of a child's nature. Sensitivenesss as to peculiarities of dress is a very strong element, and it cannot be laughed down. The late admirable Lydia Maria Child said that she believed her character had been permanently injured by the laughter of her schoolmates at a peculiar short-waisted gown which her mother made her wear to school. And a very sensible mother who would not allow her little daughter to wear hoops at dancing school when hoops were the fashion, said that she was certain that by the mortification she had caused her, and the undue attention which had been given to the subject, she had made love of dress a passion with the child. On all these questions a certain wholesome inattention is perhaps the best treatment. Try to allow your child to be as much like his fellows as you can; and, above all things, do not make him too splendid, for that hurts his feelings more than anything, and makes the other boys laugh at him. The ragged jacket, the poor shoes, the forlorn cap, the deciduous pantaloon which has shed the leaves of freshness—these are not laughed at; they do not move the youthful soul to ridicule. It is a lovely trait in the character of boyhood that poverty is no disgrace. But a velvet jacket, a peculiar collar, hair cut in a singular fashion, long hair especially—these are cruel guide-posts to the young bully. He makes the picturesque wearer whose prettiness delights his mother suffer for this peculiar grace most fearfully.

6. As they grow older, let them have a little property and a purse of their own, to keep, take care of, increase and spend upon their own responsibility, with the aid of your advice, however, if very gently given.

7. Nearly all mental and moral discipline should be brought about in some ingenious and indirect manner. Youth, like older people, must be taught, as Alexander Pope says, "As though you taught them not, and new things proposed to them as things forgot." We cannot "make" a child love a thing any more than we can "make" a horse drink water. In the management and discipline of children there must be an even, steady, firm and temperate treatment, accom-

panied by a disposition of mind so much master of itself as never to yield to passion, but always to be governed by calm judgment. Perservering, yet gentle firmness, begun in infancy and practiced daily, establishes discipline, insures obedience, and almost entirely prevents the necessity of punishment of any kind. On the other hand, the gratification of the child's every whim, encouraged by frequent indulgences of improper desires, associates the idea of happiness with such gratification, and of misery with disappointments. Self-will grows rapidly; a capricious humor is the natural consequence, and the product is that pest of pests, a "spoiled" child. However, to avoid improper indulgences the parent should endeavor to avoid undue severity.

8. The parent should have the respect of the child due to his superior wisdom. This is a widely different feeling from the fear of punishment. When the fear of punishment predominates the child almost invariably becomes artful. He seeks more to escape detection of a wrong act than to avoid the doing of it. Indeed, timid children, if treated with severity, can scarcely resist the temptation to hide offenses when possible. Severity may extort confession and promise to do better, but it cannot in itself enkindle better thoughts or implant correct principles in the heart of the child. A spirit of revenge is often generated by such a course. Correction, as a general rule, in order to prove salutary and beneficial must be applied to the mind and not to the body. Children must be taught that parents are afflicted rather than exasperated by their misconduct. In this way their better feelings and their reason are brought to bear upon. This will be far more efficient than repeated recourse to the rod, or harsh rebuke, which only irritates the disposition.

9. Over-burdening a child or youth with a task further than he can see any reason for, causes him to hate the one who imposes the task. Of course, in this work-a-day world, not everything can be made perfectly smooth for a child; to undertake it would effeminate him; all that is necessary is not to over-burden him further than there is necessity, which may be plain to him at the time or soon afterward. By this rule alone, a parent or employer will retain the love of those under his care. By the way, employers and superintendents should, as far as practicable, lighten the heaviest and most exhausting work by giving the laborer something lighter to do for a while; as when digging post-holes, take a rest at pruning vines or fruit-trees, or using the team with something—almost anything else which will bring into play a different set of muscles, to rest those which have been overworked in digging. In company with a large number of laborers work is always more pleasant, and four men working together will do five times as much work as one man alone. Thus we see the reason why harvest time is proverbially a jolly time.

10. Most children exhibit special talent, as well as a few idiosyncrasies, that is, disagreeable peculiarities of character. The idiosyncrasies of childhood are generally transient, and need no special checking indeed, a special, direct effort to check transitory phases of development is apt to confirm some disagreeable trait. But idiosyncrasies setting in after the age of puberty are apt to become permanent, despite all effort to eradicate them. The best thing to do in this regard is to encourage high ambitions, so that the youth will see the necessity of eliminating all his peculiarities, in order to rise in the world.

11. Should a son or daughter cause you anxiety and trouble through their indiscretion or thoughtlessness, gently and affectionately reprove them. Harshness and anger will almost invariably cause greater perverseness.

12. And last, but not least, every physiologist at the present day earnestly exhorts all parents, guardians, etc., to instruct those under their charge in certain sexological truths before it is too late.

In concluding this advice to parents we want to make a few remarks of special character as to the treatment of the young ladies and gentlemen—children of a larger growth. The young lady as she emerges into womanhood naturally regards the subject of marriage of very great importance. They often have erroneous ideas of what is true happiness, or their judgment may lead them in the wrong direction in seeking this goal. They should be guided aright by those who have buffeted life's waves these many years. They must be taught to respect farming as an occupation, and be required to help their mothers in the work of the house and the dairy. When farmers educate their girls in a manner which will fit them to become farmers' wives, and teach them that farming is one of the most honorable of all occupations, and that the girl who marries a farmer does fully as well as one who marries a merchant or a lawyer, they will thereby do a great deal toward keeping their boys on the farm. The idea that because a young lady has married a farmer she has "thrown herself away" is one of the most preposterous ones which ever found expression in civilized society. The girl who will reject a man simply because he is a farmer shows that she has a very shallow or else a sadly uncultivated mind and a heart which is incapable of deep affection. And the farmer who will advise his daughters to reject honest and intelligent farmers in the hope of securing clerks, business or professional men, thereby shows his own lack of good judgment as well as proves that he has no genuine respect for the calling by means of which he obtains his bread. The mother who advises her daughters to "look higher" than the young men who are farmers is thereby doing a great wrong. There may be reasons why certain farmers' boys are not suitable companions for certain farmers' girls, but the mere fact that the men are farmers should weigh in their favor rather than against them.

How to manage the young men is a question of deepest interest to the farmers. How to keep them on the farm and induce them to cheerfully choose farming as their life vocation is a question hard to solve.

One of the ways in which the boys can be strongly

influenced to choose farming as an occupation is by giving them the use of a small piece of land each season. Let each boy who is old enough take a plot of land each spring, and plant it with such seeds as he chooses. Give him time to cultivate the crop, and allow him to use the team when he needs it. The money obtained from the sale of the products of this piece of ground should be his own to use as he desires. Such a course will prove beneficial in several ways. It will lead the boy to take a deep interest in thorough farming, and induce him to study the best methods of cultivation in order that he may obtain as large a sum of money as possible. It will show him the real worth of a dollar, and lead him to spend his money wisely.

Many a boy has soon "run out" a fine property left him by his father, because he had no clear comprehension of the difficulty of obtaining money. The father who gives his boy spending money does a great deal better than the one who never allows him to have any, but it is by far the best plan to have the boy earn the money which he spends. The boy who earns a dollar by growing fruit or grain, understands that the dollar represents a certain amount of labor. He appreciates the money, and knows its actual worth far better than the boy whose father gives him some outright. Such a plan will enable the boy to buy books, or take papers, with his own money. It will tend to make him industrious and frugal, and may be made the means of great good to the boy, and, indirectly, prove an almost equal benefit to the father. If it is not convenient to allow the use of land, the farmer may give his boys the entire care of the poultry, requiring them to pay for the food which is consumed, and allowing them to retain the money received from the sale of chickens and eggs. Or two or three sheep may be given to a boy to care for, he paying the cost of keeping, and having the money obtained from lambs and wool for his own. In some such a way the boy may be inspired with a love for the farm, and induced to lay a good foundation for a successful business career thereon.

To the Young. If you are living with your parents, remember that amid all their scoldings and coldnesses, amid all their faults and shortcomings, at heart they love you more than all other persons in existence. If they should see you abused by strangers, they would defend you with a greater zest than any one or anything else in this world; they will fight for you as a tiger fights for her young, or "rush into the jaws of death," if need be; and do all this, too, with a greater pleasure than they could otherwise experience. This parental sense we can scarcely call love; it is something far beyond or above it: indeed, there does not exist anything in human nature more perfect than the affection which parents bear for their children. The slender cord of friendship which binds one person to another is often broken without a struggle; a word, a look may snap its threads, never to be re-united. It often proves false in the hour of need, or grows cold by the lapse of time; but it is seldom, though amid greatest tribulations, that the parental heart, especially that of the mother, turns from its offspring.

Never be treacherous; that is, whenever you are trusted with anything, be faithful to that trust. The reward of such fidelity is sure to come even in this world. If you live even but a few years longer, it will come in the shape of high positions in society, and probably high offices in the gift of the State. Daniel Webster said there was plenty of room for lawyers, in the upper story of the legal profession; we can say with much more emphasis, there is plenty of room for honest men and women, in the upper story of society and of political preferment. One reason why many persons do not get along in the world, is because they cannot be depended upon. They do not keep their agreements. When they are weighed in the balance of actual affairs, they are often found wanting. They are seldom on time. The workman who is always on time and does his work according to agreement, is sure to get along. To a young mechanic starting in life, the habit of promptness and punctuality is worth more than $1,000 cash capital—although $1,000 is not to be despised. The trustworthiness of the faithful workman produces money, but the untrustworthiness of the unfaithful one causes him to lose money. This is an everlasting principle. He who would be permanently prosperous must keep his engagements.

Another chief requisite to a successful life is honesty. We might couple with it as a twin sister, strict integrity. Let honesty and strict integrity in every transaction of life be your characteristic. Let a man have the reputation of being fair and upright in his dealings, and he will possess the confidence of all who know him. Honesty is not only right but it is the best policy. Remember this, young man; do not believe it is a false statement. It has been proven true to the satisfaction of millions of wise men in all ages of the world. Think not that with you it will be different.

Be cautious. Weigh things well before you endorse or accept them. Slowness of belief and a proper distrust are essential to success. The credulous and confiding are ever the dupes of swindlers and impostors. The majority of men who have lost their property will invariably tell you it was through misplaced confidence. One lost by endorsing for a friend or neighbor; another by fraud or by false representation; another by crediting one whom he believed honest and able to pay. Judge of men by their actions and not by their cunningly devised statements. Observe their every movement; learn their motives and their ends. Notice what they do and say in their unguarded moments. It is your duty before trusting a man, or putting in his power the means of causing you to lose, to know as much about him as possible. Learn his history, his habits, inclinations and propensities; his reputation for honesty, industry, frugality and punctuality; his prospects, resources, supports, advantages, and his disadvantages; his intentions and motives of action; who are his friends and enemies; and what are his good or bad qualities. You may learn a man's good qualities and advantages from his

friends; his bad qualities and disadvantages from his enemies. Make a due allowance for exaggeration in both. Finally, examine carefully before engaging in anything, but when you have decided, act with energy.

To a young man or woman just emerging into active life, order and system in the management of their affairs should receive due attention. Nothing contributes more to economy of time and rapidity with which work may be accomplished. Have a place for everything, and everything in its place; a time for everything, and everything in its time. Do first what presses most, and having determined what is to be done and how it is to be done, lose no time in doing it. Without this method all is hurry and confusion.

Another important feature to be observed by the young beginning active life is politeness. Agreeable manners contribute largely to a man's success. Take two men having equal advantages in every respect, but let one be gentlemanly, kind, obliging and conciliating in his manners; the other harsh, rude, and disobliging, and the one will become rich while the other starves. For further advice on this topic see Etiquette.

To be prosperous in the way of money-getting, one must observe another very important principle; that is, industry. Constant, regular, habitual and systematic application to business will in time, if properly directed, produce great results, whether on the farm, at the bench, or in the counting-room. It will lead to wealth, just so surely as idleness, inattention, vice and drinking leads to poverty.

The art of money-saving is no unimportant feature of a successful life. Without frugality none can become rich. This should be taught the young. Children may be educated to save even when quite young. Remember there is a difference from legitimate economy and being mean and miserly. Who ever knew a prudent, economical, saving man to come to want? but we see hundreds born to wealth, who, by extravagance, have died in want and misery.

Let it be deeply impressed upon the minds of the young the terribleness of falsehood. When once concealment or deceit has been practiced where all should have been fair and open as day, confidence can never be fully restored. Distrust will ever hover over such an one. How many otherwise happy lives have been made miserable because prevarication and deceit were the controlling habits of their lives. How many young men's hopes have been blasted by one false step.

While most earnestly desiring to instill into the minds and hearts of the young a hatred of falsehood, with equal emphasis we urge them to cling to truth and despise not religion. The teachings of the humble Jesus, if only observed, will make you a better man, a more honorable citizen, a kinder father, and a more dutiful husband. Religion is the most important subject that can interest the attention of man, for the effects of religion are felt amid all the vicissitudes of fortune in this life. Indeed, that which interests the immortal spirit, which will decide its destiny during eternity, is so far above the petty considerations which agitate the world, that no comparison can be drawn between them. Christianity enters the hut of the poor man and sits down with him and his children. It makes them contented in the midst of their privations, and leaves behind an everlasting blessing. It walks amid all the pomp and splendor of wealth as a purifying, ennobling and redeeming angel. It is alike the beautiful companion of childhood, and the comforting assurance of age. It adds dignity to the noble, gives wisdom to the wise, and new grace to the lovely. Young man, young woman, you cannot afford to ignore the religion that the Son of God established in the world. Without it the highest success and enjoyments of life never can be attained.

The young are ever impatient. Especially does it seem so of the young men of the country. They easily become dissatisfied with their mode of life, and seek to better it by changing. This change almost invariably points to the city. Their young minds have been dazzled and blinded by the exaggerated stories of stupendous fortunes made in a day in the great cities; of the pleasure, high life and excitement these great centers afford. Young man, be not deceived, for not one in a thousand who go to the city ever realize their fond hope's expectation. The great majority who flock there settle down to a life of drudgery and disappointment. Stick to the farm, is our often and repeated advice. Realizing how prone the young are to desire to go to the city, and knowing the unhappy results, we most earnestly desire to impress upon their minds as indelibly as possible this advice. Farming is an honorable, lucrative and pleasant business; and if nine-tenths of the young men who leave the farms and go to the cities would work as hard upon them, live as cheaply as they often have to, they would become wealthy and influential, whereas they neither have wealth, influence nor happiness.

We further give the following advice to be observed both by the child and youth.

Be not contentious for your rights; if you cannot obtain them peaceably, let them go. Nations fight one another because there is no higher court to adjust claims between them.

Be you ever so mad, or disturbed in your feelings, do not exhibit that you are thrown off your balance and unable to reason coolly. Worded shortly: Do not show bad temper.

Do not protract controversies.

Be kind and obliging in little things; let no opportunity escape.

Treat your school-teacher on the same general principles of politeness that you would any one else.

Be punctual. This is the surest way to advancement in position in after life.

Gossip is such talk about your neighbors as has a bad influence.

Those who are too talkative do not know it. "A fool is known by his multitude of words."

In conversation, refer to yourself just as little as possible, and then in such an indifferent manner that it will not call attention to yourself.

Pure language is the surest ladder to high position in society, irrespective of other merits.

While punning and playing with words is admissible as far as it is sure to create no ill feeling, be careful not to prevaricate, or get in the habit of saying one thing in earnest while you mean another.

Never play "practical" jokes; they are always dangerous.

Avoid affectation, which is the vice of taking on an air of superiority.

Do not be conceited, pretending to know more than you do.

Be affable, ready to listen and to respond with as much endorsement of your friend's sentiments as you can conscientiously give.

We have an especial word to the farmer's boy, who is busily engaged upon his father's farm. Your present duties are here: perform them to the uttermost. Observe the advice given above, heed what we now give, and your life, we doubt not, will be honorable, prosperous and happy.

To the farmer boy at work: You have almost a constant fear lest your father (or employer, as the case may be) will not think you have done work enough for the day, or the half-day,—a fear lest he will not see what invisible difficulties you had to overcome. Your work, too, on some days will not show off to as great advantage as that done on other days, and your employer, not being by your side through it all, like almost everybody else, will be governed more by appearances than by the hireling's account of the matter. Sometimes the obstacles in the way of accomplishing the usual amount of work lie in the nature of the ground, sometimes in that of the crop growing upon it, sometimes in the team with which you work, and sometimes in the plow, harrow, machine, harness, or other "rigging" you have to use; but oftener than in any other way, perhaps, they occur in the conditions of your body and of the atmosphere. Some days the air is full of heated, noxious vapors, and is so oppressive and enervating that one cannot possibly do as much as he can on other days. Sometimes one can do twice as much as at other times, and not feel so exhausted; yet how few men who conduct a farm seem to recognize this fact! and how many scoldings the boy receives for not doing as much one day as he did some other given day.

Many employers have a very awkward way of telling what they want done, and of making themselves understood. They are sometimes coarsely organized, ignorant, and consequently very conceited, and imagine they tell everything plainly enough, and that they are more reasonable and honest than any of their neighbors in all respects.

You receive orders from such a one, go out into the field to execute them, and behold! his orders do not apply to the work at all You are in a quandary. "What shall I do?" you inwardly exclaim. Although ashamed to go all the way back to the house to have the orders repeated more clearly, or to get further information about something (and it is often a half-mile or a mile to the house) you have to go. On reaching the house, lo! the man has gone to town or off hunting cattle. The half-day is almost wasted.

Often there are not sufficient pains taken that a full understanding be had as to all the particulars, and a disagreeable quarrel follows, with this language:

Man.—"You did not harrow that low piece of ground beyond the oats the other day."

Boy.—"You didn't tell me to."

Man.—"I did. I told you to harrow it if you got the other piece done before—"

Boy.—"You didn't say any such thing. You said that," etc.

The boy should have modestly replied, "I did not understand (or notice) that you told me to harrow it," and said nothing more; and the father or employer should with equal modesty acknowledge that he may have not distinctly enough expressed himself, and say no more. We cannot expect all men to be philosophers, much more than boys nearly grown. The judgment of the man is generally the best; but if he were a philosopher he will not act as if he were perfect and the boy wrong in every matter of difference. In case of hiring out the boy should speak beforehand for these little but serious points of justice and reason, as well as for all the pleasures and liberties he may wish to enjoy, arranging for a large margin, and then ever afterward be a little more steady and faithful to work than he had led his employer to expect. This will keep up pleasant relations.

We close by reference to some of the pleasant pictures of a young farm laborer's life:

In solitude, while laboring, perhaps, at the farthest corner of the farm, plowing corn, how the mind will run upon various subjects, taking imaginary excursions, devising great schemes, making up eloquent speeches, and anticipating the scenes of harvest, of autumn, and of winter! But how often, too, the forenoon seems so long,—so much longer than usual, and the eyes cast up toward the house to see the dinner flag hung out! But this longing is as often for rest as for dinner.

One morning will be fresh and the air bracing, the birds are singing and everything seems to be looking up, and your task light and pleasant. Just for the time the feeling is that nearly all work might be made as pleasant; but the very next morning is hot and sultry, and the horizon shows signs of a thunder-shower. "How I wish that cloud would hurry up here and cool us off a little, give us some rain, and me a little rest!" In a dry season that cloud generally disappears without giving you any rain; but a wet season is "a great time for hired men and young ducks."

There is a strange and irresistible influx of youth of the country to the towns and cities. They are allured somewhat by the imagined "honor" of being a city resident, somewhat by the sights and vivacity of the thronged thoroughfare, but more than all, perhaps, by the lottery chance of making a sudden fortune, or of having at least an easy and honored position, where the labor is light and the pay is heavy. Their sober

judgment teaches them that such positions are as scarce as lottery prizes,—one prize to a thousand blanks; but such is human passion, each one thinks *he* has got a "sure thing," until he has acquired some experience, while the other "feller" has "acquired" the money. Were it not for legislative prohibition, the people would "lottery" themselves to death—to a complete pecuniary death. City life with the masses is one of the greatest drudgery and poverty. Those that are not overworked and die prematurely are rushed on to premature graves by dissipation and debauchery. Real happiness and the charms of life are seldom found in the city. Indeed, city life is purely an abnormal state. The highest enjoyment is experienced in the rural districts. The legitimate charms of life and all poetry are in the country. The highest poetry is in the wilds of nature. Not one true poet in a hundred has been born and bred in the city. Let any thinking genius, whose infant eyes were first taught to see by the trees and plants, birds and insects, hills and streams of the vast wilderness. and all whose senses were trained by the experiences of farm life, go to the city and confine himself to office life there for a few months or years, and he will long to return and dwell upon the farm; he sees poetry only there; but let one who is born and brought up in the city—well, as a general rule, he has neither body nor soul, for either city or country life. Therefore we conclude: Go to the city on business; go visiting; go often; stay long enough to see everything new; but *live* upon the farm.

For full information in reference to seeing the sights of a city and advice to the farmer visiting the city, see Traveling.

Chill, in casting iron, is to pour the melted metal against cold metal in the mold, to render certain parts harder, which are more exposed to wear.

Chills and **Fever,** intermittent fever; ague. See Ague and Fever.

Chimney. In constructing a brick chimney, the thickness of five bricks, with the intervening mortar, makes a foot in height; to leave a flue (passage for smoke) four by eight inches, requires five bricks to the round, or 25 to the foot in height, and each brick added to the round increases the dimension of the flue on one side or end by four inches; thus, to leave a flue eight by eight inches, requires six bricks to the round, or 30 to the foot in height; a flue 8 by 12 inches, 35 brick to the perpendicular foot; a foot square, 40 brick to the foot, etc. By these data any one can readily calculate the number of brick required for any regular chimney. As chimneys are generally not uniform in their size from bottom to top, of course each section must be calculated separately and the results added together to obtain the total. A large chimney, say with an aperture a foot square, or 12 by 16 inches, is far better than a smaller one, even for a stove; and a flue should never be diminished at any point above the smoke entrance. Masons and builders generally insist on putting up a house or a chimney in a certain way, which is the fashion at the time and which they are most familiar with, and often succeed in persuading the proprietor to adopt plans which are not the best for comfort, if they are for looks; but the proprietor should have his own way, where he wants comfort and convenience, even though he has to discharge the obstreperous mason or builder.

In the measurement of a chimney, however, to calculate the mason work, it is counted as solid, outside measurement, to allow him for the trouble of forming and plastering the flue. Thus, a chimney 16 by 24 inches, or two bricks by six, outside measure, would count 60 to the foot; and the thousand brick he contracted to lay would run the chimney up only 16⅔ feet. In chimney breasts, take the width of the face on each floor, and multiply by the height and by the thickness projecting into the room; the fire-place not deducted. When projections on the top exceed two courses of brick, two courses to be added to the height.

To examine a chimney, after it has been used, hold a piece of looking-glass, inclined at an angle of 40° in the hole in the chimney where the pipe enters, and if you can see the light of the sky, you can see the whole of the interior of the chimney and any obstruction therein.

To put out the fire of a burning chimney, shut all the doors and throw into the stove or fire-place, as the case may be, a handful of salt.

Chinch Bug: see Wheat.

Chine, the ends of the staves of a barrel, outside the heads.

Chisley (chiz′ly), having a large admixture of small pebbles or gravel: said of a soil between gravel and clay.

Chives: see Cives.

Chlorine, a greenish-yellow, irrespirable, poisonous gas. It is pungent, fuming, and of great chemical activity. When chlorine is combined with metals the substances are called chlorides, as chloride of sodium (common salt), chloride of hydrogen (muriatic acid). Chlorine also unites with lime and soda, forming feeble compounds, the chlorides of lime and soda. Chlorides are erroneously called muriates, and muriatic acid should be called hydrochloric acid. Chlorine gas is prepared by pouring hydrochloric acid on the black oxide of manganese; also by heating sulphuric acid with common salt and the manganese. This gas is a disinfectant, and for this purpose is made and used as follows: Take an ounce or so, depending on the size of the place to be disinfected, of black oxide of manganese, and hydrochloric acid of sufficient quantity, carry them to the place where they are to be used, pour the one into the other, and close the doors, having first removed all the animals out of the place. A spirit lamp placed under the bottom of the vessel holding the materials, will insure a greater volume of gas. Chlorine when sufficiently and properly used is considered to be of great advantage in arrest-

ing the ravages of glanders, farcy and other distempers in the horse, of pleuro-pneumonia and contagious typhus in cattle, and small-pox in sheep. It will cost no more than $3, and consists of a small lamp with a stand, so formed that a small glass bottle can sit right above the blaze of the lamp, while from its wide and open mouth issues the disease-healing and health-restoring gas.

Chloroform, a chemical, volatile compound, the the vapor of which when taken into the lungs renders one in part insensible to pain and in part heroic, through a peculiar blinding of the sensations. It has been the chief anæsthetic for many years, but, on account of its danger, ether and other agencies are taking its place. No one but a responsible physician should undertake to administer it. Chloroform is an excellent stimulant, when given to horses having a chill, or shivering fit, from congestion or from cold, and is equal to turpentine for the cure of colic. An excellent liniment is made by adding one ounce of chloroform to two of olive oil.

Dose. Chloroform is given to the horse and cow, in doses from one to two drachms, mixed in weak whisky, and repeat every two or three hours, or till the colic is relieved.

Inhalation. The inhalation of chloroform, by either horse or ox, is attended with risk, provided the animal be not secured or tied, so that it cannot get loose; because some horses and cattle become completely wild when the effect of the inhalation commences to act upon the brain. On the other hand, some horses will quietly stand up, others will quietly lie down under it. Two to four ounces are sufficient to produce anæsthesia, or loss of sensibility.

The usual way of giving chloroform by inhalation is by pouring about two ounces of chloroform on a soft and moist sponge, whilst the animal is tied down, and holding the sponge to one nostril only, covering the nose loosely with a large towel to save the fumes of the chloroform, using great care not to exclude the admission of pure air with the fumes of the chloroform. In all operations lasting any length of time, humanity and fine feeling demand the outlay for a little chloroform. It is not necessary to destroy completely all feeling, just sufficient to blunt the sensibility of the nerve centers.

Chocolate (chock'o-let), a paste composed of the roasted kernel of a tropical tree, ground and mixed with other ingredients, usually a little sugar, cinnamon or vanilla; also the beverage made from this paste. Chocolate is generally adulterated with flour, potato starch, sugar, cocoa-nut oil, lard, tallow, red ochre, yellow ochre, red lead, vermilion, sulphate of lime, or chalk, etc. People can enjoy just as much of life without using it as by adding it to the numerous more healthful beverages at hand. To prepare the beverage, scrape up about ¼ of a pound of the chocolate cake into a saucepan with 2 gills of water; set it on the fire; stir it constantly with a wooden spoon until it is rather thick, then work it very quickly with the spoon. Stir in a pint of boiling milk by degrees and serve it.

Choke-Damp, carbonic acid gas, generally as it is found at the bottom of some wells. No well should ever be entered without first letting down a lighted candle or torch of some kind, to ascertain whether that gas is present. If it is there, the blaze will be extinguished. By throwing down a quantity of water or cloths, good air can be forced down to take the place of the "damp;" but a thorough pumping would do better work. This gas sometimes collects in cellars, old cisterns, etc. In case of suffocation from this heavy gas, remove the patient to fresh air, dash cold water over the head, neck and chest, carefully apply smelling salts to the nostrils, and keep up the warmth of the body. When breathing has ceased, treat as for Drowning.

Choking. When a person has a fish-bone in the throat, insert the forefinger, press upon the root of the tongue, so as to induce vomiting; if this does not do, let him swallow a large piece of potato or soft bread; and if these fail give a mustard emetic, or one of salt and water.

Cholera, Asiatic, violent purging, vomiting and prostration; caused by anxiety and fear, in connection with bad diet, and possibly a weak state of the bowels and certain germs in the atmosphere. "Cramps" generally set in just before death, and continue a while after the patient has breathed his last. Medical treatment usually consists of hot applications, both externally and internally, special attention being required to keep the extremities warm. The odor of drugs in the room aggravates the disease. Keep the head cool with a wet cloth; warm up and cleanse the bowels with injections of warm, pure water; and no food should be taken until the violence of the attack has abated, and then it should consist of farinaceous gruels, the soft part of fresh, warm graham gems, or graham crackers with a little cream. These things do until the physician arrives, who should be sent for as soon as possible after the attack is suspected. Don't do any drugging.

Cholera Infantum is very fatal among children, and may be known from the following symptoms: Diarrhœa, vomiting, want of appetite, languor, head hot, abdomen swollen,—in some cases constant diarrhœa and vomiting until death. It often comes during teething and previous to the fourth year. The blood is impure and the disease seems to affect the whole digestive apparatus. After the stomach and bowels have been evacuated, give charcoal and magnesia, or the latter alone. When there is much irritability, clysters of flaxseed tea, mutton broth, and starch, with a little laudanum in them, will give ease. Fomentations of the bowels and abdomen are useful. After the violence of the symptoms is over, give the Peruvian bark in powder or decoction, adding a little nutmeg. Or use a tea of avens, or bayberry root, or the leaves of red raspberry. The removal of children to the country, abstaining from fruit, the use of flannel and the

cold bath, are the means prescribed for prevention.

Chloride of Lime, also called lime chloride and bleaching powder. It is a chemical combination of chlorine and lime. Chlorine is a greenish-yellow gas, irrespirable and poisonous; but its combination with lime constitutes a very different substance. It is a good disinfectant, and is an excellent stimulant to unhealthy ulcers. Chloride of lime has been highly recommended in tympanitis in the horse, and hoven in cattle, arising from eating wet clover. The dose, as given, is from two to four drachms, mixed with cold water. As a disinfectant it may be sprinkled on the stable or barn floor every morning; but a good way would be to suspend it in a box having many small holes in it and hung from the roof of the house. If the house be large, two or more boxes may be used.

Cholera Morbus arises from a diseased condition of the bile, often brought on by the use of too much unripe fruit and vegetables, usually commencing with sickness and pain at the stomach, followed by the most severe pain and griping of the bowels, vomiting and purging, which soon prostrate the patient. The thirst is very great, evacuations tinged with bile, and often progressing some time, nearly all bilious.

Treatment. Apply flannel cloths, wrung out in hot water or spirits, over the whole surface of the stomach, immerse the feet in warm water, or, if the patient be in bed, bottles filled with hot water and kept to the feet will answer. Drink freely of warm pennyroyal tea and composition powders. If these means fail, give 60 drops of paregoric, and put a strong poultice of mustard upon the stomach. When the pain subsides, give a dose of castor oil, to carry off the remaining bile. Those subject to this disease should always wear a flannel next to their body, be cautious of their diet, and avoid exposure to the damp, cold air.

Many prescriptions for this complaint are made of astringents, as, ginger, rhubarb, pepper, laudanum, paregoric, lye, peppermint, wormwood, etc., etc.—all on the principle that the only thing needed is to "lock up" the bowels, or stop the diarrhœa. The diarrhœa is evidently nature's method of throwing out matter which ought not to be in the body, and locking the bowels is therefore just the thing *not* to do. Enemas of water, of the most comfortable temperature, generally tepid, will best aid nature in this work, and the diarrhœa will then naturally stop, for want of work to do.

Chowchow, a kind of mixed pickles; also mixed, as chowchow sweetmeats, etc. To make chowchow, take two quarts of small onions, four of small cucumbers, and three cauliflowers; cut the cauliflowers and cucumbers into small pieces, and soak in strong salt water over night; then rinse well, and boil in vinegar until quite tender; mix one pound of the best ground mustard and two ounces of the best salad oil with enough vinegar to mix it well; then stir in while boiling; just before taking from the fire add three ounces of fine red pepper; it is then ready to bottle.

Chowder, a dish made of fresh fish, pork, biscuit, onions, etc., stewed together. To make it, take a pound of salt pork, cut into strips, and soak in hot water five minutes; cover the bottom of a pot with a layer of this; cut four pounds of cod or clam into pieces two inches square, and lay enough of these on the pork to cover it; follow with a layer of chopped onions, a little parsley, summer savory, and pepper, either black or cayenne; then a layer of split Boston, or butter, or whole cream crackers, which have been soaked in warm water until moist through, but not ready to break; above this lay a stratum of pork, and repeat the order given above—onions, seasoning (not too much), crackers and pork, until your materials are exhausted; let the topmost layer be buttered crackers, well soaked; pour in enough water to barely cover all; cover the pot, stew gently for an hour, watching that the water does not sink too low; should it leave the upper layer exposed, replenish cautiously from the boiling tea-kettle; when the chowder is thoroughly done, take out with a perforated skimmer and put into a tureen; thicken the gravy with a tablespoonful of flour and about the same quantity of butter; boil up and pour over the chowder; send sliced lemon, pickles, and stewed tomatoes to the table with it, that the guests may add, if they like. Before putting in clams, the heads and hard, leathery parts should be cut off.

Chrysalid (cris'a-lid), or **Chrysalis,** the form which caterpillars and the larves of some other insects assume, in which to develop into the winged or perfect state. In this condition the insect has a kind of shell or a silken cocoon around it. "Pupa" is another term for chrysalis, and to "pupate" is to pass into and through the chrysalis form.

Chufa, or Earth Almond, is a sedge bearing sweet and nutritions tubers upon its roots, which taste somewhat like almonds. The plant will yield 200 to 500 bushels of tubers to the acre, and is said to be a profitable crop in the South, where it is extensively raised for hogs and other farm animals. The crop is propagated by planting the tubers, or "nuts," as they are often called, in drills three feet apart, and six inches apart in the drill.

Church, a building dedicated to Christian worship. The word is also used to designate a body of Christian believers, observing the same rites, and acknowledging the same ecclesiastical authority. There are few farmers but are more or less interested in their neighborhood churches. They may not be prominent or active members of any congregation, or even connected with it in any way, yet there are but few intelligent farmers who do not recognize, to some extent, at least, the importance of a good, live religious congregation in their neighborhood. There are none so indifferent but that they take more or less pride in having a neat, tasty and well-kept church edifice in their community. The character of the church and school buildings of any neighborhood is a good index to the character of the people living there.

In erecting a church building, the first step, after having selected a building committee, which should be composed of the best business men accessible, is to select the location. A somewhat elevated site affords a more beautiful aspect. The convenience of the majority of the members should be borne in mind, and the location be as central as possible. Of course this should not prevent varying one way or the other a short distance, in order to get a beautiful site.

FIG. 1.—*A Model Country Church.*

The location once selected, the plan of the building must be adopted and well understood. It must be adapted to the site chosen. A plan may be admirable in itself, and yet unsuited to any particular spot. Adopt no plan hastily. It should be carefully studied, examined in every light, looked at from every point of view. There are many things to be taken into consideration. The site chosen, the plan adopted, the building should be so placed as to present an agreeable appearance, with reference to the main points from which it is seen.

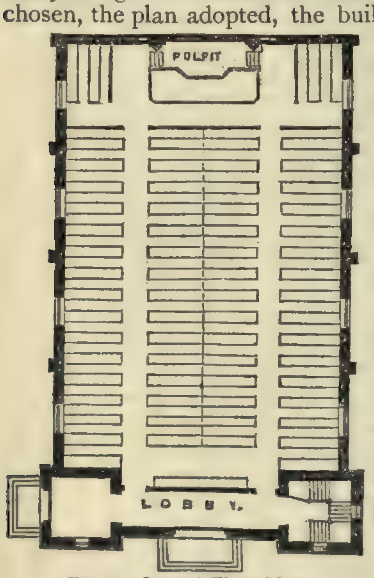


FIG. 2.—*Ground-Floor Plan.*

The architectural beauty of the exterior should not be overlooked, but it must be borne in mind that in erecting a building of any kind the first thing to be considered and the last thing to be lost sight of, is the use to which it is appropriated. A country church should be as pleasant in appearance, as beautiful in finish and as tasteful in furniture as the residence of the most cultured.

The materials to be used in construction will necessarily have an influence in choice of style. Wood is the material most generally used in the country. This arises chiefly from its abundance and cheapness. A greater variety of form and more elaborate embellishment may be secured at a given expense in the use of wood rather than stone or brick. Where stone can be procured it is the best of all materials for a church edifice. Brick may be substituted in designs where stone cannot be had without too great expense.

Ventilation is an important feature to be observed in building a church. In many of the country churches the windows and doors are kept closed, and the oxygen of the air, being rapidly consumed by the burning of the lamps and fires, and by the inspiration of the congregation, it is impossible for one to remain long in such places without feeling the evil effects of the bad air. Poor ventilation often accounts for the dullness of sermons and the drowsiness of congregations. See to it, that proper ventilation has been provided.

We give an excellent design for a country church, the elevation of which is represented by Fig. 1, and the ground plan by Fig. 2. It will not suit every one, or every location, but it will furnish ideas for all. It may be modified and changed to be adapted to location and outlay desired to be made in the erection of a church.

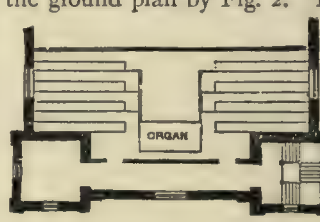


FIG. 3.—*Gallery-Floor Plan.*

The height of this church from the floor to the eaves is 17 feet, and the whole height of the ceiling about 22 feet. It is planned for a gallery across the front only. It will seat 400 people. The same ground plan may of course be so executed as to give much greater accommodations.

Churn, a vessel in which butter is produced from cream by agitation. The various kinds of churns are very numerous, and for each some special advantages are claimed by its advocates. It is not proposed to discuss here the relative merits of different churns, but to point out, if possible, the best principle on which churning can be done, and leave the choice of the churn itself to the reader. It is no great merit in a churn to produce butter very rapidly, for this is done at the expense of the quality and grain. The main things to be looked for are complete absence of buttermilk in the butter and ease in working the churn. As the butter is produced rather by impact (striking or dashing) than by mere agitation, the churn which will give the most effective impact, without injuring the grain of the butter, must be considered the best. It seems that these conditions are perfectly secured in a right-angled box churn, as Fig. 1. All the agitation which can be got in any other form of the churn is secured in this, while the concussion or impact on the right-angled sides or corners is greater and more direct than any other. The butter, too, comes as rapidly as it is advisable to have it. The form of churn most commonly used in small dairies is the upright or dash churn. Another variety is the cylinder churn, which is simply constructed and can be easily cleaned.

FIG. 1.—*Rectangular Churn.*

The Davis swing churn is very easy to work, and very simple in its construction. The opening into the box is always right side up, the lid is ventilated, and there is no slopping or dripping of cream. Each churn has a glass indicator in the cover, thus enabling a person to tell when the butter comes without raising the lid. The butter comes in beautiful granules in the most desirable form for washing with cold water or brine.

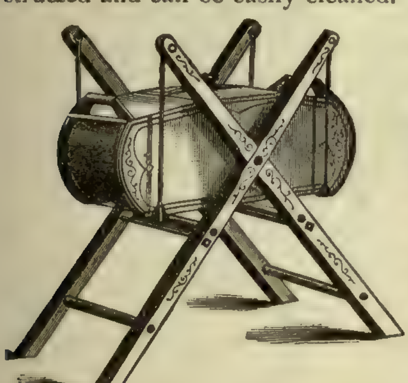


FIG. 2.—*Davis Swing Churn.*

The "Boss" Churn. These churns have become very popular among the dairymen and creameries of the West. They are simple, strongly made, and the opening at the top is so large that every part of them can be examined and thoroughly cleaned. Butter churned in a box churn or barrel churn without inside breaks comes in much better condition than in any churn with inside dash, and this class of churn is rapidly supplanting many others among dairymen.

FIG. 3.—*The "Boss" Churn.*

The improved Union Churn is represented by Fig. 4. It is made with a heavy stave bottom supported by strong hoops, with patent adjustable fastenings, ventilating cover, thermometer for testing the temperature of cream, gear-wheels to increase the motion of the double-acting dasher, which creates four distinct counter currents of cream at every revolution. The inside irons are all tinned to prevent rusting, and the churn has no projections inside, being easy to clean. For strength, durability, neatness, adjustability, ease of operating and rapid and thorough work, it ranks high.

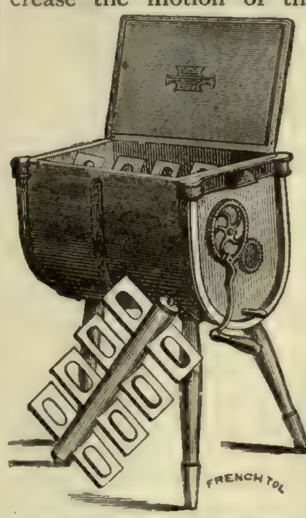


FIG. 4.—*Improved Union Churn.*

The churn represented by Fig. 5 is the I. X. L. Churn, which is an improvement on the old barrel or cylinder churn. It has a four-winged dasher, which folds together to be taken out. It is convenient to manage, and very durable.

Red Jacket Churn, which is nothing more than the old dasher churn, with a frame and gear to run it with, is represented by Fig. 6. This is perhaps the most successful attempt yet made to run the old dasher churn with machinery.

A good home-made churn can easily be made from a good, water-tight cask or barrel. Nail some cleats and lateral braces on the inside. The cover is held in place by a bar screwed loosely at one end to the head of the churn, the other end falling into a hook, after the cover is adjusted. This churn is then hung in a frame, a crank attached to it, and it is then ready for business.

Or, a good cask can have a cover fitted in the top and thus converted into a common dasher churn. As one can bring butter with a common dasher

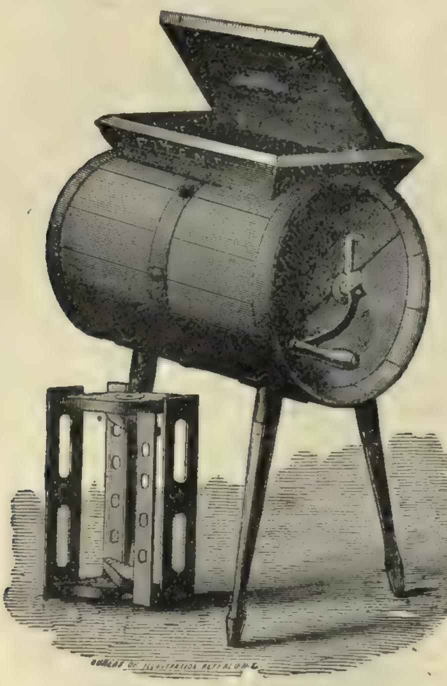


Fig. 5.—*I. X. L. Churn.*

churn in less time than is necessary for the best quality of butter, there is really no great need of complicated apparatus where only small quantities of butter are required to be made, as with most families.

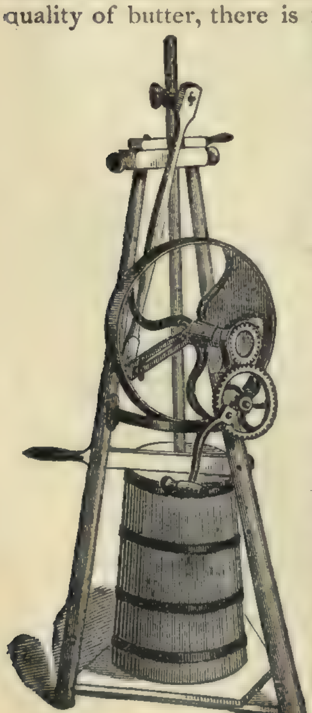


Fig. 6.—*Red Jacket Churn.*

Very neat, easy-running dog-powers (Fig. 7) are in the market, for running any light churn. Although intended for dairy purposes, they can be made use of wherever a light and portable power is desired. They are adapted for dash churns, and are also arranged with pulleys, or tumbling-rod and connections, for running crank or larger churns intended for power only. This power is supplied by Chas. P. Willard & Co., Chicago.

To keep a churn from frothing, take the body of the churn and cut a groove around the inside of the mouth, about three inches from the top and three-eighths of an inch deep, and then remove half the thickness of the wood, making a shoulder all around: then take the cover and cut it to fit accurately inside. Cloths, tubs, pans, etc., previously necessary to prevent the cream from flowing over, may now be dispensed with.

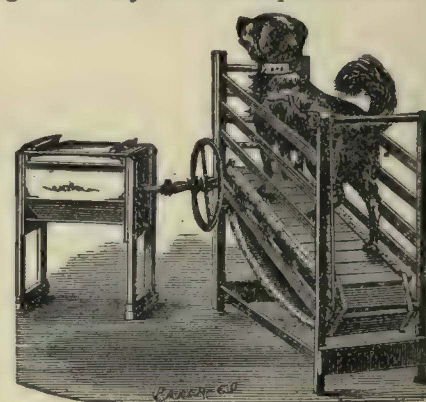


Fig. 7.—*Dog-Power.*

Churning: see under head of Butter.

Cider. "A drink made from the juice of apples." "The word is now appropriated to the juice of apples, before and after fermentation."—*Webster.* "A fermented liquor made from the juice of apples."—*Worcester.* It might prevent controversy among temperance people if they would abandon this ambiguous term, and substitute in their total abstinence pledges the phrase, "the fermented juice of fruits," or "any liquor containing alcohol."

For good cider, the apples should be allowed to hang on the trees as long as the wind and frost will permit them, and then picked by hand. The riper the apples the better the cider. They are then picked up and placed in large heaps, either in the orchard or at the cider mill, and are allowed to lie a few days to complete the ripening process, in which the starch is converted into sugar. Any that are bruised or rotten should be put in a heap by themselves, for an inferior cider with which to make vinegar. The apples are then rasped or ground into pulp. If the weather is cool or the apples not fully ripe, it is better to let the pulp remain in the vat a few days before pressing out the juice. This gives the cider a higher color, makes it sweeter and of better flavor. The process of pressing the apples is simple, but requires some skill. Four boards about six inches wide are nailed together in a square, the size it is desired to make the cheese, say from four to five feet each way. This is placed on the floor of the press, and a little clean rye or wheat straw is placed around the inside, with the ends extending some distance out-

side of the frame. A layer of pulp, say six inches deep, is then placed on the straw; the straw is then turned over on it, and a little pulp placed on the straw to keep it down. The rim is then lifted and a stick is placed on each corner of the layer of pulp added, and the straw turned over it as before. This process is repeated until the cheese is as large as desired, using say from 75 to 100 bushels of apples. When they can be obtained, use hair cloths instead of straw, to place between the layers of pomace. The straw, when heated, gives a disagreeable taste to the cider.

The pressing of the pulp, which is the next step in making cider, should be very gradual at first, else the pulp will burst out at the sides. But almost every one who undertakes to make cider at all is able to have a regular press or mill, manufactured on scientific principles, such, for example, as those illustrated in the annexed cuts.

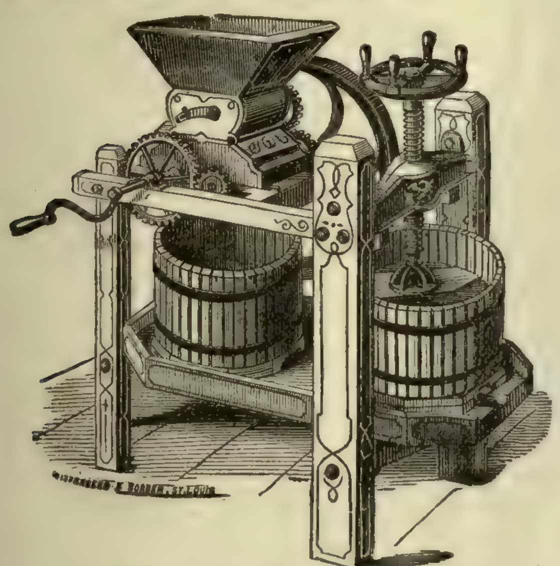


FIG. 1.—*Cider Mill, the "Americus."*

In the Americus the lower rollers run at the same speed as the upper, mashing perfectly. All mills should be left clean after using. The hopper of this mill can be removed in an instant for cleaning the mill after grinding. The lower rollers being adjustable, the mill can be set to mash grapes for wine without breaking the seeds.

Ragan's cider press is very compact, of immense power, weighs only 950 pounds, is portable, and can be removed from orchard to orchard in a regular two-horse wagon. It is 6⅓ feet high, 4¾ feet wide, and the platform is 6½ feet long. It can also be operated by horse or steam power, in which case a tight and loose pulley is placed where the crank is now seen at the left side of press. The ground apples are formed into cheeses by means of cloths made of coffee sacks or other suitable material, and said cheeses are formed by the open-ended square shapers, of which there are five. By raising loose pinion, which meshes with large wheel, you have a quick return motion. Parties owning portable engines can use them to great advantage after harvest by engaging in the cider-making business; it will pay large profit. Farmers may bring their apples eight to ten miles to make cider of them, as they thus get at least 25 per cent. more cider than they would by using the small hand mills.

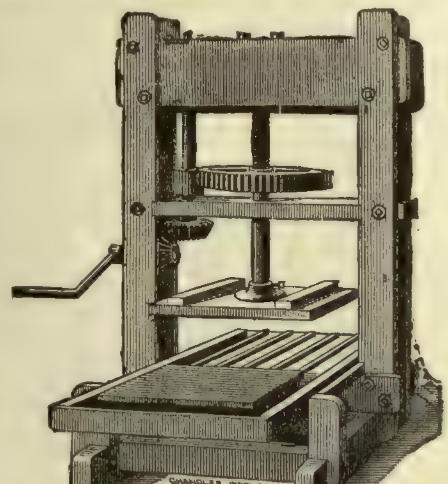


FIG. 2.—*Ragan's Cider Press.*

As the "sweet cider" runs from the press, let it pass through a hair sieve into a large open vessel, that will hold as much juice as can be expressed in one day. The cheese is generally allowed to remain under the press all night, and before leaving it in the evening the screw is turned as tight as possible. In the morning additional pressure is again applied. When the juice ceases to flow the screw is turned back, the boards taken off, and the corners of the cheese are cut off with a hay-knife and the pomace laid on the top. The pressure is now renewed, and the cider flows again for a time. Then remove the pressure, cut off and place on top as before four or five inches from the sides of the cheese, and the cider will flow once more. Eight bushels of good apples, in this manner, will make one barrel of cider. When little white bubbles break through the pomace, which will soon rise to the top, draw off the liquor by a spigot placed about three inches from the bottom, so that the lees may be left quietly behind. In this form of sweet cider it is a mild and pleasant beverage, which is not intoxicating. By another method the juice is placed in large, open tubs, and kept at a temperature of about 60°. After two or three days for weak cider, and eight or ten days for strong cider, or as soon as the sediment has sub-

sided, the liquor is racked off into clean casks. The casks are then stored in a cellar, shaded barn, or other cool place, where a low and regular temperature can be insured, and are left to mature and ripen until the following spring, when it may be re-racked for use. The refuse pulp is an acceptable food for pigs and neat cattle.

If it is desired to keep the cider sweet for a long time, any one of several methods may be adopted. First, let it stand in open casks or barrels, and put into each barrel about one pint each of hickory (if you have them; if not, other hard-wood) ashes and fresh slaked lime; stir the ashes and lime first into one quart of new milk; then stir into the cider. It will cause all the pomace to rise to the surface, from which you can skim it as it rises; or you can let it remain about ten hours, then draw off by a faucet near the bottom, through a strainer, to avoid the hardened pomace. Then a handful of powdered clay may be put into the barrel, or two or three pounds of well burnt charcoal. Others add a little mustard seed, from one to two gills for each barrel. Sometimes a few gallons of cider are placed in the barrel, and a rag saturated with brimstone is attached to the inner end of a long tapering bung; this is ignited and the bung loosely inserted. After the brimstone is consumed, the barrel is rolled until the cider has absorbed the sulphurous acid gas. The barrel is then filled up with cider. The sulphurous acid arrests fermentation. The objection to this method is that if too much gas is absorbed, it may prove unpleasant, and it may prove injurious in any case. To obviate this objection sulphite of lime is now used, which has the property of arresting fermentation, making the cider perfectly clear, and imparting an agreeable taste. One-fourth of an ounce of sulphite is added for each gallon of cider. The sulphite should first be dissolved in a quart or so of cider before introducing it into the barrel. Agitate briskly for a few moments, and then let the cider settle. The fermentation will cease at once. If loosely corked, or kept in a barrel on draught, it will retain its taste as a still cider. If preserved in bottles carefully corked it will become a sparkling cider, and may be kept indefinitely long.

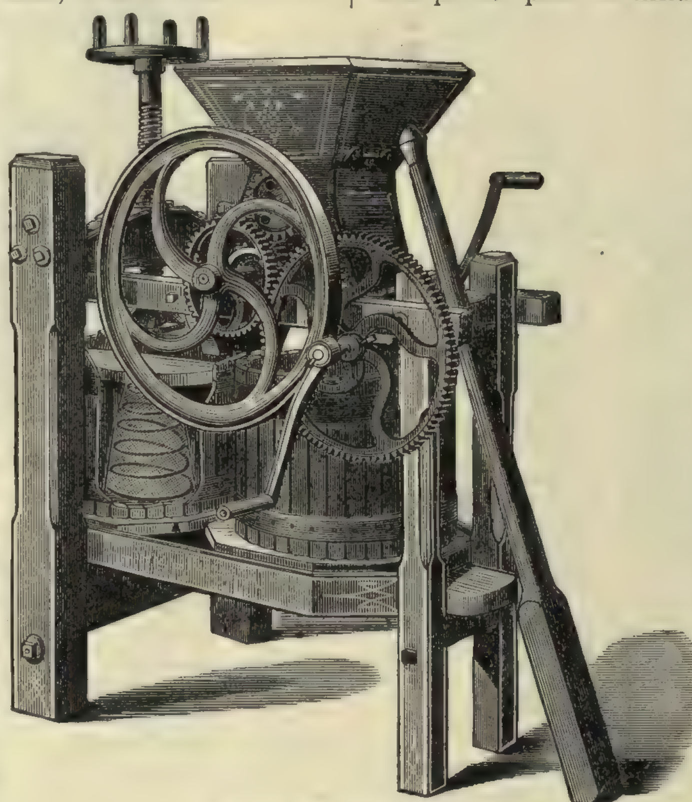


FIG. 3.—*The American Cider Mill.*

Whatever method may be adopted, the cider must be drawn off into very clean, sweet casks, and closely watched. The moment white bubbles are perceived rising at the bung-hole, rack it again. When the fermentation is completely at an end, fill up the cask with cider in all respects like that already contained in it, and bung it up tight. The most perfect plan for excluding all action of the air from the surface of the cider, and preserving it sweet, is the addition of a tumbler of sweet oil before finally closing up the bung-hole. It is not an easy matter to keep cider sweet and pure for any length of time, especially if the weather is warm. If the cider is not made until just before winter sets in, and can afterwards be kept at or near the freezing point, it will remain sweet and excellent.

The mill, Fig. 3, is constructed on an entirely different principle from other cider mills, which either grate or cut the apples, leaving the larger portion of the pomace in lumps, from which the juice cannot be extracted by the press. in this mill the two lower rollers are cast with alternate ribs and grooves, interlocking to draw in the apples, and the fruit is mashed between the smooth segments, breaking thoroughly all the cells, so that the cider is thoroughly extracted in the press.

To make good fermented cider, that will keep a year or more without turning too sour to be used for anything but vinegar, is not a difficult matter. The first thing is to exclude all decayed fruit, but it should be quite ripe. The sweeter the juice, the stronger the cider, and the better it will keep. Put the barrel immediately in a cool cellar, the cooler the better. The fermentation may go on

slowly or rapidly, practice differing in this respect. In the former case the liquid is treated the same as wine. In the bung there is fixed, air tight, a metal tube bent at right angles, or a piece of india rubber tube. In either case the free end of the tube dips into a vessel of water.

This arrangement allows the gases liberated in fermentation to pass out, and the end of the tube being covered with water, air cannot pass in. The bubbling of the gas through the water shows how the fermentation is progressing. When this has ceased the cider is racked off into clean casks, which are to be full and bunged tightly. The importance of keeping the cider in a cool place is too often overlooked. The temperature should not exceed 50°. When exposed to the full heat of autumn, much of the alcohol is converted into vinegar, by the absorption of atmospheric oxygen.

Another process is as follows: After obtaining the juice as already directed, strain it through a coarse hair sieve into open vats or close casks. When the liquor has undergone the proper fermentation in these close vessels, which may be best effected in a temperature of from 40° to 55° F., and which may be known by its appearing tolerably clear, and having a vinous sharpness upon the tongue, any further fermentation must be stopped by racking off the pure part into open vessels, exposed for a day or two in a cool situation. After this the liquor must again be put into casks and left in a cool place during winter. The proper time for racking may always be known by the brightness of the liquor, the discharge of the fixed air, and the appearance of a thick crust formed of fragments of the reduced pulp. The liquor should always be racked off anew as often as a hissing noise is heard, or as it extinguishes a lighted match held to the bung-hole. When a favorable vinous fermentation has been obtained, nothing more is required than to fill up the vessels every two or three weeks, to supply the waste by fermentation. By the beginning of March the liquor will be bright and pure, and fit for final racking, which should be done in fair weather. When the bottles are filled they should be set by, uncorked, till morning, when the corks must be driven in tightly, secured by wire or twine and melted resin, or any similar substance.

Cider should never be put into new casks without previously scalding with salt water, or with water in which pomace has been boiled. Beer casks should never be used for cider. Wine and brandy casks will keep cider well, if the tartar adhering to their sides is first carefully scraped off and the casks are well scalded. Burning a little sulphur in a cask will effectually remove must. Cider may be preserved for years by canning it air-tight, as fruit is canned. To cleanse old casks, take lime water and a trace chain and put them in the barrel through the bung-hole, first fastening a strong twine to the chain to draw it out with. Then shake the barrel about until the chain wears or scours off all mold or pomace remaining in the barrel. Then rinse well with water; after throwing out the rinsing water put in a little whisky, turning the barrel to bring it in contact with every part, and pour out all that will run out. To clarify cider, to one hogshead add one and a half gallons of brandy or rum, two ounces powdered catechu (dissolved in water), seven pounds moist sugar or honey, four ounces mustard seed, one-half ounce bitter almonds, and one-half ounce cloves. These must be well stirred in, and occasionally stirred up for a fortnight, after which it must be allowed to repose for three or four months, when it will usually be found as bright as wine. Should this not be the case, it must be fined with a pint of isinglass finings or a dozen eggs, and in two weeks more it will be fit for use. If the cider be preferred pale, omit the catechu, and instead of the isinglass, fine with one quart of skimmed milk. If wanted of a light reddish or rose tint, use one-half ounce cochineal and omit the catechu.

Preparatory to bottling cider, it should be clarified until it is clear and sparkling. The bung should be left out of the cask the night before the cider is bottled. The bottles themselves should be left unclosed the next night, else some will burst. The corks should be of good quality, and be covered with tin foil, as with champagne. When the cider is wanted for immediate use, or for consumption during the cooler season of the year, a small piece of lump sugar may be put into each bottle before corking it. When intended for keeping, it should be stored in a cool cellar, when the quality will be greatly improved by age.

Champagne Cider is made by mixing in one hogshead cider 3 gallons spirit and 20 pounds sugar or honey. Let it rest for two weeks, then fine with two quarts skimmed milk. This is very pale, and a similar article, bottled in champagne bottles, and silvered and labeled, has often been sold to the ignorant for champagne. It opens very brisk if managed properly.

Imitation Champagne is made by putting a teaspoonful of carbonate of soda, two teaspoonfuls fine sugar, and a tablespoonful brandy in a tumbler and filling up with sharp cider.

Imitation Cider is made by the use of the following recipe: 25 gallons soft water; 2 pounds tartaric acid; 25 pounds New Orleans sugar; 1 pint yeast. Put all the ingredients into a clean cask and stir them up well after standing 24 hours with the bung out. Then bung the cask up tight, adding 3 gallons spirit, and let it stand 48 hours, when it will be ready for use.

Sweet Cider may be imitated as follows: Take 100 gallons water; 5 gallons honey; 3 ounces

powdered catechu; five ounces alum; one quart yeast. Ferment for 15 days in a warm place in the sun, if possible; then add bitter almonds, half pound; cloves, half pound; burnt sugar, one quart; whisky, three gallons. If acid be in excess, correct with honey or sugar. If too sweet, add cider vinegar to suit the taste.

A cheap imitation is made by the usual ingredients, and sulphuric acid to give it "body." This is not near so good as to ferment.

Cinchona (sin-ko'na), Peruvian or Jesuit bark. There are several barks of cinchona, used in medicine, and from which "quinine," or the sulphate of quinia, is made. Cinchona, or its barks, are not used in horse and cattle diseases. Quinine is the only preparation used; but its high price is against its use in veterinary practice. Among valuable horses, it is frequently used to hasten recovery from influenza, lung fever, etc.

DOSE. Twenty to 40 grains, repeated from three to four times a day. Quinine is apt to be adulterated with arsenic, as proved to be the case with many samples used in the late war.

Cinnamon. Ground cinnamon is frequently adulterated with cassia bark, which may be distinguished, before being ground, by its greater thickness, its breaking without splintering, and its redder color and bitter taste. Sometimes, indeed, the ground article is all cassia, and sometimes it consists in great part of other ingredients, as starch or saw-dust.

Circular Work, TO MEASURE: see Measurements.

Cistern. Every farmer should have a cistern. Soft water is needed by the wife not only in washing, but for a hundred different purposes. The quantity of rain-water falling on roofs in a year is commonly much under-estimated. Three feet of rain per annum, the average quantity, gives 72 barrels for each space of 10 feet square; a barn 30 by 60 feet yields from its roof each year 650 hogsheads of rain-water, most of which is wasted. In building the cistern, have the walls below the reach of the frost. To supply an ordinary family, it should be at least ten feet deep and four in diameter. Of course, in very wet ground, or where hard rock is in the way, the cistern has to be broader and shallower. It should be walled up with brick or stone (brick is the best), and well cemented with the following: Take equal parts of quicklime, pulverized baked bricks and wood ashes, thoroughly mixed and diluted with sufficient linseed oil to make a paste. It immediately hardens and never cracks beneath the water. A cheaper cement, however, and about as good, is a mixture of two parts of Louisville or Rosendale cement with one part of sand.

To smooth the surface, brush it over with a white-wash brush dipped in clear water, thus closing up all the openings that may have been left by the trowel; when sufficiently hardened, white-wash it with clear cement and water. This forms a glazed surface like earthenware.

For filtering, build a partition wall, curving to the side where the water runs in, curve to be one inch to the foot; make the dividing wall double, two feet high and one foot wide; this space fill with finely pulverized charcoal and sand, two parts charcoal one part sand. Of course the partition wall does not need cementing. Another plan is to dig two cisterns and filter the water from one to the other by means of a pipe filled with charcoal and sand. To rectify impure water in the cistern, put in two ounces of permanganate of potash to each 25 barrels of water.

To calculate exactly the capacity of a jug-shaped cistern requires more nice figuring than most persons care to undertake. The contents of any cistern can be easily approximated by the use of the following table, calculated for a cistern of uniform diameter from top to bottom, for each ten inches of depth:

DIAMETER IN FEET.	NO. OF GALLONS.	NO. OF BARRELS.
2	19	2/3
2½	30	1
3	44	1 3/8
3½	60	2
4	78	2½
4½	97	3 1/8
5	122	3 7/8
5½	148	4 2/3
6	176	5 3-5
6½	207	6½
7	240	7 5/8
8	313	10
9	396	12½
10	489	15½
11	592	18¾
12	705	22¾
15	1101	33 1/3
20	1958	62

Thus, a cistern seven feet in diameter and ten feet deep, would contain 7 5/8 x 12, or 91½ barrels. (Ten feet is 12 times ten inches). A cistern gradually increasing or decreasing in diameter can be estimated by sections, taking, for example, every ten inches, which will render it easy to work by the above table.

Citric Acid, the acid of lemons and limes, which are fruits of the citron family. The acid, as concentrated, is a crude poison, but diluted, it has of course the same properties as lemon juice. To be of the average strength of lemon juice, the acid is dissolved in the proportion of 18 drachms to the pint of water.

Citron, the fruit of the citron tree, which is of the same family with lemons, limes and oranges, and grows in warm countries; also the name of a species of watermelon, globular in form and symmetrically striped and used only in preserves; also, of late, a name of the cantaloupe or nutmeg muskmelon. In both the latter senses the word is unauthorized according to Webster's dictionary. The cultivation of the citron watermelon is the same as that of any other species of watermelon.

Candied citron, such as is used for fruit cake, can

be prepared from the above at far less cost than to buy the imported. If the citrons are small, divide them lengthwise into eighths; if large ones, divide again; pare off the rind and pick out the seeds carefully, then drop the slices into boiling syrup—maple syrup is best, but syrup made from clarified sugar will do; use syrup enough to cover the pieces, cook slowly until the syrup is nearly boiled down, then place the pieces on plates to dry; dip the thickened syrup over the pieces, and then dry them in the stove oven, being careful to watch them closely so they will not scorch. After all the syrup has been dried in and the citron candied down, place it in glass jars for future use. Use, the same as imported citron.

City. For information in reference to seeing the sights of a city, the things and persons to be avoided, caution, advice, and the general rules to be observed by the person in visiting the city, we refer the reader to the article on Traveling.

Cives or **Chives,** a hardy species of onion, of easy culture. It is propagated by tearing to pieces the old clumps and setting the divisions in rows a foot apart. Not cultivated as much as formerly.

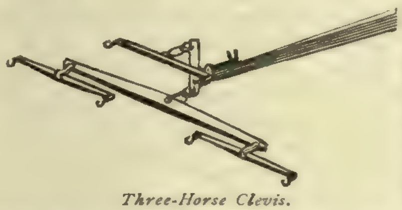
Clabber, bonnyclabber, or loppered milk; milk which has soured and become coagulated, or thickened.

Clay, a soft earth, which is plastic, or may be molded with the hands, and consists of alumina, silica and water. It originates from several species of rock, worn down very fine. Lime, magnesia, oxide of iron and other ingredients are generally present. One of the purest kinds of clay is decomposed from granite; and that which comes from feldspar, one element of granite, is the "porcelain" clay. "Potter's" clay is a tolerably pure kind, free from iron. "Brick" clay contains some iron, on which account it turns red when burned. Clay for fire-brick is entirely free from lime, iron or any alkali, and will not therefore glaze in burning. "Fatty" clays are those which feel greasy. "Clay loam" contains 15 to 20 per cent. of sand, while "loamy" clay contains 30 to 60 per cent. Pure clay is infertile, but it forms the body of all fertile soils. In the West the clay underneath the black humus or soil is yellow, and averages about 20 feet in depth; underneath this is another black soil, which was once the surface of the earth; and underneath the latter again is a body of "blue clay," very compact and sticky, requiring picks in digging it.

Clay, being gradually heated, parts with its water and diminishes in bulk without cracking. Heated to redness, it forms a solid msss, which retains its form even if placed, when cool, in water and allowed to absorb this into its pores. Free from foreign substances, it bears the most intense furnace-heat without melting and is hence well suited for the manufacture of crucibles and fire-brick.

Cleaning: see article to be cleaned.

Clevis, a U-shaped piece of iron for hitching a whiffle-tree to a plow, harrow or cultivator. A "dial" clevis is one on the forward end of the beam of a breaking plow, arranged on a dial-plate piece of iron for gauging the plow to the land. The three-horse clevis is illustrated in the annexed engraving, also one style of three-horse whiffletrees. See Whiffletree. It will be noticed in the cut that the principle is to give the middle horse twice as much leverage in the clevis as is given the other two horses combined, so that the draft may come equally upon the three.



Three-Horse Clevis.

Climate. Climate affects the agriculturist so far as the product of the soil is concerned, in an important degree; heat, rainfall, humidity, air currents, all operating for or against the fertility of the soil. The principal points collected from a variety of sources, as relating to the United States generally, are summed up as follows: The climate of the United States is a peculiar one. Most of it lies within the dry belt of the trade-winds, which, in our summers, make the dryness of the California climate and of New Mexico, where the corn crop is dependent on irrigation. There are two of these dry belts, one on each side of the equator, and their dry winds blow diagonally into each other, producing by their mutual action a belt of rain about 500 miles in width under the equator, and directly under the sun. These winds are concentrated by the lofty range of mountains in South America and Mexico, and turned northwards, carrying with them this belt of rains. In our summer they extend west as far as the middle of Texas; thence north, through the middle of Kansas; they curve gradually eastward and pass to the Atlantic by the line of the great northern lakes, covering all the old States with the rains from this equatorial belt; extending no further west than the middle of Texas and Kansas, they leave the western portions of them to the dry California climate. These rains, from causes not yet fully ascertained by science, are irregular as to time, quantity and duration. In the spring they are more concentrated, giving us the heavy, beating rains of March and April, and in July and August they cease almost entirely. We have no rains from the evaporations of our country; these we see in the form of dew only, or, at most, they but slightly increase the amount of our equatorial rains. From this source of our rains results the extremes so peculiar to the American climate. At one time our plowed lands are saturated with water, our clay soils are melted, and, in drying out, are compacted, so as to be much harder than the frosts left them in spring, before they were broken up. Then quickly follow droughts, parching and baking the soil, making it unfit, if worn, for profitable production. These influences of the climate so act upon the soil that the standing topics of our agricultural writers are

drainage, thorough plowing and constant stirring of the soil.

Nearly all the rain of California falls between November and June. The annual fall of rain in that State is about 22 inches, decreasing southward to the Colorado desert, where it is almost nothing. In the northern part of the State, and on the western slope of the Sierra Nevada, the range is stated at 35 inches per annum. The general average is about that of half the States east of the Mississippi. This average increases northward. At Humboldt it is about 45 inches, and at Vancouver's Island about 65 inches per annum. At Port Townshend, on Puget Sound, the distinction between the wet and the dry season is practically obliterated, the fall of rain being distributed throughout the year. On Sitka Island it becomes excessive, the mean annual deposit being 89.90 inches. Coming now to the climate of the West and Northwest, east of the meridian near which Omaha is situated, we find a climate often intensely cold or at least variable in winter, but with plenty of rainfall, equably distributed, and with summers of strong heat so the grape may be ripened well up to and even in Minnesota. So the more prolific varieties of Dent corn thrive as nowhere else in the world; also all cereal grains, sweet potatoes, tomatoes, egg plant, pepper, melons, and many other tropical and sub-tropical annuals. As a fruit-growing region the prairie districts are not especially adapted thereto, yet with a little care many varieties adapted to the climate may be raised, and the timber districts are unsurpassed in the production of fruit, the peach and sweet cherries flourishing on the east shore of Lake Michigan, nearly to 45° north latitude. West of Omaha the climate becomes dryer and dryer until passing the hundredth meridian, or the central part of Kansas, the climate becomes too dry in summer for general agriculture, or the successful cultivation of fruit and the cereal crops without irrigation, but is eminently adapted to pasturage. Further north there is more rain, so that, in the latitude of Minnesota, cereal crops may be raised in the valleys through to the Pacific coast.

The nature of the vegetation covering the earth varies, as we have remarked, according to the climate and locality; and plants are fitted for different kinds of soils, as well as for different amounts of temperature, light and moisture. From the poles to the equator this constant variation in the nature of the flora is a shifting scene, passing from the lichens and mosses (the lowest vegetable forms in the arctic and antarctic regions) to the noble palms, bananas, and orchids of the tropics by a series of regulated changes through all the multiform aspects of the vegetable kingdom. The same progress and graduated fitness is observed in the vegetation of lofty mountains under the equator, when descending from the summit to the base. From the scanty vegetation of Greenland, where the only woody plants are the arctic willows, trees scarcely a finger-length in height, we may trace the expansion of vegetation as we move southward over the lichens and mosses to the saxifrages and cruciferous plants, those resembling the cabbage and turnip in their mode of flowering; then to grassy pastures, and by coniferous or fir-like trees, and amentaceous or birch and alder-like trees, to the northern borders of the United States. Extending our glance further southward we shall perceive that we enter the region of oaks, hickory and ash, of tulip (Liriodendron), cottonwood, buttonwood, walnut, red and white cedars, sugar and other maples, sassafras, sumac, laurel, and many other trees and shrubs of the temperate regions of North America. In the districts further south we find an increase both of species and of genera, and more tropical forms show themselves, such as magnolia, Osage orange, honey locust, cypress, holly, bay, wax myrtle, the cotton plant, rice, the live oak, and enter the borders of the regions of the palmetto and the orange; thence to those of the sugar-cane and pineapple, the coffee plant and the cocoanut, and the luxuriant vegetation of the equator and torrid heats. In this progress, as Humboldt, the father of geographical botany, remarks, we find organic life and vigor gradually augmenting with the increase of temperature. The number of species continues to increase as we approach the equator, and each zone presents its own peculiar features: the tropics their variety and grandeur of vegetable forms; the north its meadows and green pastures, its evergreen firs and pines, and the periodical awakening of nature in the spring-time of the year. Many causes intimately connected with the aspects of our globe have an influence in modifying the conditions of climate, and thus affecting the distribution of animals and plants on its surface. The geographical forms of contour, the relief or elevation and depression of the terrestrial surface, the relations of size, extent, and position, each exert a very marked effect upon the climatic peculiarities of a district. The bearing or direction of the shores of a continent, the elevation of a mountain in one place rather than in another, the subdivision of a continent into islands or peninsulas, and other minor differences, have very important bearings upon the climate of a district. The depression of a few hundred feet over some wide areas would reduce some regions to the level of the sea, or sink them beneath its waves, or so modify the climate of the higher portions left above the waters as to render them no longer tenable by the life that once enjoyed a congenial clime. This is shown by the observation that some low islands scattered in clusters are covered with a vegetation entirely different from that of extensive plains, though lying in the same latitude. A change in the bearing of the shores would modify the currents of the ocean, which would react upon vegetation. Mountain-chains have oftentimes an influence upon the prevailing winds, and their height, or the plateaus from which they arise, modify the climate, and render it temperate or arctic under the fervent heats of the torrid zone. A mountain-chain extending from east to west may form a barrier between the colder regions on the north and the warmer on the south, and thus protect the northern plains from the warmer winds of more tem-

perate regions, and increase the heat on the southern slope. This is exemplified by the Alps of Switzerland, which reduce the temperature of Germany below the mean that would otherwise prevail but for their cooling influence. Under some of the high towers of this mountain-barrier against the assaults of winter, the palm, the pomegranate, the orange and the olive grow, in the open air, while a few miles to the eastward, in valleys open to the north, through which the hurricane-blasts of the Borra rush with terrific force and severity of cold, often sweeping vessels from anchorage, these more tender plants cannot exist. A few thousand feet in elevation, which is insignificant compared with the mass of the earth, changes entirely the aspect and the character of a country. For evidence of this assertion we may compare the burning region of Vera Cruz—its tropical productions and its fatal fevers—with the lofty plains of Mexico, their temperate growths and perennial spring, or the immense forests of the Amazon, where vegetation puts forth all its splendors, and where animal life is abundantly prolific, with the desolate paramos or Alpine regions of the summits of the Andes, rude, ungenial and misty.

The climate that would result from latitude alone is greatly modified by the presence or absence of extended sheets of water; and the distribution of heat through the year, for any place whatever, depends essentially on its proximity to, or its distance from, the ocean or large lakes, and the relative frequency of the winds that blow over them. The equalizing influence of large bodies of water, the temperature of which is less liable to sudden changes than the atmospheric air, is quite apparent.

Knowing as we do how much local influences, as supply of moisture, currents of air, elevation, capacity of soil for absorbing and holding heat and moisture, and the various other conditions that may be seen by every observing person, alter the range of production in localities, we have the key to many of the difficulties in the cultivation of crops, and thus may easily see why certain plants may be hardy and prolific in one locality and yet impossible to be successfully cultivated in another, not far distant. For instance, the peach is at home in Western Michigan, near the lake shore, while in Illinois, not more than 40 miles west, it can not be raised at all. The climate of that State, modified by the unfathomable depths of Lake Michigan, is cooler in summer and warmer in winter, and they escape spring frosts, prevalent in Illinois in the same latitude.

Clingstone, a peach the flesh of which clings to the stone.

Clipping of Horses. The clipping or shortening of the hair of the horse, in winter, is as vicious as it is distressing to the animal, unless in the case of horses used for fast driving, and which, both in and out of the stable, receive the very best of attention and clothing. So the clipping of the long hair about the lower limbs and fetlock should never be allowed except the horse be kept out of cold drafts, when standing, and also is thoroughly washed and dried, by rubbing, when brought into the stable. See article on Horse for directions as to how clipping should be done.

Clocks are indispensable at the farm-house; meals must be ready on time; farm hands must be wakened early in the morning; and a thousand things require its presence. The best kind for a farmer is an eight-day alarm. A pendulum clock run with weights, although not so portable, keeps time more evenly than spring clocks, which run a little too fast when wound up and too slow when nearly run down. In setting up a clock great care should be taken that the pendulum rod swings easy, that is, that the thin portion works squarely back and forth and not with a warping jerk. In setting the time, it is customary in the country to call it 12 o'clock when the sun is on the meridian as shown by the noon mark; but the sun generally varies from true clock time, sometimes as much as a quarter of an hour. A good almanac indicates the variation for each day in the year. Those living near railroads generally keep "railroad" time, which is of course more satisfactory. In winding up a clock, be careful not to shake it much, and always keep the clock door closed when not winding or repairing, in order to keep out all dust.

Closet (clọz'et), literally, a closed place; in general, a small room for private retirement; also, a case for containing clothes, articles of furniture, curiosities, etc. The various closets are named with reference to the use made of them, as "clothes" closet, "water" closet, etc. These "closed" places are, of all places in the house, the best calculated to hold confined air, and are therefore universal sources of malaria. It requires some trouble to ventilate them frequently as they should be, at some seasons of the year almost or quite every day. But all closets should be made self-ventilating in their original manufacture. Every domicile should also have a bath-room. Families of very limited means can cheaply construct a small room adjoining the back side of the cook stove, in such a way that the stove will not only keep the room warm but furnish hot water, so that it may be ever convenient to take a comfortable bath. What is inconvenient to be done is generally neglected. See Residence and Privy.

Cloth, any woven fabric, of fibrous material, used for garments or other purposes. "Broadcloth" is a fine kind of woolen for men's garments, exceeding 29 inches in width, all woolens of less width being known as "narrow" cloths.

To revive the color of black cloth, first clean it well (see Laundry); boil two, three or four ounces of logwood half an hour; then dip the coat in warm water, wring it well, and boil it half an hour in the logwood water; take it out, dissolve in the logwood water a piece of copperas about the size of a small thimble, and in this solution boil the cloth another half hour; then draw it, hang it in the air an hour or two, rinse it in two or three cold waters, dry it, and brush it thoroughly with a soft brush over which a drop or

two of olive oil has been rubbed, and finally stroke the cloth regularly all over. A cloth coat may be treated by this method.

To raise the nap on cloth, soak it in cold water half an hour, then put it on a board and rub the threadbare parts with a half-worn hatter's card filled with flocks, or with a prickly thistle, until a nap is raised. Hang up to dry, and with a hard brush lay the nap the right way. For other treatment of cloth, see Bleaching, Dyeing, Cement, Laundry and Waterproofing.

Clothes Line, Pins, Rack and **Wringer:** see Laundry.

Clothing: see Hygiene.

Cloud: see Weather.

Clover. The several clovers afford valuable provender for live stock. The most popular, in their order, are, the white, the red, lucern, Alsike, sainfoin, Bokhara, Southern, spurry, yellow, etc. The white so universally propagates itself that it is seldom cultivated. Along with blue-grass it is the most efficient herb in forming a dense mat under the feet of horses and cattle. The several varieties of white clover are peculiarly partial to clay lands having a rich vegetable mold upon the surface; and the addition of gypsum or salt will at all times give them great luxuriance. They are all too low for harvesting.

Fig. 1 represents the white clover. This is a valuable honey plant, especially in June. Its chaste and modest bloom betokens the beautiful, luscious and unrivaled sweets which are hidden in its corolla tube as a storehouse for the little bee to feast upon.

Fig. 1.—*White Clover.*

The common red or Northern clover, a biennial, is the best kind for cultivation and cutting. In Wisconsin the smaller variety is the best. It is very easy of cultivation, especially on limy soils, where sometimes it is indeed a triennial (lasting for three years). The seed may be sown broadcast either in August or September, but much better and surer in early spring, with most of the grains or the cultivated grasses; or it may profitably constitute a crop by itself. On well prepared loams, 10 to 12 pounds of good seed will frequently give a full covering to the land, while on clay 12 to 16 pounds are necessary to the acre. When sown with the grasses, four to six pounds on the first kind of soil are sufficient, and 8 to 12 pounds on the last. The more thickly sown, however, the finer the stems will be, and on that account a little better as provender. If sown on well pulverized ground, especially before a rain, it will germinate freely enough without being harrowed in. After the leaves are out in the spring, gypsum may be sown broadcast, at the rate of three to four bushels to the acre, where the land is at all favorable to its action. The effect is extraordinary. Bones are good manure for clover.

Fig. 2.—*Clover Roots.*

Fig. 2 shows how the roots go down deep into the earth, which they loosen, and whence they bring up, like gold miners, the treasures of the deep and deposit them near the surface of the ground for the use of other crops. Poor sandy soils may be made to sustain clover with manure, ashes and gypsum, combined with the free use of the roller. This object is much facilitated by scattering dry straw over the surface, which affords shade, increases the deposit of dew and prolongs its effects.

The value of clover for enriching and renewing land is almost incalculable. It is a common observation of intelligent farmers, that they are never at a loss to renovate such lands as will produce even a moderate crop of clover. Poor clay lands not capable of bearing this plant, have been made so capable by sowing an early and a late crop of oats in the same season and feeding them off on the ground.

Clover should be cut after having fully blossomed and assumed a brownish hue. By close cutting, more forage is secured, and the clover afterward springs up more rapidly and evenly. The swath, unless very heavy, ought never to be stirred open, but allowed to wilt on the top. It may then be carefully turned over, and when thus partially cured, placed in high, slender cocks and remain till sufficiently dry to stow away in the barn. Storage can be done while the clover is comparatively green if 10 to 20 quarts of salt per ton is evenly scattered over it in the mow. It is somewhat better, however, to place in alternate layers of dry grass, hay or straw, which will absorb much of the nutritious gases.

The second crop of clover may be either saved for seed, mown, pastured, or turned under for manure. The greatest benefit to the soil can be secured the second year, when the dried roots are in the propor-

tion of 56 for every 100 pounds of clover hay produced from them in two years. This then is the proper time for plowing up the field and renewing again its accustomed round of crops. If desirable, clover may be imperfectly sustained on some soils for a few years by the use of gypsum, bone-dust, ashes, and other manures. In rare cases of upland meadow, clover has been known to keep well up for quite a number of years, but in such cases no seed crops must be taken from it. In wet lands the roots are often thrown out by "heaving" by frost of winter, in which case a tolerable crop may be secured by heavy rolling. Wet lands, for clover, should be under-drained.

Harvesting clover-seed may be done generally after taking off one crop, or pasturing the field till June, or at such time as experience shows to be the proper one for leaving it to mature a full crop of seed. Early mowing removes the first weeds, and the second growth of the clover is so rapid as to smother them. It is then mown and raked into very small cocks, and when dried at the top they are turned completely over without breaking. As soon as thoroughly dried they may be carried to the threshing-floor and the seeds beaten out with sticks, light flails or a "clover-huller."

A kind of horse-rake with closely set teeth can be used to advantage in collecting clover-heads from the standing stalks. For cropping at home, these heads can be sown without threshing. It is difficult to thresh clover until after it has fermented in heaps, to divide the little seed-pods.

Southern clover is smaller, does better on a light, thin soil, and matures 10 to 14 days earlier than the Northern red. Yellow clover, like the white, is spontaneous, prolific and hardy. Bokhara or sweet-scented clover is a tall, shrub-like plant, four to six feet high, with branches whose extremities bear numerous small flowers of great fragrance. When full grown it is too coarse for fodder, but if thick and cut young it yields a profusion of green or winter forage. It should be sown in the spring with about two pounds of seed per acre, in drills 16 to 20 inches apart; and must be kept clear of weeds. It requires a rich, mellow, loamy soil. But the extreme northern portion of the United States is rather too cold for it, as it is also for crimson clover and sainfoin.

Lucern is one of the most productive plants for forage ever cultivated. Compared with red clover it is inferior in quality, but considering its productiveness, it is in many places more valuable. It bears three to five crops a season, yielding three to eight tons of hay to each crop. It is hardy in the South; the Northern States are rather too cold for it. It requires a deep, dry, loamy soil, free from weeds and well filled with manure. A suitable crop to precede it is corn or potatoes, heavily manured and kept clean. Plow in the fall and add 40 bushels of crushed bones to the acre. Early in April, harrow thoroughly and sow in drills from one to two and a half feet apart, at the rate of eight or ten pounds of seed per acre. Stir the ground and extirpate the weeds with the cultivator or horse and hand hoe. It may be lightly cropped the first year, and more freely the second, but it does not attain full maturity till the third. Being a perennial, it requires no renewal. It should be cut before getting too heavy, and cured like clover. Liquid manure, gypsum and ashes are good for this plant. Barnyard manure, freed from weed-seeds, is occasionally needful. It is one of the most valuble plants for soiling.

Fig. 3.—*Alsike Clover.*

Alsike (al-see' ka), or Swedish clover (Fig 3.), seems to be very capricious in its productiveness in this country, succeeding well in some places and not at all in others. In moist ground, however, it succeeds better than red clover, growing to the average height of this plant and bearing white blossoms, and is probably not so liable to winter-kill or to be drowned out by wet weather. This is a most excellent honey plant, and should be sown by apiarists. It forms fine pasture and makes good hay for cattle and sheep. It is best for provender when mowed at the full maturity of the blossoms. The aftermath is both dense and heavy, and endures until late in the autumn.

Fig. 4.—*Melilot Clover.*

Melilot or sweet clover, Fig. 4, both white and yellow, blooms from the middle of June till the first of October. It is a most excellent bee plant. Its perfume scents the air for a long distance. These clovers are biennial, not blooming the first season, and dying after they bloom the second season. They have no value except for honey, and are said to become pernicious weeds if allowed to spread.

Spurrey is a hardy plant which grows spontaneously in the "Middle States." Its chief merit consists in its growing on soils too thin to bear clover. Poor soils with it can readily be brought up to the clover-bearing point. It is excellent for cows giving milk. If the land is to lie several years in pasture, white clover should be sown with it. When sown in the middle of April, in the latitude of 40° or 41°, it is ripe for pasture by the end of May. When eaten off in June, the land is turned flat and another crop is sown, which

18

affords fine pasture in August and September. This operation is equivalent to a dressing of ten loads of manure per acre.

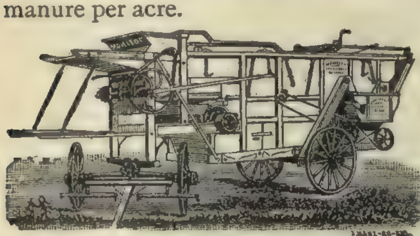


FIG. 4.—*Birdsell's Clover Separator.*

Three crops can be grown upon land in one season, which, if turned in or fed on the ground can be made a means of rapid improvement. See Alfalfa or Lucern.

Cloves, a valuable aromatic. The oil of cloves applied with raw cotton, is said to be very effectual in relieving toothache.

Clyster, an injection of water or medicated fluid into the bowels by means of a syringe; an enema. We give the following forms of clyster used for cattle and horses:

LAXATIVE CLYSTERS, useful in obstinate constipation, "stoppage," or whenever the excrement is hard and dark colored:

3 or 4 Quarts warm water,
8 Ounces linseed oil,
1 Tablespoonful common salt (fine).

Another:

4 Quarts warm water,
1 Gill soft soap,
½ Tablespoonful fine salt.

EMOLLIENT CLYSTER, to be used in all cases of irritation and inflammation of the intestines and bladder:

2 Ounces slippery elm bark,
2 Quarts boiling water.

Simmer over the fire a few minutes, strain through a fine sieve, and inject, when nearly cool. The following articles may be substituted for elm: flaxseed, lily roots, gum Arabic, poplar bark, Iceland moss.

STIMULATING CLYSTER, to be used in all cases when the rectum and small intestines are inactive and loaded with excrement, or gas:

3 Quarts of thin mucilage of slippery elm or linseed tea,
1 Teaspoonful African cayenne, pure.

Another:

½ Tablespoonful powdered ginger,
3 Quarts boiling water.

When cool, inject.

ANODYNE CLYSTER, used to relieve pain and relax spasms:

1 Ounce lady's slipper (Cypripedium),
1 Ounce camomile flowers,
3 Quarts boiling water.

Let the mixture stand a short time, then strain through a fine sieve, when it will be fit for use.

DIURETIC CLYSTER: This form of clyster may be used with decided advantage in all acute diseases of the urinary organs. This injection is useful in cases of red water, both in cattle and sheep; and when the malady is supposed to result from general or local debility, the addition of tonics (golden seal or gentian) will be indicated. Their active properties may be extracted by infusion.

3 Quarts linseed tea,
1 Tablespoonful oil of juniper

Or, substitute for the latter, cream of tartar, half an ounce.

ASTRINGENT CLYSTER: Take an infusion of hardhack, strain, and add a tablespoonful of finely-pulverized charcoal to every three quarts of fluid.

Another is an infusion of witch hazel.

Another:

1 Tablespoonful powdered bayberry bark,
3 Quarts boiling water.

When cool, it is fit for use.

Astringent injections are used in all cases where it is desired to contract the living fiber, as in scouring, dysentery, scouring rot, diarrhœa, bloody flux, falling of the womb, fundament, etc.

NOURISHING CLYSTERS: These are composed of thin gruel made from flour, etc.

INJECTION FOR WORMS: Make an infusion of pomegranate (rind of the fruit), and inject every night for a few days. This will rid the animal of worms that infest the rectum; but if the animal is infested with the long, round worm (teres), then half a pint of the above infusion must be given for a few mornings, before feeding.

Another for worms:

1 Ounce powdered lobelia,
1 Handful wood ashes,
3 Quarts boiling water.

When cool, it is fit for use.

Coach, a large, close, four-wheeled carriage, having at least two seats within and capable of holding four persons. See Carriage.

Coagulation, to gather into masses, as butter in churning, or curd; to thicken, as loppered milk.

Coal. Stone coal is the hardened remains of vegetable matter, being chemically a condensation of gases, which with a common fire are easily decomposed. Anthracite is the hardest species, having but little or no sulphur, is nearly pure carbon, is difficult of combustion and burns with but little flame. This kind of coal is most abundant in Pennsylvania and Wales. Bituminous coal, such as that of Virginia, Ohio and the Western States, is softer, more sulphurous and combustible, and produces considerable flame. Wood coal resembles charred wood, and in burning gives considerable light. Cannel coal is similar, but is very homogeneous in its texture, being easily carved into statuesque forms. It gives a steady flame when burned. Hard coal (anthracite) is the best for heating sitting-rooms, if burned in a "base burner;" but in the distant West is too expensive.

The breathing of the gases from burning coal is disagreeable and unhealthful, and smoky stoves and fire-places are to be dreaded. Many persons imagine that what they take into their lungs from burning coal cannot be very unhealthful, as it does not signally and immediately bring upon them serious sickness; but the foundations of future incurable diseases should be avoided, at almost any expense. As the country becomes more wealthy, the citizens manage to obtain more efficient heaters, furnaces, etc., and learn to avoid the effluvia of burning coal. In throwing "fine" or

pulverized coal upon a fire (unless to keep it over night or for several hours without burning), but little should be thrown on at a time, to prevent puffs of smoke into the room. Throwing water upon coal is no advantage in small fires, such as we have in common stoves.

Coal Tar, a tarry fluid of a complicated nature, produced during the distillation of bituminous coal for gas. It is a cheap and excellent paint for ironware, railings, rough wood-work in some situations, and is much used for saturating ropes, and such coarse paper as is employed in rendering buildings warm and comfortable.

Coal tar in almost any form in which it can be used is a powerful disinfectant. When it is distilled, it furnishes, first, a light oil which is a naphtha; and next a heavy oil. This last is, in great part, composed of creasote, and contains also an acid known as carbolic acid, both of which are among the most powerful of all known antiseptics, disinfectants and deodorizers. Meat steeped for about 24 hours in a solution of 1 part of creosote to 100 of water, is rendered incapable of putrefaction, and acquires a delicate flavor of smoke. It is the presence of this principle in wood smoke that gives it its characteristic smell and its power of curing meats.

Cobbler, in cookery, is a name sometimes given to a kind of large fruit pie or dumpling. The fruit is prepared as for pie, enveloped in a sheet of dough or paste like a dumpling, and steamed or baked. It is a fine and economical dish.

Cochineal (coch'i-neal), a dye-stuff consisting of the dried bodies of a Mexican insect (the female only), flourishing upon cactus. This material yields several shades of red, and is used as a dye for coloring tinctures and other medicines for the purpose of deception. Druggists color water with it, for filling their show bottles usually found in their store windows.

Cochin, a breed of fowls, of which there are several varieties. See Fowls, Domestic.

Cockerel, a young cock or rooster.

Cocklebur, a foul weed, bearing elliptical, thorny burs: has been called "smaller burdock." It is a great pest in some fields.

Cockroach. Borax is one of the best of roach exterminators. There is something peculiar, either in the smell or touch of borax, which is certain death to them. They will flee in terror from it, and never appear again where it has once been placed. It has also the great advantage of being perfectly harmless to human beings; hence there is no danger from poisoning. The borax should be pulverized and sprinkled around the infested places. Another infallible means of destroying black beetles and cockroaches is to strew the roots of black hellebore on the floor at night. Next morning the whole family of these insects will be found either dead or dying, for such is their avidity for the poisonous plant that they never fail to eat it when they can get it. Black hellebore grows in marshy grounds and may be had at all herb shops. Cockroaches and water-bugs may also be destroyed by placing vessels containing molasses where they abound. A small stick should be laid from the edge of the vessel to the floor. They will not return upon it. A decoction of poke-root, spread on plates with molasses, oil of cedar, pulverized pepper and insect powder are also highly recommended.

Cocoa, a preparation of the ground bean of the chocolate tree, to be used in making a beverage. To prepare the latter, boil two large spoonfuls of ground cocoa in a quart of water half an hour; skim off the oil, pour in three gills of milk, and boil it up again. It is the best way to make it the day before it is used, as the oily substance can be more perfectly removed when the cocoa is cold.

Cocoanut, the fruit of the cocoanut palm, well known throughout the world. The nut ground and dried, known as "desiccated cocoanut," can be obtained at the groceries, and is used in various culinary preparations. See also Cake and Pie.

Cocoon, the envelope of silk or other substance growing around a caterpillar or other larva when it is undergoing its transformation to the winged or perfect state. The insect and its envelope are together called a "chrysalis," or "pupa."

C. O. D. Collect On Delivery: a term used in connection with goods sent by express, when the express company is authorized to collect for the value of the goods as named by the consignor. In this way, goods may be ordered from the city and paid for on receipt. Sometimes the privilege to examine the goods before receiving is granted by the party sending, but generally payment is required before examination. In sending a package C. O. D., make out a receipt bill for the amount you desire the express company to collect, and deliver to the company. The company is then responsible for the return of the money or the goods. It is a very safe and satisfactory way of sending goods to strangers, although the additional expense of returning the money is incurred by the party receiving them.

Cod-Liver Oil. This is extracted from the fresh liver of the cod by a heat not exceeding 180°. There are three varieties in market—the white, or pale yellow, the brownish yellow and the dark brown, but they are of equal value. The odor is similar to that of shoe leather, and the taste disagreeable. In all animals, cod-liver oil increases fat and flesh. It is now considered a very valuable remedy. There has been so great a demand for it that the oil of every fish caught has been sold for it. It is employed where an exalted temperature is maintained at the expense of the tissues. In such cases it saves the tissues, and the burning of flesh-forming food. The principal diseases for which this is prescribed and taken are consumption and scrofula. In cases of emaciation it is used with good results. In children, evidently, where

the mesentery glands are diseased or defective, cod-liver oil has been found one of the most beneficial remedies. The dose for infants and small children is from ½ to one teaspoonful three or four times a day, in a little breast or other milk; for youths and adults a tablespoonful three or four times a day. The taste of cod-liver oil is completely disguised by masticating a morsel of dried orange peel before and after swallowing the dose, or by the use of a lump of brown sugar.

In diseases affecting digestion and assimilation cod-liver oil can be of no use. It materially relieves broken wind, or heaves in horses. For hastening or forcing animals intended for shows, cod-liver oil is just what is wanted, as it not only hastens the fattening process, but increases the quality and appearance of the meat.

Coffee. There will be coffee-drinkers as long as the "world stands." While parched grains, roots, etc., satisfy some people as a basis of a mild beverage, most people in this country will have genuine coffee. This grain should never be purchased from the store already ground, as such is generally adulterated with chiccory, liver of animals, burnt sugar, Venetian red, okra, potato, etc. As long ago as 1850, a patent was taken out for a process for molding chiccory paste into the form of coffee grains. But even pure coffee, if ground, gradually loses its aroma. In browning coffee, it should not be burned, or even scorched, but parched to a light brown.

To roast coffee, dry it in the oven an hour or two before roasting, then put it on the stove in a round-bottomed kettle, and stir constantly until it becomes brown. Two pounds of coffee roasted at one time is sufficient for a small family. Add a piece of butter the size of a walnut just before taking up. Put it while steaming hot into a box with a close cover. It should be ground as it is wanted.

For grinding coffee, L. J. Miller of Cincinnati, Ohio, furnishes a hand and power mill, which is not only good for this purpose, but also for grinding grain for mushes and bread. (See also Grist-mill.)

Coffee Mill.

To Make Coffee. Put a coffee-cupful into a pot that will hold three pints or two quarts; break an egg into it, or some egg-shells, or a bit of fish-skin an inch square; pour on a quart of boiling water. Boil it ten minutes, take it off, turn a cupful out at the spout and back again into the pot; pour in half a cupful of cold water, and let it stand ten minutes to settle. Turn it off into another pot to send to table. Boiling cream or milk should always be served with coffee.

To make coffee in a biggin put the ground coffee into a filter, wet it with cold water, and let it stand five minutes to swell. Put the filter into the pot where it belongs; fill it up with boiling water, and set where it will keep hot and not boil. When this has run through, add water until you have made a quart of coffee. It does not require more than ten minutes to make good coffee. The best kinds of coffee are the Mocha and the Java, and it is considered an improvement to mix the two. West India coffee, though of a different flavor, is often very good.

Never let coffee, once made, stand in tin.

Effects of Coffee on the Constitution. Coffee exerts a very powerful influence on the sympathetic nerves and brain; and for this reason, after taking it, all feelings of drowsiness are dispelled while the system continues under its influence. Coffee possesses this property, chiefly owing to the empyreumatic oil it contains. It is for this reason that the beverage should always be prepared from the freshly-roasted berry, ground immediately before use. Coffee contains a considerable quantity of nitrogen, which tends to render it more nutritious. Coffee as a beverage is most suitable for elderly or thin individuals. It is not so well adapted for persons of an excitable temperment, or for plethoric individuals. It is liable to produce, if taken to excess, hæmorrhages from the bowels, and congestion of the liver. It is thought that coffee promotes digestion when taken after a meal, and that it also removes the symptoms caused by too great an indulgence in wine; but as a matter of fact, if taken immediately after a meal, it impairs the action of the stomach and injures the digestion. These affections are, however, thought to disappear more readily on persons leaving off its use, than those complaints which are produced by the excessive use of strong tea.

Coffee Milk. Put a dessert spoonful of ground coffee into a pint of milk; boil it a quarter of an hour with a shaving or two of isinglass; then let it stand ten minutes, and pour it off.

Coffin, in farriery, is the hollow part of a horse's hoof, or the whole hoof below the coronet, including the "coffin" bone, which is a small, spongy bone in the midst of the hoof.

Coins, Old, To Clean: Rub them with a nail brush dipped in strong lye made of wood ashes.

Coke, the cinder of mineral coal after being heated for gas. It is light and inflammable, but lacks strength as compared with its former condition. There is a heavy coke, however, made for manufacturing purposes. Only the sulphur and other injurious elements are driven out. Coke, in combustion, gives an intense heat, without smoke, but leaves a great deal of ashes. In using it for an open fire it should be broken into lumps about the size of a goose-egg, and laid on top of the fire, but not in front.

Colander (cul'en-der), a perforated vessel for straining liquors, or separating the finer elements of a mixture from the coarser. A slight hygienic objection to the use of tin colanders consists in the fact that it is difficult to keep the perforations perfectly dry and clean, and the rust and filth that accumulates in them are unfit to go into our food.

Colchicum, meadow saffron. This is not the common yellow or garden saffron, but a native of Europe, which in September bears two to six lilac or pale purple flowers. Not raised in this country. The seeds and root are the parts usually employed in medicine, sometimes in powder; but the best is in the form of a tincture. In veterinary practice it is given in all rheumatic affections of the joints, and in lumbago, and also in diseases of the eye of the horse, depending on rheumatism of that organ.

Dose. Of the corm or seeds in powder for horses and cattle, the dose is from one to two drachms, given in the animal's feed twice in the day, for a week or two. The wine of colchicum will answer for the dog, in from 5 to 15 drop doses, twice a day in a little water.

Cold, a fever caused by a stoppage of the pores of the skin. The cause and symptoms of this disease are so well understood that little need be said in regard to these. Oppression of the breast, stoppage of the nose, sneezing, weariness, chills, pain in the head, and cough are the usual attendants. But few diseases require more attention than this, and but few are more neglected. Remember that neglected colds are frequently dangerous, and often result in incurable diseases. A cold produces cough, then certain pains in the side, fever, difficulty in breathing, and finally ends in consumption.

The thing to do, of course, is to open the pores of the skin, and this is generally accomplished, or attempted to be accomplished, by a course of sweating. If fasting and hand-rubbing of the skin are also persisted in for a day or so, the cure will generally be successful. Sweating indeed opens the pores of the skin, but the patient generally comes out of the process in such a way as to reproduce the disease. On coming out, vigorous hand-rubbing should be given until the skin is perfectly dry and somewhat pinkish, and then the patient should immediately cover up warm in bed again, and remain there until he feels like arising and taking exercise. For persons not subject to any lung or heart disease, the Turkish bath (see Hygiene) is recommended, as one such bath, if properly terminated, is sufficient to cure almost any cold instantaneously. In taking a sweat by a pack, voluntary breathing greatly aids the process. In fact, heavy, voluntary breathing in a dry pack, in a room well ventilated, is often the best method of curing a cold. Drinking herb teas, especially those made hot by pepper and other spices, is preferred by many, but effects no better cure than so much hot water. They are all merely different methods of making hot water palatable, so as to prevent nausea. One day's treatment, properly administered, is sufficient to cure almost any cold; sometimes the process should be repeated the next day, in which case the patient should eat but little, and the treatment given as far from the meals as possible, as there should be no food in the stomach at the time.

Cold Chisel, a chisel of peculiar strength and hardness, for cutting cold metal.

Cold Frame, a framed bed, of the nature of a hotbed, for the early propagation of plants. The cover is removed during the day, unless the weather is too cold, that the plants may not become too tender.

Cold frames are extensively used by market gardeners to carry lettuce and cabbage plants through the winter. Select the locality in the fall, choosing a warm location on a southern slope, protected by a fence or building on the north and northwest. Set posts in the ground, nail two boards to these parallel to each other, one about a foot in height and the other toward the south about four inches narrower; this will give the sashes resting on them the right slope to shed the rain and receive as much heat as possible from the sun. Have these boards at a distance apart equal to the length of the sash, which may be any common window-sash for a small bed, or the length of a usual gardener's sash. If common window-sash is used, cut channels in the cross-bars to let the water run off. Dig the ground thoroughly (it is best to cover it in the fall with litter to keep the frost out), and rake out all stones or clods; then slide in the sash and let it remain closed three or four days that the soil may be warmed by the sun's rays. The two end boards should rise as high as the sash to prevent the heat escaping, and the bottom board of a small frame should have a strip nailed inside to rest the sash on. Next rake thoroughly in guano or phosphate or finely-pulverized hen manure, and plant in rows three to six inches apart, depending on whether the plants are to be allowed to remain or are to be transplanted; if the latter, then three inches will be sufficient distance. Thin out the tomato plants when quite small, but allow peppers to remain rather thick at first by reason of danger from depredations of the cut-worm. As the season advances, raise the sashes an inch or two in the middle of the day, and water freely at evening with water that is nearly of the temperature of the earth in the frame. As the heat of the season increases whitewash the glass, and keep them more and more open until about the close of May, just before the more tender varieties are set in open ground, you allow the glass to remain entirely off both day and night, unless there should be a cold rain. This will harden them so that they will not be apt to be injured by the cabbage beetle, as well as chilled and put back by the change. If the tomato plants have been well hardened, the stalks will be of a red color. Should the plants be getting too large before the season for transplanting, they should be checked by drawing a sharp knife within a couple of inches of the stalk. If it is desirable to dwarf the tomatoes and thus force

them into a compact growth, transplant into another cold frame, allowing each plant double the distance it before occupied. Early tomato plants in a small way may be raised in flower pots or boxes in a warm kitchen window; so also may egg plants and peppers. When raising them in the house, the pot or box containing the seed should be placed quite near the stove for a few days, and the soil be kept well moistened until the plants begin to break ground, when they may be removed to a warm window. It is best, if practicable, to have but one plant in each pot, that they may grow short and stocky. If the seed are not planted earlier than the first of April for out-of-door cultivation, a cold frame will answer.

Colewort: see Rape; also a name given to non-heading early cabbages, and is corrupted to "collards."

Colic, a spasmodic pain in the stomach or bowels, which is relieved by pressure upon the abdomen as the patient is inclined forward, or lies face downward with the abdomen upon a support. It prevails mostly among infants, and is temporary, but severe. In children it is generally produced by too much food, or some improper diet of the mother, and sometimes from exposure to cold or change of clothing, and often from bad quality of the milk. It makes its attacks suddenly, by violent screaming, kicking, drawing up of the legs, and frequently a stoppage of the urine or water. This complaint attacks those children who are subject to it, so suddenly, and often with such violence, that we should always be careful to attend to it at once, or it may produce convulsions. Nursing children are very subject to the colic, which is often so severe as to produce a cold sweat.

Treatment. Paregoric seldom fails to procure relief. Children can take from ten drops to a teaspoonful. Half a teaspoonful is a medium dose for a child a year old. In children, where the distress is great, an injection, made of a small quantity of common salt dissolved in warm water, will often procure the most instant relief. Half a teaspoonful of castor oil and half a teaspoonful of paregoric, mixed, will effect a cure. In some cases, a little peppermint, or pennyroyal, or ginger tea, given warm, will remove the colic. Dry, hot flannel cloths should be put to the stomach, and a bottle of hot water or a hot brick to the feet, or warm bathing and rubbing, or friction, over the stomach and belly, with some liniment, will give great relief. When the child is costive, or bound in its bowels, a gentle purgative of manna or castor oil will be required to relieve the flatulence and constipation, or costiveness.

Colic, Bilious and **Cramp,** is characterized by excruciating pain in the region of the navel, thirst, feverish symptoms, vomiting of bilious matter, and costiveness. The attack generally commences with a bitter taste in the mouth, followed by vomiting of a yellow-greenish matter. The bowels are constipated; little or no discharge of urine; the pain about the navel will sometimes shift from place to place; a sort of hoarseness usually attends the patient throughout the disease, and more or less fever. Sometimes there are cramps in the stomach and limbs.

Treatment: First evacuate the stomach by an emetic of warm water and salt; drink copiously. Move the bowels with a mild cathartic. Apply a large mustard-plaster wet with vinegar over the stomach and bowels. After the mustard has been borne as long as it can be, remove it and apply constantly to the abdomen flannel or other cloths dipped in hot water. This will have a soothing and relaxing effect.

Collar, in mechanics, a metal ring around the end of a cylinder of wood to prevent splitting, or a ring around a piston or a journal, for securing tightness or steadiness. In botany, the "collar" of a plant is the junction of the roots with the stem or trunk of the plant, at the ground. For horse-collar, see Harness.

Collateral, stock, bond, mortgage, or other commercial "paper" used as security for a loan.

Colley, the Scotch shepherd dog: see Dog.

Collodion, a solution of gun-cotton in ether. Gun-cotton is a highly explosive substance obtained by soaking common cotton, or indeed any other vegetable fiber, in nitric and sulphuric acid, and then leaving it to dry. It is occasionally used as a substitute for gunpowder. Collodion is used for dressing wounds and cuts, instead of sticking-plaster. In veterinary surgery it is applied in the following manner: clip the hair from the edges of the wound, take a camel's-hair pencil, or a soft brush, and paint the surface and edges of the wound well, and in a few minutes the ether, which holds the gun-cotton in solution, evaporates, leaving over the sore a complete covering, resembling the gold-beater's skin, thus completely shielding the sore from the action of the air; hence its value.

Cologne Water. Mix alcohol, 1 gallon; oil of lavender, 12 drachms; oil of rosemary, 4 drachms; essence of lemon, 12 drachms; oil of bergamot, 12 drachms; oil of cinnamon, 12 drops.

Colter, Coulter or **Cutter,** the cutting iron (or steel blade) of a plow; either "upright" or "rolling."

Coloring: see Dyeing, Painting and Staining.

Commode (com-mode′), a chest of drawers, often with shelves added; also, a dry-earth closet; see Privy.

Common Carrier, a party who makes periodical trips for the purpose of carrying goods or letters, as the express companies, postal agents, etc.

Communism (com′-u-nizm), "having all things common;" that is, having all property in the hands of the community at large, and none of it in the possession of any individual.

Complexion: see Toilet.

Compost, a rotted mass of mixed manures. It is called Ash, Guano, Lime, etc., according to the prevailing fertilizer or other ingredient employed. Ordinary compost for garden use may be made by mixing

the manure of spent hot-beds with equal quantities of fresh barn-yard manure and swamp-muck, or sods pared from alongside fences, or from any spot where water often settles. To these add air-slacked lime equal to one-twentieth of the whole bulk, and an equal quantity of unleached ashes, or double this quantity of leached, and throw in and cover any decaying animal matter, or drainage from the slaughter-house. Watch the heap, keeping a stick thrust into its center, to serve as a thermometer. Whenever, on withdrawing the stick, you find it getting hot, turn the heap over and inside out; re-insert the stick, watch it and repeat the operation several times until it is made quite homogeneous, say several weeks. In turning over the mass it is well to sow in a little plaster (gypsum). The lime should be mixed with stable manure when it is cool, else it will drive off the ammonia instead of retaining it. Ash compost is composed of equal quantities of ashes and gypsum, carefully mixed or sifted together. Keep it dry and apply it to the ground by sowing just before a rain. Guano compost may be made of guano, or hen manure, mixed with one-half the bulk of ground gypsum, and four or five times the bulk of rich loam, and allowing the mass to remain in a dry place for several weeks and turning it once or twice during the time. In applying this compost to planted ground, it should be covered with soil, that there be no loss of ammonia, etc.

For flowers, the best compost is made of good loam, leaf-mold, peat, road-wash, sand and rotted manures. Good loam is rather dull yellow, not reddish, and when moderately dry it has a kind of cheesy softness on cutting, is friable when thrown up with a spade, break-into rather coarse granules, a lump when broken showing the same structure; yet it is not clayey or liable to break hard after a rain. All manures should be one or two years old and thoroughly reduced by turning, chopping and mixing. The manure of spent hot-beds is generally used for flower composts, but for certain kinds of flowers sheep manure and blood, or other animal matter, are said to be most valuable.

Compounding or **Composition,** in commerce, an agreement between a debtor and his creditors whereby they accept only a portion of their claims in final settlement. To "compound a felony" is to accept of a consideration for forebearing to prosecute.

Compromise (com′pro-mize), in business or legal transactions, a settlement made by mutual concession.

Concrete, a mixture of lime, sand and gravel, used as a substitute for stone in building. The proportions are: 60 parts of coarse pebbles, 25 of rough sand, and 15 of lime. Sometimes other proportions are used. A well-built concrete wall is unaffected by frost. Sand, gravel and asphaltum, or coal-tar, mixed together, is also called "concrete," and are used in laying walks. The essential quality of concrete seems to be that the materials used should be of small dimensions, so that the cementing medium may act in every direction around them, and that the latter on no account be more in quantity than is necessary for that purpose.

Concussion, striking against, as one body against another. Sometimes, by a fall, a person has his "breath knocked out of him," and in such a case he should be kept quiet and warm, in a room of fresh air, until he revives. Do not raise the head too high, or keep him on his back. An old custom is to give the patient a little water and brandy, but the majority of physicians at the present day do not recommend it.

Condiments, substances used to season food. The following is an alphabetical list of the more common ones, most of which are treated in their respective places in this volume: Bay Leaves, Butter, Cheese, Cinnamon, Cives, Cloves, the Essences and Extracts, Cream, Garlic, Ginger, the Liquors, Mace, the Mints, Mustard, Nutmeg, Onion, Parsley, Pepper, Peppergrass, Salt, Summer Savory, Sugar, Thyme, Vanilla and Vinegar. The flavor from scorching a part of the food, as of corn bread and parsnips, is really of the nature of a condiment.

Condition Powders. For a horse suspected of indigestion, the following will be useful: One ounce powdered assafœtida, 2 ounces powdered ginger, 5 drachms powdered sulphate of iron, 1 ounce powdered golden seal, 2 ounces powdered poplar bark, 1 drachm powdered capsicum, 1 pound oat meal. Divide the mass into 16 doses, one to be given in the food every night. For hidebound, when there seems to be no particular disease, give nutritious food, and the following: 3 ounces each of powdered sassafras bark, of powdered sulphur, and salt; 2 ounces each of powdered bloodroot and balmony, and 1 pound of oat meal. Mix and divide into 12 parts, and give one daily in the morning feed. Unless there is a plethoric habit (too much blood) from standing still and want of exercise, reduce the food, give proper exercise, and, if the dung be hard, give 2 to 4 ounces of aloes twice a week, and also an ounce of saltpeter in the water as often. If this does not bring the animal around, give twice a week of the following: ½ ounce each of Fowler's solution of arsenic and iodide of potash, mixed in a pint of water, and give with water or gruel. Avoid arsenic, however, on general principles, to get up a sleek coat. It is valuable when properly used, but you must know what you are using it for.

Confectionery, Confections, candies and sweetmeats: see Candy.

Congestion, a determination of the blood to any part, as the lungs, liver, brain, bowels, etc. Generally relieved or cured by producing an excitement in some other part of the system, what particular part being indicated by the nature of each case. A physician should be called, but fomentation near the parts is safe and efficient.

Conservatory, a building with a glazed roof, in which plants are grown in a bed or border of soil precisely as in open air; also an out-house, built upon the ice-house plan, for the preservation of fruits and vegetables for table use. See Ice-House.

Consignment, the merchandise shipped to a consignee.

Consignor, the sender of goods, by a public conveyance; "consignee," the party to whom such goods are sent.

Constipation or **Costiveness,** a hardening of the contents of the bowels. Sometimes even a sort of diarrhœa may attend this condition, that is, fluid and strained discharges may take place while the hardened fæces are still retained in the intestines. Nearly all constipation is caused by eating too much concentrated food, or white bread and butter, sugar, starch and the like, sometimes by the eating of raspberries, blackberries and other astringent fruits, and very often by the use of astringent medicines. Coffee and tea produce some of its worst forms. The cure, therefore, consists in removing the cause, that is, by abstinence from the use of the foregoing substances, and the substitution of graham and corn bread—indeed, any of the numerous preparations from the grains instead of the common white flour. Juicy fruits which are not astringent, and "vegetables" should also be eaten.

Where there is defective secretion from the bowels, it is usual to resort to that class of remedies called cathartics, and with many the more active remedies are employed. It has been noticed by almost every one that an inaction always follows, and is usually in proportion to the increased activity produced by the cathartic; so that it is said by some that the most pressing want in therapeutics is a remedy which will act thoroughly on the bowels, and yet leave them in a soluble (active) condition. To overcome habitual constipation there are no remedies of this class that can be employed with any certainty, and one should depend principally upon hygienic measures, which are really the most natural as well as the best. Such a person should drink a tumbler of water on rising in the morning, rub the bowels thoroughly with the hand, and after breakfast solicit a stool. If this is persevered in, a habit will be established which will give a healthy activity of this function, and remove all the derangements that have been produced by the constipation.

Consumption, Pulmonary. This disease, which is very prevalent in this country, has its seat in the lungs. The structure of the lungs consisting of what we may term an interwoven mass of extremely delicate and fragile vessels, its tender membranes are consequently very susceptible to injury. Tuberculous consumption is a disease which for insidiousness and fatality has no prototype. It is due to the formation of tubercles, resembling small boils, in the lungs, which make their first appearance in a grey, semi-transparent, granular form, gradually enlarging and ulcerating until they finally destroy the lung. The first stage of this disease frequently commences with drowsiness and a headache. These are followed by a cough, which is very slight at first, and only heard in the morning. It next occurs during the day, and is accompanied by the expectoration of a transparent fluid resembling saliva. When taking exercise or ascending stairs the breathing becomes oppressive, and occasional darting pains are felt in the chest. The pulse soon begins to beat more rapidly, the body becomes heated and chilled at short intervals, a burning sensation is experienced in the soles of the feet and palms of the hands. At night the victim is slightly feverish, and in the morning perspires slightly. The countenance assumes an expression of languor, and grows pale. The flesh wastes away, and strength decays. At this stage of the disease a change of weather or removal to a warmer or less fickle climate will for a time at least dissipate such symptoms; and now, if ever, the progress of the disease must be earnestly and carefully striven against. In the next stage of this disease the fluid expectorated undergoes a striking change, specks of opaque matter of a yellowish color, due to the rupture of an abscess, with sometimes streaks of blood, appear in it, and at the same time the other symptoms above mentioned become aggravated. The cough, the alternate heats and chills, and the morning perspirations, increase in severity and in frequency. Hectic fever is established, the pulse and breathing become more hurried, the flesh grows flabby, and the body becomes more wasted. The delicate flush, which is so well known as the most fatal symptom of this disease, appears in the cheeks, and blood appears with greater frequency in the expectorations. The third and final stage of this disease follows closely upon the second. Diarrhœa comes on, the perspirations and expectorations become more copious, and the coughing incessant. The feet and ankles swell, the breathing is oppressive, the chest sinks in, and a gurgling sound marks every expiration of the breath. The patient grows rapidly weaker, and soon after dies. Consumption varies in its nature to some extent in different cases, but the above are the ordinary symptoms. Amongst other symptoms more or less common is a certain form of indigestion known as "strumous dyspepsia," which creates a strong distaste of all food of a fatty nature by heartburn and acidity of the stomach. The appetite usually remains unimpaired.

Acute Consumption is so called from the rapidity with which it runs its course.

Latent Consumption is so gradual in its progress, that up to the period of dying scarcely any of the usual symptoms are discoverable, and very often only dissection makes the cause of death quite clear.

Febrile Consumption is that which is brought on by a cold.

Chronic Consumption is the most common form of this disease, and the least understood. Patients suffering from it often linger on from year to year, and enjoy at intervals more or less long, all the characteristics of perfect health. It is, however, nearly always fatal.

Causes of Consumption. These are classified as exciting and remote. Under the last of these heads is included hereditary predisposition. Whatever occasions a determination of blood to the lungs, or irritates them, will in case of scrofulous individuals pro-

duce partial effusions of scrófulous lymph in the cellular substance of the lungs—in a word, tubercles. These prevent the due expansion of the lungs, and, of course, that free circulation of the blood through the pulmonary organs which is of vital importance. It was formerly held that the tubercles had their origin in inflammation of the lungs, but this idea has, we believe, been entirely abandoned by all our best authorities. Improper diet, impure air, deficient exercise, injudicious clothing, a want of cleanliness, drunkenness, or anything which tends to deprive the body of its due nutrition, is an active agent in producing scrofula or king's evil, which is now identified with consumption. Amongst other causes are mental anxiety, exposure to cold and wet, over-exciting aliment which gives the digestive organs an undue proportion of work, excessive sedentary labor, tight lacing, breathing an atmosphere impregnated with dust, etc.

Treatment of Consumption. Consumption is so insidious in its first approaches, and so rapid and strong in its after progress, that too much care cannot be exercised in watching for premonitory symptoms in those who are predisposed for its reception. At first the disease produces so little inconvenience to the patient that he is not alive to the importance of at once checking it, and instead of having immediate recourse to medical advice, he pooh-poohs the words of those who bid him do so, and foolishly allows the disease to work its fatal way in secret, undisturbed. The treatment usually adopted is that which strengthens the system to resist its approach, and acts upon the seat of its development. In the first case, nutritious diet of a wholesome, non-stimulant kind, and frequent gentle exercise in fresh, mild, pure air, generally that of the sea-side, are recommended, with regular and particularly cleanly habits. Cod-liver oil is a very valuable remedy, which has been adopted with the most beneficial results in numerous cases. Tonic medicines, such as bark, sarsaparilla, iron, and iodine, are also very beneficial where the symptoms of febrile conditions do not exist. Counter-irritants applied to the upper parts of the chest are used where inflammation is apparent, and in some cases warm baths are found to do good service by promoting more vigorous circulation in the extremities and in the surface of the body generally. Care must be taken not to check the perspirations, either by diminishing the quantity of bedclothes at night or by throwing them off in the morning. When the purging occurs care must be exercised in not checking it too suddenly. Carefully selected diet will serve best to moderate it. From the foregoing directions it must appear evident that a low diet should be adopted, and everything avoided that has a tendency to inflame the constitution. The jellies of arrow-root, sago, tapioca, oat meal, and light bread pudding may be occasionally varied, as agreeable to the inclination of the patient. The animal jellies of calves' feet, hartshorn shavings, and isinglass; a little boiled fowl, shell-fish, flounders, and soles (without sauce) may be allowed when febrile symptoms are not high, or when the system is not irritable; but animal food in substance, as beef, mutton, lamb, and pork, and wine and spirits of all sorts, must be scrupulously avoided. The beverage should be very simple, such as the almond emulsion, whey, distilled water, linseed-tea, weak lemonade, buttermilk, and barley-water. Flannel should be worn next the skin; and any sudden transitions from heat to cold, and vice versa, must be carefully guarded against; and as a light atmosphere is more easy of respiration than a heavy one, the patient should sleep and live as much as possible in the uppermost room of the house. By a strict observance of these instructions the progress of the disease may be speedily and effectually suspended, the effect of the diseased action removed, the lungs rendered adequate to their important functions, and the patient, of course, gradually restored to his usual strength and health. Some writers disapprove of a milk diet in this disease. The experience of many ages and the arguments which may be adduced from analogy have, however, proved, to the conviction of every candid inquirer, that it affords a nutriment admirably adapted to support the debilitated frame of a consumptive patient. When it is found to be too heavy for the stomach it may be diluted with barley-water or distilled water, which will often reconcile it to the stomach. Ass's milk, being thinner than that of the cow, often agrees better with the patient. Some, however, have so great an aversion to the milk of this animal that they cannot be prevailed on to take it. In such case some substitute of a kindred nature should be adopted.

It is generally agreed that there is no cure for genuine consumption after it is well established, but that the ordinary laws of health constitute the only hope of the patient for a mitigation of his sufferings. Sometimes a faithful observance of these laws, especially those relating to the use of pure air, have arrested the progress of consumption. An out-door life is the most important thing, especially in a climate where the air is pure and bracing. A predisposition to this dreaded malady may be prevented from developing into the real pulmonary phthisis, by special exercise of the lungs in pure air from infancy up, conjoined with a general observance of the laws of health. See Hygiene. Above all do not dose yourself with any of the numerous advertised " sure cures for consumption."

Contagion. This term is applied to something (as the virus of glanders) coming in contact with the body of an animal in health, producing a similar disease to that existing in the animal from which it came. In a word, it is a specific poison, like that of small-pox, syphilis, scarlet fever, measles, etc. Diseases may be epidemic and not strictly contagious. (See Epidemic). Few diseases of animals are considered contagious. The following diseases, however, are considered of that character: Aphthous fever, malignant anthrax, canine madness, contagious pleuro-pneumonia, cow-pox, distemper or strangles, cholera (hog and Asiatic), glanders, rinderpest, typhoid and bilious fever, scab, itch, etc. In malignant anthrax, malignant hog chol-

era (intestinal fever), glanders, canine madness and contagious pleuro-pneumonia, the disease being well defined, it is cheaper to kill and bury deeply than to attempt a cure. Rinderpest we have never had on this continent. Contagious diseases incident to this country will be treated under their appropriate names.

Although many animals may be taken sick one after another, this is no proof that the disease is contagious; for it must be remembered that a number of animals, all situated and cared for in the same way, are certainly subjected to the same exciting causes that produced the disease in the first animal affected. Those that escape the disease were not predisposed to take it; hence their exemption.

PREVENTION. If the following excellent advice is followed contagious diseases may be prevented from spreading: Avoid contagium or special cause of the disease. Do not take the breath of one sick. Unless you are needed to care for the sick, or are protected by having had the disease, or in case of small-pox by thorough vaccination, do not go near the sick person. Do not allow your lips to touch any food, cup, spoon, or anything else that the sick person has touched or that has been in the sick-room. Do not wipe your face or hands with any cloth that has been near the sick person. Do not wear any clothing that the sick person has worn during, just before or just after his sickness. Keep your hands free from discharges from the body or skin of the sick person. Do not touch him with sore or scratched hands. Particularly avoid inhaling or in any way receiving into the mouth or nose the branny scales that fall off or peal off from one recovering from or apparently wholly recovered from scarlet fever.

Restrict the contagium or special cause of the disease. Isolate the sick. Separate those sick with any of these diseases, even if they are but mildly sick, from all persons except necessary attendants. A person sick with any of these diseases should not be permitted to suffer for want of care, food or comfort; but all his wants should be attended to by adults, or by those who are protected by proper vaccination or by having had the disease. Children and those who are not thus protected should be kept away from these diseases. Do not go from the sick-room to a child or other unprotected persons until after change of clothing, and thorough washing of hands, face, hair and beard. Always wash the hands thoroughly after any necessary handling of the sick person, or anything that has been in contact with the sick person. Keep those who have been exposed to any of these diseases away from schools, churches and other assemblies, and from all children until it is known whether they are infected —and if they are found to be infected, isolate them till after complete recovery and thorough disinfection.

Destroy the contagium or special cause of the disease:

1. By thoroughly disinfecting or destroying whatever is removed from the person sick or from the sick-room. All discharges from the patient should be received into vessels containing a strong solution of sulphate of iron (copperas) and then, in cities, thrown into the water-closet; elsewhere they should be buried at least 100 feet from any well; or where this is impractible they should be received on old cloths which should be immediately burned, disinfected or buried.

2. By thoroughly disinfecting the sick-room, and its contents, after removal of the sick person, whether by death or recovery. Disinfect as follows: Burn whatever has been in contact with the sick person and is not too valuable to burn. Garments, sheets, blankets, etc., that will not be injured by bleaching, should be boiled for half an hour in a zinc solution made by dissolving zinc sulphate and common salt in water, in the proportion of 4 ounces of zinc sulphate and 2 ounces of common salt to one gallon of water. Hang up and loosely spread out clothing, bedding, etc., that cannot be boiled in the zinc solution, or spread it loosely over chairs in the sick-room, leaving the bedstead and other furniture in the room. Close all openings to the room very tight. For a room ten feet square place 2 pounds of sulphur in an iron pot or pan supported on bricks. Set the sulphur on fire with live coals or with a spoonful of alcohol lighted by a match. Be careful not to breathe the sulphurous fumes. Leave the room tightly closed for several hours, then air it thoroughly. For a large room use a proportionally larger quantity of sulphur, at the rate of 2 pounds for each 1,000 cubic feet of air space, and try to burn as much as possible of the sulphur used.

Keep your house and premises, and everything connected therewith, clean; but remember that the contagium of these diseases may attach to the cleanest article of clothing, food, drink, book or paper if it is exposed thereto. For further advice see Disinfectants, and the respective diseases of man, cattle, horse, etc.

Contract, an agreement upon sufficient consideration to do or not to do a certain thing. There are three kinds: Parole, or written; by specialty, or under seal, as bonds, deeds, etc.; and of record, made by a person or his attorney in open court.

A parole contract is a verbal bargain. All contracts to be complete must bind both parties; must be based upon good consideration, motive, or inducement to make the promise, and not contrary to law or public morals. It is not complete until the proposition has been distinctly made on one side and distinctly accepted by the other, and by persons who are in turn capable of contracting. Persons under age, idiots and insane persons are incapable of contracting. Married women, in most States, over 21 years of age, make contracts in relation to their sole and separate property, not otherwise. Contracts must be made by the persons interested or by their authorized agent, acting within the scope of his authority. They may be made by letter or telegraph, and are completed when the offer is received and the letter accepting same is mailed, properly addressed to the person making the offer.

Implied contracts are such as reason and justice dictate, and which, therefore, the law presumes every

man undertakes to perform; as, if a man employs another to do any business for him, or perform any work, the law implies that the former contracted or undertook to pay the latter as much as his labor is really worth.

Contracts for goods exceeding in value $50 require a partial delivery of the property or part payment of the purchase money.

Contracts for sale of land, or any interest in land, cannot be enforced unless in writing and signed by the person making the sale, or unless possession is given to the purchaser and valuable improvements made.

Contracts made payable at a particular place must be complied with at the place mentioned. If no place is mentioned in the contract the place of business of the person who is to receive the money—or, if he has no place of business—then at his residence, is the place understood.

Contracts obtained by fraud are destroyed by such fraud, if practiced by a party thereto or his agent.

Contracting for Real Estate. This is done usually by some offers passing back and forth until a price is mutually agreed upon; but it is not a legal contract which can be enforced unless there is an agreement in writing to sell, giving date, amount to be paid, a sufficient description to identify the land, a time fixed for compliance, and signed by the person who is selling or some one for him who is authorized in writing so to do.

The usual and better way is for the purchaser to make an offer in writing, stating terms and description of land. This is then accepted in writing upon the same or a separate piece of paper. This may be, and often is, done by letter, and if sufficiently explicit, will be binding. If an offer is made by letter or in writing and withdrawn before acceptance, it is not binding upon either party. But if the offer is made by letter through the mail and accepted, and letter of acceptance mailed before notice of offer is withdrawn, the sale is complete.

When the deed is not to be made at once, a bond for a deed is usually drawn up and signed by the seller. Never buy a piece of land unless the seller furnishes you a good abstract of title, showing a connected chain of title, free of judgments, mortgages, mechanics' liens, and taxes. A little care of this kind may save you from troublesome litigation and loss. If all the deeds necessary to complete the title have not been recorded, see to it that they are properly filed for record before paying your money.

Convalesence, a term applied to the time which elapses between the controlling of acute disease and the restoration of the patient to perfect health. This period of recovery is a most important time and often requires as much care as the disease itself; the body is weak, susceptible of impression, disposed to take on morbid actions, and, in some instances, a relapse into its previous state may occur from causes which in its healthy condition would not at all affect the body.

Convertible Husbandry, a term implying frequent change in the same field from tillage crops to grass, then back to tillage crops; an alternation of wheat, rye, etc., with fallow and grass crops. In all new countries mixed husbandry only comes to be carefully practiced as settlement increases, and markets are provided for various products. Mixed husbandry and manure are the best means of bringing exhausted land back to a state of fertility.

Convulsions. In children they originate in some derangement or irritation of the bowels, stomach, brain, or from teething. Give an aperient, as magnesia and rhubarb, and a warm bath at about 100°, and apply to the head linen dipped in cold water. The following powder is useful in altering the condition which brings them on: Rhubarb in powder, 8 grs.; supersulphate of potash, 12 grs. Mix. Give also a little syrup of poppies. If aperients cannot be taken give a mild injection, as a little Epsom salts in barley gruel, with a little butter; or a weak solution of salt and water, with a few drops of oil or butter. Convulsions often arise from over-feeding; this must be avoided. If indigestible food has been taken give an emetic, the wine of ipecacuanha; or, if the patient cannot be sufficiently roused from sleep so as to take the emetic, tickle the back part of the mouth with a feather to produce the effect. If the convulsions are obstinate, apply friction along the spine, when in the bath; or out of it, rub the spine with an anodyne composed of 10 drops of laudanum, 10 drops of oil, and 6 drops of tincture of cayenne. Mustard plasters may be applied a minute or two to the legs and feet. If convulsions are caused by teething, the gums must be lanced a little. If one falls in a fit let him remain on the ground, provided his face be pale; for should it be fainting or temporary suspension of the heart's action, you may cause death by raising him upright, or by bleeding; but if the face be red or dark-colored, raise him on his seat, throw cold water on his head immediately, and send for a surgeon, and get a vein opened, or fatal pressure on the brain may ensue. Give him all the fresh air possible and loosen all the tight places about his clothing. Put the feet and legs in warm water, apply spirits of hartshorn to the nose, and give a few drops in a glass of water, or hot brandy and water. If of a hysterical character, in addition to the foregoing treatment, bathe the temples with cologne water, and avoid bustle and excessive sympathy.

Cookery, the art of preparing food for the table. For some mysterious reason there is a popular belief in the absolute potentiality of all women, with or without instruction, to cook food in such a manner as will render it acceptable to the taste, and supply the proper nourishment. This belief is wholly unfounded. The art of cookery is as high and complicated as landscape and portrait painting, or sculpture; and probably these three arts require more skill than any other within the whole domain of human power. To be good in any specialty, in any department of human life, one

must have both natural endowment and practice.

It is true that the average woman does possess the elements essential to culinary excellence—patience, nice sense of taste and smell, and that superior intuitive judgment which enables her to unravel such mysteries as "seasoning to taste" and "adding enough flour to make a good dough," but unless these elements are brought into homogeneous accord by actual experimentation, they are neither more nor less than theoretical nonentities. With earnestness of purpose and absolute concentration of mind upon her task, the woman who would cook must give herself up to serious study under competent instructors; and it is safe to say, that while by this means only the exceptional woman will rise to greatness, the average woman will achieve a measure of success which will fit her to shine as the care-taker of a household. The daughters should early be taught the art of properly preparing dishes. Many of the girls, even of the farm, grow up with their latent talent undeveloped.

Cookery is of two kinds, simple and refined, or compound. The object of the first is either to destroy some deleterious property or to render food palatable and nutritious. That of the second is to stimulate appetite and please the palate, an end sometimes attained by fantastic and unwholesome compositions. The general modes of cooking are as follows:—1, roasting; 2, boiling; 3, stewing; 4, broiling; 5, frying; and 6, baking. By roasting a greater quantity of nutritious matter is retained in meat than by any other process of cookery except that of boiling. The perfection of this process consists in doing the meat neither too rapidly nor too slowly. By the last method it is withered, by the other burned or scorched, and by either rendered unnutritive and indigestible. Meat to be wholesome should neither be over or under-done. By over-dressing meat, as its fluids are expelled by the heat and the fibres compelled to approach closer to each other, it is rendered indigestible; by its being under-dressed it runs quickly into putrefaction. The perfection of roasting consists in the medium between over-dressing and under-dressing, namely, in the meat being well done, when it will eat short and agreeable and be in its most nutritive state. The flesh of old and full-grown animals is not unwholesome if eaten rather under-done; but young and viscid food, as veal, lamb, pig, chicken, etc., should be thoroughly cooked, or it will disagree with the stomach and probably occasion sickness. Such food is also more wholesome and nutritious and more easily digested when roasted than when boiled. Boiling renders meat more tender than roasting it, but it deprives it of more of its nutritive qualities. Boiled too long or too fast meat becomes hard and indigestible; besides, all its nutritive qualities are lost or dissipated in the water. Meat boiled in hard water is more tender and juicy than when soft water is used; while vegetables, on the contrary, are rendered harder and less digestible when boiled in hard water. Boiling is the best process for dressing vegetables, as they are thereby rendered more soluble in the stomach, and are deprived of a considerable quantity of fixed air. By stewing, meat is rendered more tender than any other process of cooking; but as more of its soluble parts are extracted than is the case with the other processes, the only good aliment that it affords is the soup, for though the meat is rendered sapid, it is hard and less nutritious. By broiling meat more of its nutritive qualities are retained than by most other processes, for the evaporation or exhalation of the juices of the meat is prevented by the sudden hardening or browning of the surface. For imparting strength it is therefore the best mode of dressing animal food, as it is thereby rendered more nutritious and easier of digestion than by any other preparation. Frying is the most objectionable mode of dressing any species of food, as it is rendered highly empyreumatic by the heat being applied through the medium of burning oil or fat. Baked meats are not unwholesome for occasional use; but from the retention of their oils, occasioned by the confined space in which they are dressed, they are not so digestible and nutritious as roasted food is. On this account those who are subject to dyspepsia or biliousness when they partake of this species of food, should assist the powers of the stomach by the additional stimulus of spices and aromatics, and they should abstain from its gravy, as it is highly empyreumatic. If by this restraint the meat should not be sufficiently savory, by pouring boiling water over it on the plate a wholesome and sapid gravy may be obtained.

We very fully treat of the cooking of all the various articles of food under their respective heads, but we wish to give the following general principles of cooking in this connection:

1. Plain cooking is more popular and satisfactory than fancy.

2. It is always better to under-season than over-season.

3. There is generally too much grease cooked into the victuals.

4. When anything is accidentally made too salt, the evil can be greatly counteracted by adding a teaspoonful each of vinegar and sugar; but a dish doctored in this way creates a great deal of thirst in one who eats of it.

5. The more uniform the heat the better the cooking.

6. Baking should be done with as great a heat as possible not to burn the article.

7. Boiling of meats should be done slowly, a steady simmer being the best.

8. It is not good to be frequently opening the oven doors during the process of baking, unless want of skill, especially with that particular stove, necessitates it.

9. The softer the water the more tender can the meats and vegetables be boiled.

10. Meats should not be washed, but wiped with a towel.

11. Vegetables should always be as fresh from the garden as possible.

12. All vegetables are rendered more bland by par-

boiling, but this process takes away some of the nutritive elements.

13. To retain the color of any vegetable, plunge it into cold water immediately after boiling.

14. In boiling cabbage and turnips, a lump of charcoal in the pot will counteract the bad odor coming out into the room; and in boiling greens, a little piece of bread tied up in a clean cloth, and put into the kettle, will absorb most of the odor.

15. Study the various recipes given in this volume, and endeavor to conquer all difficulties in the management of each dish.

French cookery is characterized by cooking into the victuals the flavor of the spices and condiments without the crude matter of the spice itself. This is effected by placing the spice or condiment under or near the article of food, in the same vessel. Skill in this art produces very fancy and palatable flavors, besides retaining the hygienic quality of the food.

To arrange dishes for the most economical distribution of them for several meals in advance, working over scraps, remnants, etc., requires constant thought. Printed suggestions and programmes are of but little use with most people.

Many housekeepers are not aware of the rapidity and constancy of the oxidization of iron, copper, brass and tin (soldered) vessels when in contact with moisture, or the amount of such poisonous oxides that enters the food that is eaten, or, further, of the extent of the mischief which such poisons effect in the system. Impurity of the "blood," poverty of the blood, paleness and emaciation or floridity and corpulency, and a general liability to any and all diseases, are the natural results of consuming articles of food in which these oxides and salts are found. Hence the importance of keeping all these wares clean; and in order to keep them clean, they should not only be washed and scoured immediately after they are taken from the fire, but should also be thoroughly rubbed, while hot, with a cloth dipped in fresh grease or oil of some kind, in order to prevent the moisture of the air from rusting them. Even then they should be kept in a dry place. Pure tin does not rust; but the soldered seams of all tinware are coated with a poisonous compound of lead, which is very deleterious to the human body. It is better to use granite-ware altogether, or boiling and stewing should be generally superseded by baking and steaming.

The articles of equipment in the kitchen and dining-room will be found enumerated under the head of Kitchen, and in this work each article of cookery is placed in its alphabetical order, thus: Biscuit, Bread, Buns, Cake, Cheese, Chowder, Cobbler, Cracker, Creams, Custard, Dessert, Doughnut, Dumpling, Eggs, Float, Fritter, Garnishing, Gravy, Greens, Gruel, Hash, Hominy, Hulled Corn, Iceland Moss, Jam, Jelly, Marmalade, Muffin, Mush, Pancakes, Pickle, Pie, Porridge, Preserves, Pudding, Roll, Roulette, Rusk, Salad, Sausage, Soup, Succotash, Tart, Toast, Waffle, and the various meats, fruits, vegetables and beverages.

Cooking Food for Stock: see Feed, Steaming and Cooking.

Co-operation, working together. In farming, this is necessary for the following purposes, in the order of their importance: 1, Destroying insects and weeds; 2, Preventing contagious diseases; 3, Draining, fencing and roads; 4, Use of large machinery, too expensive for every farmer to buy; 5, Competition against high freights; and 6. Mutual instruction and lecture courses.

Coping (co' ping), the highest or covering course of masonry in a wall, often with sloping edges to carry off the water: sometimes called "capping." Stone coping upon brick work is highly ornamental, and is in almost universal use.

Copper Vessels, to keep from rust: Dip them in very dilute nitric acid, and then immerse them in linseed oil; let the excess of oil drain off. To clean copper vessels, first wash them with hot water, to remove all grease, then rub them with a mixture of pulverized rotten stone, soft soap and oil of turpentine; make this mixture stiff as putty. Hard solder for copper: melt together copper, zinc and tin.

As antidotes for poisoning by copper oxide, verdigris, etc., administer iron filings; also white of an egg (albumen), which forms with copper a compound insoluble in water. Apply the stomach-pump.

Cordial, in medicine, that which stimulates the nervous system and cheers up the spirits. To form the basis of cordials the following materials are employed: Rain or distilled water, white sugar, and clean, perfectly flavorless spirits. To these may be added the substances from which the flavor or aroma is extracted, which distinguish and give character to the particular cordial to be made, and also the article employed as "finings," when artificial clarifications are resorted to. In the preparation or compounding of cordials, one of the first things is to produce an alcoholic solution of the aromatic principles which are to give them their peculiar aroma and flavor. This is done by simple infusion or maceration, or by maceration and subsequent distillation, or by flavoring the spirit with essential oils. In the preparation of liquors, glycerine is admirably adapted for preserving the characteristic flavors of those compounds.

Blackberry Cordial. One quart of blackberry juice, 1 pound of white sugar, ½ ounce of grated nutmeg, ½ ounce powdered cinnamon, ¼ ounce allspice, ¼ ounce of cloves, and 1 pint best brandy. Tie the spices in muslin bags; boil the juice and spices together fifteen minutes, skimming well; add the brandy; set aside in a closely vessel covered to cool. When perfectly cold, strain out the spices, and bottle, sealing the corks.

Black-Currant Cordial. To every four quarts of black currants, picked from the stems and lightly bruised, add 1 gallon of the best whisky; let it remain four months, shaking the jar occasionally; then drain off the liquor and strain. Add 3 pounds of loaf

sugar and ¼ of a pound of the best cloves, slightly bruised; bottle well, and seal.

Coriander (co-ri-an'der), an aromatic plant of the parsley family, growing about two feet high, and bearing fragrant seeds which are often used in flavoring confectioneries and in medicines. In the latter capacity it is a stomachic—expelling gases from it, easing it from distention, and settling the nerves in connection with that organ. It is an excellent medicine for young calves having weak stomachs. The bruised seeds should be given in 2-dram doses, in milk. The seeds are globular, brown, and about a sixteenth of an inch in diameter. The plant is easily raised throughout the United States, and is found in some old-fashioned gardens.

Cork. To get a cork out of a bottle when it is entirely inside, drop a string into the bottle, holding both ends on the outside; turn the bottle top down and move it about until the loop of the string surrounds the cork, when the latter can be drawn out by force

Corking. Procure good, soft, velvety corks, free from large pores, and large enough to be extracted without the use of the corkscrew. In effervescent wines, such as champagne, gooseberry, etc., use the very best corks; and after placing them securely in the neck or mouth of the bottle, tie with a good strong string or wire.

Cork-Screw. This is a little convenience which should be in every household. A substitute may be improvised by taking a common screw with a string attached to it to pull the cork; or, two forks stuck into the cork vertically and a knife inserted between the two. Give a twist, and out pops the cork.

Corn. In the United States this name is applied only to Indian corn, or maize. In Europe the word "corn" is understood to mean the various cereals, or grain in general. It is a member of the grass family, botanically, and with reference to its value as an article of food it rivals rice and sugar-cane with the human family at large; and in our own country it exceeds wheat in money value, and in number of bushels is four times as great. It is a most important article of food, both to man and beast, and to the poor of the South is verily the staff of life, where it is used more extensively as human food than in any other part of the world. The origin of Indian corn has been a source of much controversy; and although there has been much written on the Eastern origin of it, yet it is certain it did not grow in that part of Asia watered by the Indus at the time of Alexander the Great's expedition, as it is not among the productions of that country mentioned by Nearchus, the commander of the fleet. Neither is it noticed by Arrian, Diodorus, Columella, or any other ancient author.

Fig. 1.—*Derby Sheller.*

And even as late as 1491, the year before Columbus discovered America, Joan di Cuba, in his "Ortus Sanitatis," makes no mention of it. It has never been found in any ancient tumulus, sarcophagus or pyramid, nor has it ever been represented in any ancient painting, sculpture, or work of art, except in America. But in this country, according to Garalaso de la Vega, one of the earliest Peruvian historians, the palace gardens of the Incas were ornamented with maize in gold and silver, with all the grains, spikes, stalks, and leaves; and in one instance, in the "Garden of Gold and Silver," there was an entire corn-field of considerable size, representing the maize in its exact and natural shape, a proof no less of the wealth of the Incas than of their veneration for this important grain. In further proof of the American origin of this plant, it may be stated that it is still found growing in a wild state, from the Rocky Mountains in North America to the humid forests of Paraguay, where, instead of each grain being naked, as is always the case after long cultivation, it is completely covered with glumes or husks. It is moreover a well authenticated fact that maize was found in a state of cultivation by the aborigines on the Island of Cuba at the time of the discovery by Columbus, as well as in most other places in America first explored by the Europeans.

The first successful attempt of the English in North America to cultivate this grain was made on James river, in Virginia, in 1608. The colonists sent over by the "London Company" adopted the mode then practiced by the Indians, which with some modifications has been pursued ever since.

Cultivation. The soil for corn should be rich, mellow, and well-drained. Land can scarcely be too rich for it; and the fresher and less fermented the manure is which is applied to it the better, unless on light, sandy soils. A clover lay or rich grass sod is an excellent preparation for corn. The manuring should be broadcast, for if it is confined to the hills the corn will come forward early and throw out an abundance of roots, which will not find support at a little distance from the stalk, and thus become impoverished later in the season. Plow in the fall, as you have more time then. Gypsum is the best fertilizer. The selection of seed should be made with the utmost care, not only from the best varieties, but also the best seed of the particular kinds desired. Some of the choicest varieties have been brought to their present perfection by selecting only the earliest and largest ears from the most prolific stalks. This ought always to be done before the corn is gathered in the field where there is an opportunity for comparison. In small fields, where there is a dense population, and where planting is done by hand, it will prove remunerative to steep the corn in a solution of saltpeter or copperas (¾ lb. to water enough to cover a bushel of corn) for one or two days before planting. This accelerates the growth of the plant and is a protection against birds, squirrels, and mice, and for a while it will keep off worms. To keep off the depredators, it has been advised to coat the seed corn with boiling tar (half a pint of tar to a

peck of corn). The use of excellent corn-planting machines at the present day is a great improvement on the old methods, considering the time required to put in a crop and the quality of the work; and their use has also superseded many of the old-fashioned modes which still might be preferable in the small acres of the densely-populated East. Check-row planting enables one to give cleaner cultivation, and this system is generally advised. See article Corn-Planter. By this plan the hills are three to four feet apart, and three to five stalks are allowed to the hill. The fewer the stalks, to a certain limit, the larger the ears. In drill planting the grains are dropped 18 inches apart, in rows three to four feet apart. The amount of seed per acre will be in proportion to the richness and dryness of the soil. Thick planting, other things being equal, gives fewer and smaller ears. A good old rule as to the time of planting is when oak-leaves have attained the size of a squirrel's foot. The average depth of planting should be about two inches, but the earlier the time, or the wetter the soil, the more shallow. Late in the season, or when the soil is very dry, the corn may be covered three inches deep or more. The rolling of the ground can be done before planting or immediately after. As soon as the corn is up the ground should be stirred by a cultivator (see Cultivator), and this process repeated every week or two until the ground is well shaded by the corn, even during the driest seasons, by which time the corn will be three or four feet high. Of course, the ground should never be touched when in a pasty condition, but only when it is pulverizable. The Western method of cultivation generally supersedes the use of the hoe. Wet weather delays cultivation and gives the weeds and grass the advantage, especially on flat land. Very flat ground should not be planted to corn, but rather seeded in grass and clover. Heaping the earth around the hills should be avoided, except with very heavy or wet soil, and, except so far as necessary, to smother small weeds in the hill—the plan generally followed in the West to supersede hoeing.

A man in Central Illinois reports that he raised ten bushels per acre more than his neighbors with less than the usual amount of cultivation, by the following method: He did not touch the ground until the first growth of weeds appeared. The ground was then plowed to the depth of three inches, and left in this condition until the second crop of weeds appeared, when it was again plowed a few inches deeper. It remained thus until the last of May, at which time it was plowed as deep as his teams could plow it, and immediately planted. The season being favorable for the pulverization of the soil, the ground was in excellent condition at the time of planting. Nothing further was done in the way of cultivation. The shallow plowings, instead of deep, saved his team. But deep culture, late in the season, on the other hand, tears up the roots and injures the corn. The prevailing sentiment is to plow deep early in the season, and shallower toward the time of laying by. On grass or sod land, manure the land in August before the sod is turned; the following spring, very soon after the usual corn-planting time, turn the sod flat, with a depth of seven inches, following with a subsoiler as deep as possible; heavily roll the land, and, if the greatest possible yield is desired, manure heavily with guano or hen manure, say 200 pounds to the

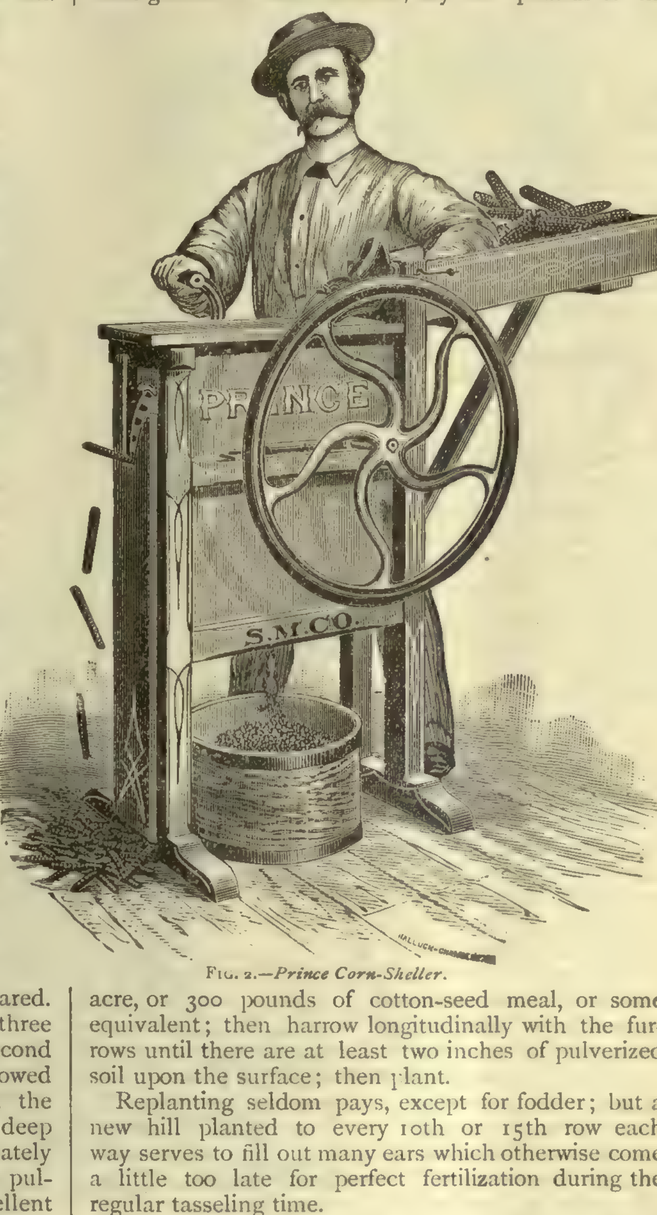


FIG. 2.—*Prince Corn-Sheller.*

acre, or 300 pounds of cotton-seed meal, or some equivalent; then harrow longitudinally with the furrows until there are at least two inches of pulverized soil upon the surface; then plant.

Replanting seldom pays, except for fodder; but a new hill planted to every 10th or 15th row each way serves to fill out many ears which otherwise come a little too late for perfect fertilization during the regular tasseling time.

HARVESTING. If there be no danger of early frosts, the corn may be permitted to stand until fully ripe. If the stalks are desired for fodder, they are better to

be cut as soon as the grain is well glazed, and this should be done in all cases when frost is expected. If the corn be shocked or stooked, scarcely any injury will occur either to the leaf or grain. Very few cultivators now-a-days advise "topping" the corn; that is, cutting off the stalks above the ear; and stripping the blades is too tedious a process of making fodder. Corn should be permitted to stand in the field until perfectly dry before stowing away in the crib. The last days of September and the beautiful "Indian summer" of October is the regular harvest time for corn, but often a farmer is so situated that he can best afford to let the corn stand on the stalks until it is fed out, which saves once handling. "High" farming and the best-paying farming are often two different things. But picking corn in the winter is so painfully disagreeable that most people would prefer to "handle the corn twice."

Considering that hills of corn in the right place are often insufficient for holding up a shock, a "corn-horse" (Fig. 3) can be easily made, by which one can locate the shock just where he wants it without anxious thought or care. The figure represents the "horse" set for a shock; the corn is put around the intersection of the pin as a center, and when done, the pin, (which fits loosely) is drawn out, and the main pole drawn out at right-angles to that, and the horse carried to the next locality for a shock. In husking the corn at a subsequent time, and in removing the fodder from the ground, the farmer is thus relieved of the torments of tugging at uncut stalks and of then cutting them with his pocket-knife. In every way the "corn horse" method is the neatest and best.

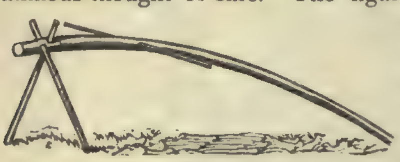


Fig. 3.—*Corn-Horse.*

"Hogging down" corn is the practice of turning hogs into the corn-field to fatten themselves. This is not advisable, as systematic experiments show that under such a regime the land actually decreases in productiveness, breaks up cloddy in the spring, and becomes difficult to cultivate neatly.

As to the amount of shrinkage of corn, systematic experiments have been made, showing that it is better, on an average, to sell shelled corn early in the winter at 40 cents than the following summer at 50 cents. The degree of shrinkage varies, of course,

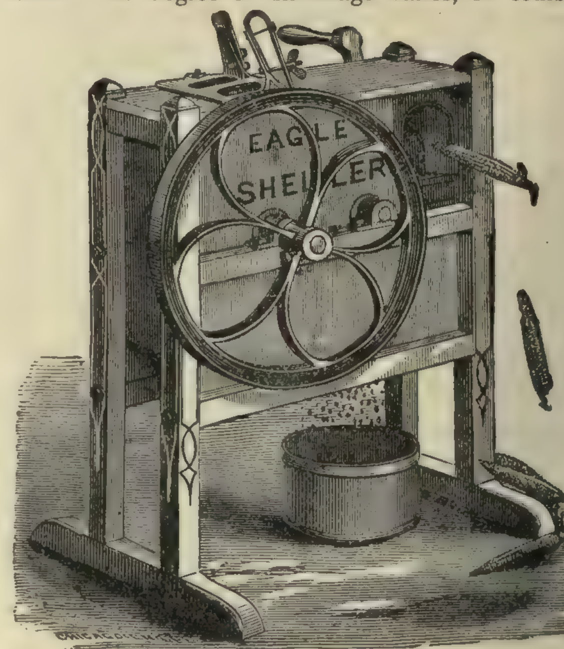


Fig 4.—*Eagle Corn-Sheller.*

with the kind of weather, the kind of corn, the degree of ripeness at the time of harvesting, etc. Ears from even the same hill will vary to some extent.

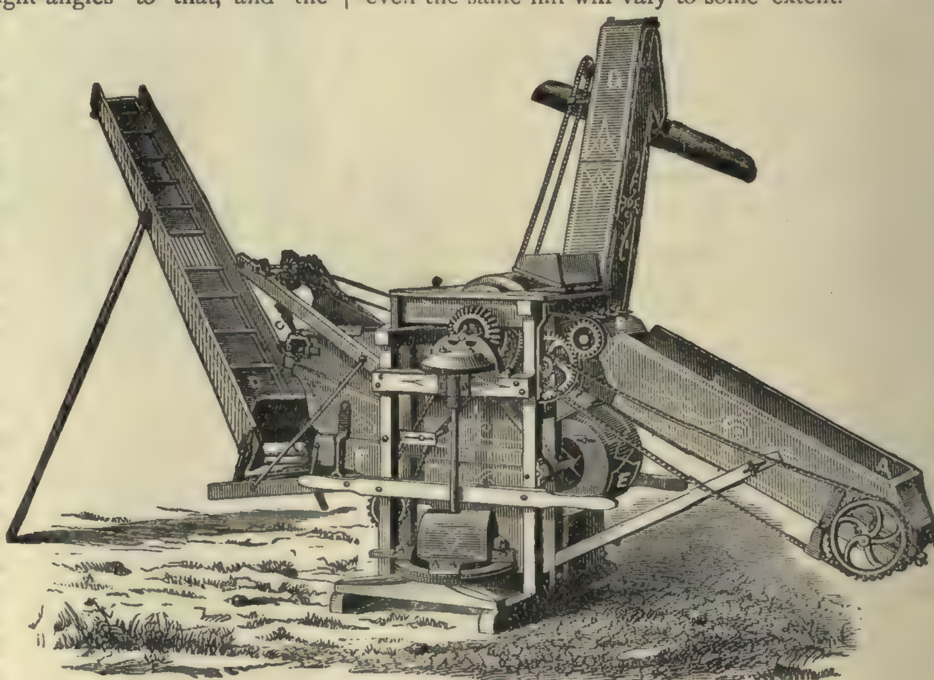


Fig. 5.—*Warehouse Sheller in Position for Work.*

The relative cost of corn and pork is indicated in the following table of equivalents, the corn at a given

price per bushel being equivalent to pork at a given rate per pound:

CORN.	PORK.	CORN.	PORK.
12½	1⅞	33	4
17	2	45	5
25	3	60	6

From this schedule any farmer can readily calculate whether to sell his corn or first turn it into pork, as nearly as he can forecast the markets.

Sometimes a piece of ground is sown thickly with corn for fodder or soiling. For this purpose the soil should be in a high condition and well pulverized. Prepare the seed in a pickle of saltpeter, like that intended for ripe corn; sow it broadcast at the rate of three or four bushels to the acre, and harrow it in. A better method is to sow thickly in drills and stir the ground with a light plow or cultivator. Some prefer even the hill method—twice as many hills to the acre as for grain. The sowing may be either early or late, but early is better. Cut before frost, dry thoroughly and then house it.

SEED CORN. The best method of saving seed in ordinary cultivation, and that is convenient for every farmer, is to select the ears while cutting the corn.

FIG. 6.—*Veteran Hand-Sheller.*

Lay the stalk and the ear one side, and these can be easily gathered and placed in a shock by themselves; husk this corn early, throwing aside any that does not come up to the standard. Leave two or three husks on the ear, then braid together 12 or 15

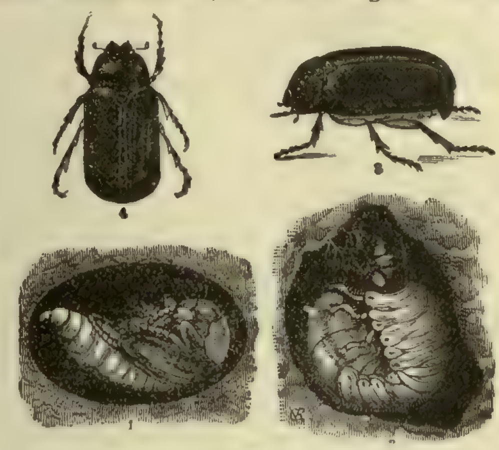


FIG. 7.—*May Beetle* (Phyllophaga fusca).
1, pupa; 2, larva; 3, beetle, side view; 4, beetle, back view.

ears and hang in any convenient place under cover where the air freely circulates. It will be well dried before cold weather, and should be put where it does not freeze hard. Such corn will not fail to grow; and not only that, it will give a strong plant, and the selection of choice ears will constantly increase the crop, provided the soil and cultivation is attended to. These remarks will apply equally to other grains, although the trouble is not as great with the small grains as with corn. In the West, however, where all the corn is picked from the stalk, it is more convenient to select the best ears while harvesting the corn in October.

DISEASES. Indian corn is not subject to any disease, strictly speaking, except the "smut," a fungoid growth familiar to every farmer. The only remedy consists in cutting off and burning all infested parts as soon as they appear. Thorough co-operation of farmers would render this process more effectual, as the spores of the fungus are readily transmissible by the winds. Such tedious work, however, is seldom remunerative, except in very extraordinary cases.

INSECTS. The chinch-bug and army-worm do corn

a great deal of damage, but as they injure wheat rather more, we take them into consideration under the head of Wheat. The cut-worm, or white grub, which is the larva of the May beetle, Fig. 7, works on the corn as it is sprouting and appearing above the ground.

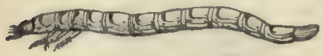


FIG. 8.—*Wire-Worm* (Elater).

The wire-worm, Fig. 8, is the larva of the spring beetle (Fig. 9), called also "click beetle," "skip jack," "snapping bug," etc. It eats the roots, the stem and finally the ear. It works also upon wheat and some of the grasses. As remedies for the cut-worm and wire-worm, all sorts of drugging of the soil have

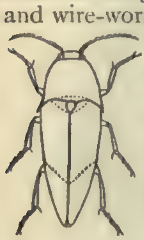


FIG. 9.—*Spring Beetle.*

been recommended, from salt to lime and ashes, but with doubtful results. "Fire and flood" are sure remedies, when they can be applied, which is seldom—namely, burning up all rubbish and remaining stalks in the field, as well firing the neighboring forests, with co-operation of neighbors, and irrigation, where practicable. But the most reliable method of all is to starve them out by omitting to plant for one season, frequently stirring the ground. Previously soaking the seed in drugged solutions, or tarring it, or both, probably aid in guarding the grain in the ground, but is no protection to the stalk or ear. The birds and domestic fowls do not reach these worms to any appreciable extent. It is very hazardous to re-sow where these worms have destroyed a crop unless the soil be plowed repeatedly. They are most to be dreaded in dry seasons, yet they

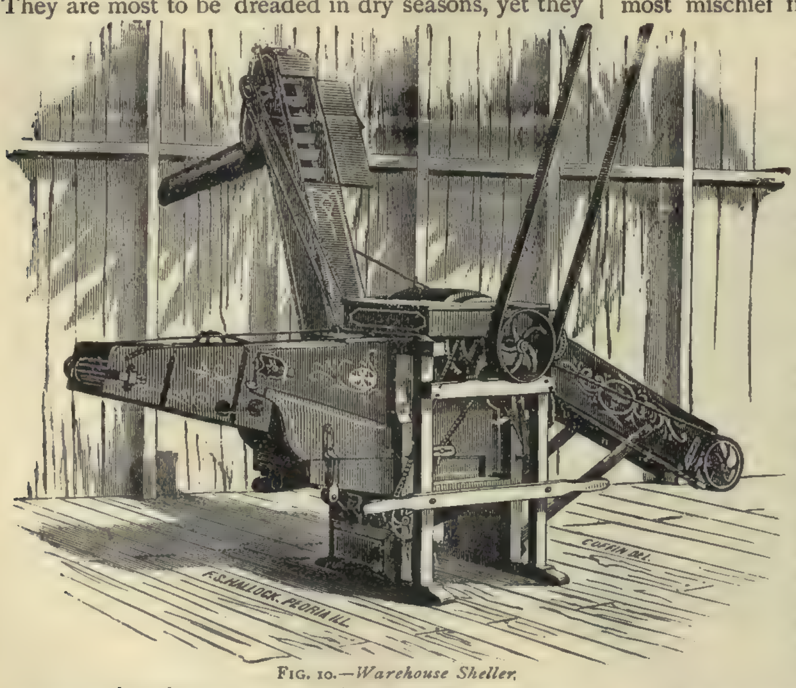


FIG. 10.—*Warehouse Sheller.*

cannot exist without some moisture. Affected plants are known by the dying off of the outer leaves. They cut into the stem above the roots and sometimes separate the stalk. Gardens suffer exceedingly; lettuces often fall a sacrifice to them. On light lands they do

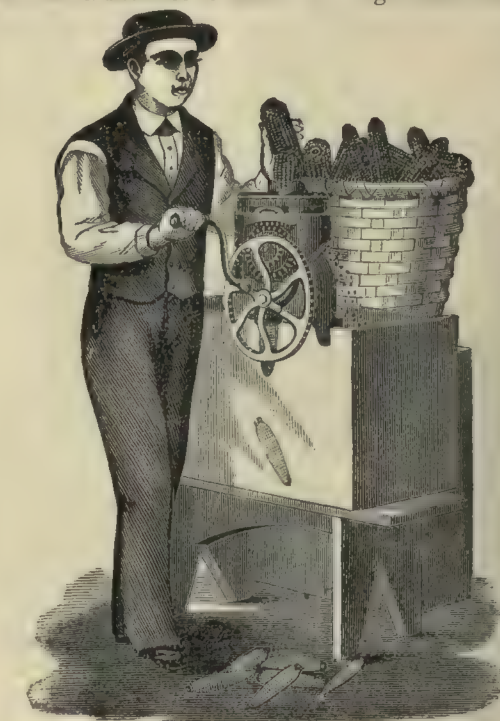


FIG. 11.—*Monitor Sheller.*

most mischief from the beginning of March to June. Lower parts of the fields joining on marshes are much infested. Rye-grass is most dangerous with clover for encouraging wire-worms. Gravelly and sandy soils are most infested; strong loam and clay most free from them. Wheat sown in dry weather is most likely to suffer. By constantly disturbing the insects it is probable they may be driven from a locality. A summer fallow and burning the rubbish are recommended after clover and grasses; it kills the eggs and starves the worms; but fallows must be kept very clear from grasses and weeds. Nothing more dangerous than to leave strips and patches of grass or lays in plowed fields. Feeding land close with sheep will prevent the eggs from being laid. Folding oxen and sheep in the spring may also keep the beetles from coming out of the earth. Harrowing and hard rolling in March and April are strongly recommended. Top dressings of lime are useful before rolling.

A great many other insects are found infesting corn, as the Rocky Mountain locusts (see Locust), the rustics, plant lice, etc., for which the remedies are in gen-

eral the same as already designated for the cut-worm and wire-worm.

Many birds, squirrels, gophers and mice also "go-

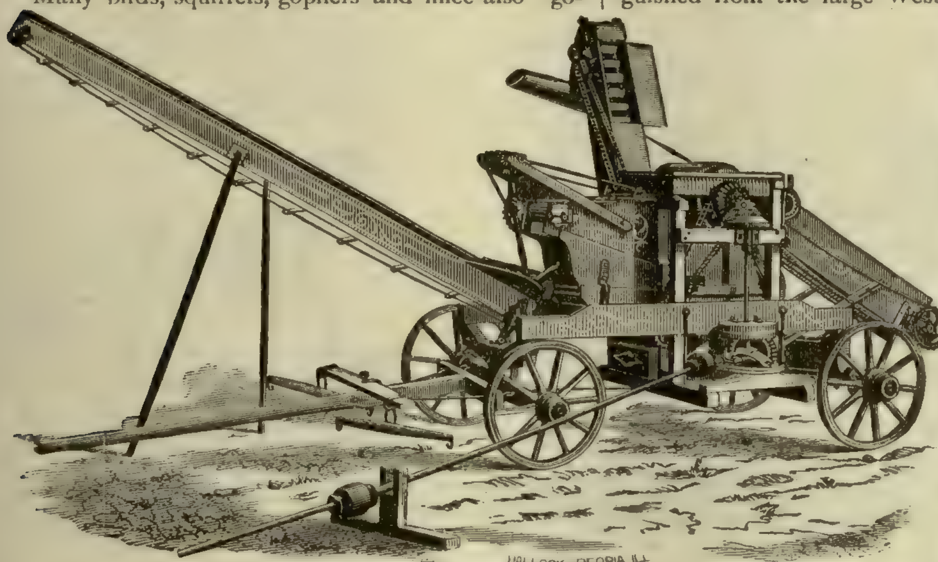


FIG. 12.—*Geared Mounted Sheller.*

for" corn, all of which have to be warred against in all imaginable ways, as there is no single remedy known that is thoroughly effectual in their destruction or in driving them off. A small mirror or piece of bright tin suspended on a pole so as to swing around in the wind, is said to be an efficient scare-crow.

VARIETIES. In reality there is but little pure-bred corn in this country, for crossing is so easy that nearly all our so called "varieties" are sub-varieties, mostly with local names. Corn readily adapts itself to the latitude in which it grows, changing its characteristics with change of locality. Varieties considered early and small in Maine, planted a few years in Tennessee, become late and large, thus completely adapting themselves to the warmer climate. Indian corn may properly be divided into four distinct groups: The Flint corn of the sea-coast States, the Dent corn of the West and South, the sugar varieties, containing gum, sugar, oil and but little starch, and the Squaw or flour corn. The latter are marked by their tenderness, the skin being filled with starch granules, which readily break into powder. The flint varieties contain largely of gum and oil, and the Dent varieties as largely of starch and oil.

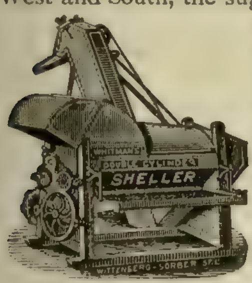


FIG. 13.—*Double-Cylinder Sheller.*

The small flint, or hard, 8 to 12 row varieties are grown principally along the north border States, from Maine to Oregon. Among these may be mentioned as best the Early Yellow Canada (small eight-row), Holden (same, but more productive), and Kingsbury's Excelsior, an early 12-row, yellow variety, growing larger every way than the others. These may be designated as types of the Northern varieties, as distinguished from the large Western and Southern Dent varieties. Among the latter are the Early Galena (one of the best for late planting), Early Minnesota, White Gourd Seed, Southern Big Yellow, Illinois Yellow, Long John, Evans, Proctor Bread, Chester County Mammoth, Chester County Gourd-Seed, Brunt's Prolific, Longfellow, etc. We notice in the State agricultural reports many other names of varieties, but they are either local or synonymous with the names above given. The same variety appears different as grown in different situations. We need a thorough overhauling and systematizing of corn nomenclature.

FIG. 14.—*Chester County Gourd-Seed Corn.*

The stalks of all the varieties are rich in sugar when the grain is in the milk, so much so that sugar in notable quantities has been produced therefrom, not however in quantities to warrant working it, since, in the South, the true sugar-cane and in the North the varieties of sorghum are more profitably worked.

In planting SWEET CORN, for table use, the smaller varieties may be sown in drills two and a half feet apart, and the stalks thinned to ten inches apart; the largest sort should have the drills three to four feet apart, the stalks a foot apart in the rows, and the very largest varieties eighteen inches apart. Use some rich manure in the drills, frequently stir the earth around the roots by hoe or cultivator, but do not draw it up about the stalks. For a succession of corn for family use to be planted at the same time, the best varieties probably are Marblehead Early, Extra Early Adams, Pratt's, Crosby's, Moore's, Stowells, and Egyptian Sweet.

VARIETIES. The sweet varieties for family use and marketing in a green state are the following:

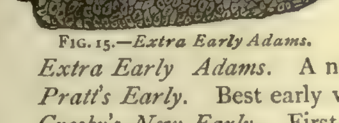


FIG. 15.—*Extra Early Adams.*

Marblehead Early. The earliest of all.

Extra Early Adams. A new variety.

Pratt's Early. Best early variety for market.

Crosby's New Early. First-rate every way.

Moore's Early Concord Sweet. A new early corn,

with 12 to 16 rows; remarkably handsome and quite popular.

Campbell's Early. Popular in Ohio.

Stowell's Evergreen. Keeps green till cold weather; ears large; a standard late variety.

Marblehead Mammoth. The largest variety grown; early and sweet.

Early Narragansett. Kernels very large and ears large and short.

Mexican Sweet. The sweetest and tenderest of all varieties for family use.

Golden. Peculiarly rich flavor; forty days; a good flint variety for an early crop in Northern latitudes.

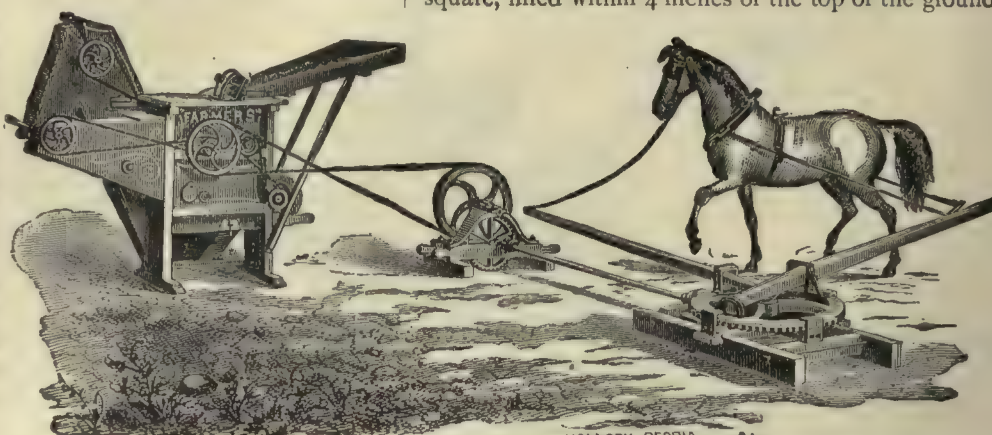


FIG. 17.—*The Farmer's Sheller.*

Early Boynton and Egyptian are new varieties promising to supersede some of the old.

Gen. Grant. The sweetest of all and best for fodder; latest of all.

Sweet Fodder Corn. Preferred for fodder to the yellow kinds.

Egyptian Sweet. Medium season.

CORN-CRIB. Fig. 16 represents the plan of a corn-crib, well calculated for ventilation, convenience and durability. The posts are set in grout; on the top of these are old tin pans inverted or sheet iron (not shown in the cut), to render the crib mouse and rat proof; the passage-way is wide and high enough for a man to carry a bushel basket of corn on his shoulder; the slats in the passage-way are left open at the top to within three feet six inches of the floor, between the second and third beams from each end, the crib being 32 feet long. Temporary slats, with a small cleat three-quarters of an inch wide at each end, are let into the grooves formed by the ends of the permanent upper slats, and a cleat is nailed on the inside part, so that the crib can be filled full from end to end. The floor is of hemlock plank, two inches thick, and the longitudinal joints are left half an inch apart. The timber in the crib is as follows: Sills of hard maple, 6 feet 6 inches long, 4 by 4 inches; plates of same, 7 feet 6 inches long, 4 by 4 inches; outside posts of hemlock (flaring 6 inches), 4 by 4 inches; inside posts, hemlock, upright, 7 feet 2 inches high between shoulders, and 4 by 4; inside, 2 feet 4 inches apart for passage-way; slats, 16 feet long, 5 by 1 inch, and ¾ of an inch apart, put on horizontally; foundation posts of cedar, 6 inches in diameter, 3 feet in the ground, 2 feet 6 inches out. Grout holes, 3 feet deep and 2 feet square, filled within 4 inches of the top of the ground.

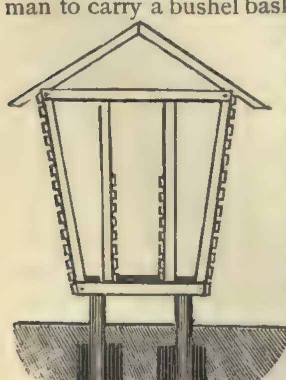


FIG. 16.—*Corn Crib.*

The posts and bents are 5 feet 4 inches apart from center to center. Length of crib, 32 feet, or 48 feet if wished for. Projection of eaves of roof, 12 inches.

Corn-cribs are often made double, that is, two long cribs are built parallel to each other about nine feet apart and the intervening space roofed over. This forms a sheltered passage way into which the loaded wagon is driven, and may be left standing secure from rain or snow Cribs are also often made as a part of the barn, with great convenience; also with pig-pens attached, and with contrivances for letting out the corn for feeding, etc.

CORN-HUSKER. Machines for husking corn have been invented which operate very well, except that they leave the stalks in irregular heaps. As most farmers in the corn-growing sections of the Union husk their corn from the standing stalks in the field, they have little use for husking machines.

CORN-SHELLER. The corn-sheller best adapted to the farmer's use, depends on the quantity of corn he has to shell. There are many good shellers in the market, among which we give illustrations of several.

Fig. 1 represents the Derby sheller. This is a two-hole sheller and discharges the cobs at the end. The shafts are of wrought iron with Babbitted bits. It is an excellent small sheller.

Fig. 2. The Prince, a one-hole, feed-table, hand sheller, is well made, easily run and well adapted to the use of those having small quantities of corn to shell.

The Eagle Sheller, Fig. 4, has wrought shafts and Babbitted boxes. The frame is well made, bolted together and nicely finished. It shells clean, separates the cob from the corn and does not choke. It will shell any kind of corn, from pop-corn to ears three inches in diameter.

Fig 6, the "Veteran," has the revolving, wire cob-rack, for separating the cobs from the corn, and a fan for cleaning the corn.

The "Monitor," Fig. 11, is a hand sheller, simple in construction and quickly adapted to a box or bin, and shells seed-corn without injury to the kernel.

The double-cylinder sheller, Fig. 13, is a "power" sheller. It has a second small cylinder which revolves in the same direction as the large one, and between these cylinders the corn is shelled without breaking the cobs or grain. Should a stone or any hard substance get into the sheller the small cylinder will prevent any damage being done to the teeth or the machine. It will shell all corn from the cob, no matter how wet or tough it may be, and is geared to attach to any power, running at 75 revolutions of tumbling rods to one of the horses.

Fig. 17 represents a sheller worked by horse power. It requires no extra help. It can be used also as a hand sheller. It is compactly built, and when not in use, occupies but little storage room.

Fig. 12 represents a large power sheller and Fig. 5 shows how it works.

The ear-corn is fed into the feed-hopper A, thence it is carried by chain conveyors, the ears being straightened by beveled partitions arranged for that purpose, and are presented endwise to the machine. Entering the machine at the point B, they are rapidly and unerringly pressed between the shelling-wheels by the action of the "force feed." In passing between the shelling-wheels the corn is completely removed from the cob. The cobs, following the course of the fluted underplate, are deposited upon the revolving wire cob-rake and from the point C are discharged into the hopper of the cob-stacker D.

The shelled corn falls upon the screen of the shaking shoe F, and is at the same time exposed to the blast from the fan E, and is thoroughly purged of all dirt, silk, tips of cobs and other impurities, and is then discharged from the under plate of the shoe in a spout which conducts it to the bin.

Fig. 10 is a large power sheller for warehouse men. It is self-feeding and made in three different sizes. The two-hole has a capacity of 600 to 800 bushels per day; the four-hole from 1,500 to 2,000 bushels per day, and the six-hole from 2,500 to 3,000 bushels per day.

For farther information in reference to mills, see also Grist Mill and Hominy Mills.

Corn Planter. While a hand-planter is all that is required for small fields or rough ground, a regular two-horse planter does more and better work, where the ground will admit of its operation at all. There are many kinds in market, the patents on most of which have run out. We call attention to a few modern features. Fig 1 is a cut of a rotary drop planter on which a check-rower (Fig. 2) can be successfully used. It cannot be locked, and thus is prevented a great deal of trouble and loss.

Barnes' Wire Check-Rower, Fig. 3, is an arrangement for doing perfect work. The wire is of annealed steel, made especially for the purpose, and does not

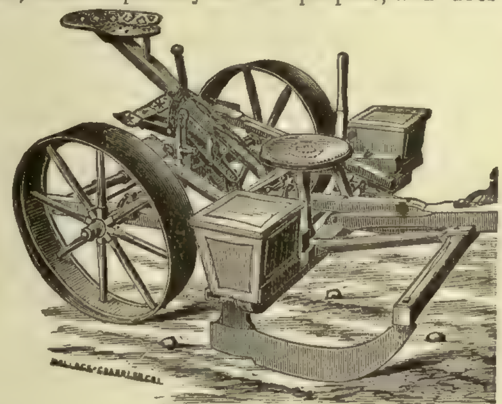


FIG. 1.—*Corn Planter.*

cross the machine. There is no stretching and drawing up of the wire, as in the use of rope. Unnecessary friction on the pulleys and heavy side draft are avoided. A check rower saves the trouble of previ-

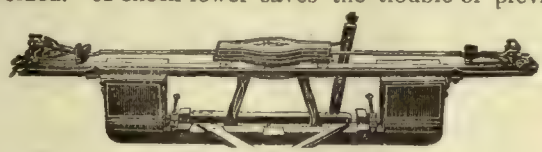


FIG. 2.—*Check-Rower.*

ously marking off the ground, and will work on any land where any other style of horse planter can work.

Corn, TO CAN: see page 184.

Corn, GREEN, TO COOK. Husk the corn; pick off all the silk; cut off the rough ends; put it into boiling water and let it boil half an hour.

Another: Prepare and boil as above, cut the kernels from the cob, stir in a little butter and salt and send to table in a covered dish.

TO STEW CORN. Choose well-filled but tender ears; cut it from the cob with two cuts to the grain; also make an incision lengthwise of the ear. It can then be cut off the cob without the skin. Then put the cobs on to boil in a stew-pan, covering them with water. When well cooked, having boiled say, 20 minutes, take them out and put the corn into the water in which they were boiled. When sufficiently done—only a few minutes are required—season with pepper, salt, cream and butter, adding a little sugar if preferred very sweet. This receipt may be relied on as being a peculiarly excellent one, the sweetness of the corn being unsurpassed when the directions are exactly observed.

TO PREPARE CANNED CORN. Take the corn from the can; put into a saucepan with a little salt, a cup of cream or milk, and the same of water, or all milk if preferred. Let it come to a boil, and just before you take it off, add a piece of butter the size of an egg.

Corn, TO DRY. Put the ears of sweet corn (none other so good) into a moderately hot oven, and let it

dry sufficiently to shell easily, taking care not to scorch it. When shelled, let it stand in a warm oven until perfectly dry. This way of drying has the advantage of retaining all the sweetness of the corn, and also of being much less trouble than the usual ways. Of course, dried this way it will require longer cooking when used. Another method is to cut from the cob raw, heat thoroughly in the oven, then dry in the sun. The Shakers steam the corn for about five minutes, to "set the milk," then shave it off by running the ears over a bit like an inverted jack-plane, with a trough surface nearly fitting; and then kiln-dry it on perforated tin or zinc, where they constantly stir it. Finally they pack it in three-bushel barrels for shipment.

Corn, To Measure in the Crib. Two cubic or solid feet of good, sound, dry corn in the ear will make a bushel of shelled corn. To ascertain the number of bushels of shelled corn in a crib of corn in the ear, then, measure the length, breadth and height of the crib inside the bin. By height is meant, of course, the height of the corn in the bin. Multiply the length by the breadth in feet, and the product by the height, and divide by two. Corn in the crib shrinks and settles during the winter, so there will be some difference between measurements taken in fall, and spring or summer.

Example. Required the number of bushels of shelled corn in a crib 20 feet long, 10 feet wide and 6 feet high: 20 x 10 x 6, divided by 2, equals 600 bushels, the answer.

When the Crib is Flared at the Sides. Multiply the sum of the top and bottom widths in inches by the perpendicular height in inches, and the product by the length in inches and divide the amount by 2,748, and the quotient will be the number of heaped bushels of ears. Take two-thirds of the quotient for the number of bushels of shelled corn.

Example. Required the number of bushels of shelled corn contained in a crib of ears 4 feet wide at the bottom, 8 feet at the top, 10 feet in perpendicular height, and 15 feet long?

Solution. 48 inches, bottom width, plus 96 inches, top width, equal 144; divided by 2 equal 72, x 120 inches, perpendicular height, x 180 inches, length, equal 1,555,200; divided by 2748, equal 565.9 bushels ears, ⅔ of which is 377.28 bushels shelled corn, the answer.

The above rule assumes that three heaping half-bushels of ears make one struck bushel of shelled corn. This proportion has been adopted upon the authority of the major part of our best agricultural journals. Nevertheless, some journals claim that two heaping bushels of ears to one of shelled corn is a more correct proportion, and it is the custom in many parts of the country to buy and sell at that rate. Of course much will depend on the kind of corn, the shape of the ear, the size of the cob, etc. Every farmer must judge for himself, from the sample on hand, whether to allow one and one-half or two bushels of ears to one of shelled corn. In either case it is only an approximate measurement, but sufficient for all ordinary purposes of estimation. The only true way of measuring all such products is by weight.

A barrel of corn is five bushels shelled. By this latter measure corn is estimated, and corn bought and sold throughout most of the Western and Southern States. At New Orleans a barrel of corn is a flour-barrel full of ears. In some parts of the West it is common to count 100 ears to the bushel.

Corn, Value as Food for Stock. According to the Patent Office reports, and the results of numerous experiments, 1 bushel of corn weighing 56 pounds will produce 10½ pounds of pork. Throwing off 1-5 to come at the net weight gives 8 2-5 pounds of pork as the product of 1 bushel of corn; or, 1 pound of pork as the product of 6⅔ pounds of corn; 3¾ pounds of cooked corn meal makes one pound of pork. Assuming that it requires 6⅔ pounds of corn to make 1 pound of pork (exclusive of the labor of feeding and taking care of hogs) the relation which the price of corn bears to that of pork is exhibited in the following:

Corn per bush.	Pork per 100 lbs.	Corn per bush.	Pork per 100 lbs.
$ .12½	$1 50	$.[illegible]8	$4 52
.15	1 78	.40	4 76
.17	2 00	.42	5 00
.20	2 38	.45	5 35
.22	2 62	.50	5 95
.25	2 96	.55	6 54
.30	3 57	.60	7 14
.33	3 92	.65	7 74
.35	4 00	.70	8 57

By reversing the above table we have the price of corn per bushel at different prices per pound for pork. The use of the above table is obvious. For example, should corn be selling for 50 cents per bushel and pork only 5 cents per pound, it would be more profitable to sell the corn; but should corn be selling for 40 cents per bushel and pork for 6 cents per pound, it would be most profitable to reduce the corn to pork, and sell the latter.

To Find the Price of Pork per Pound, Taking the Price of Corn per Bushel as the Datum: Divide the price of a bushel of corn by 8.4 (the number of pounds of pork produced by a bushel of corn) and the quotient will be the answer.

Example. When corn is 20 cents per bushel, what should be the price of pork per pound?

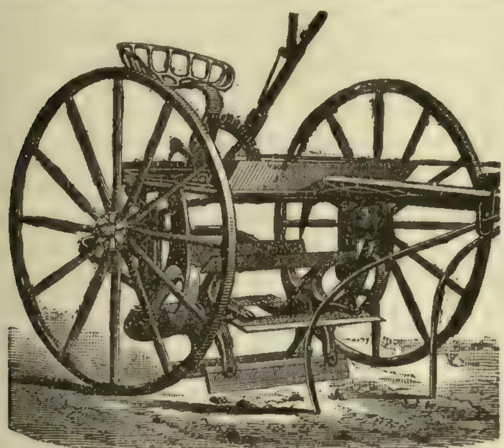
Solution. 20 cents divided by 8.4 pounds equals 2.38 cents, answer. To find the price of corn per bushel taking the price of pound as the datum, multiply the price of a pound of pork by 8.4 (the number of pounds of pork produced by a bushel of corn) and the product will be the answer.

Example. What would be the price of corn per bushel when pork is selling at 4½ cents per pound?

Solution. 4.5 cents multiplied by 8.4 equals 37.8 cents, answer. The foregoing table and rules must not be taken as invariably correct. The proportions and results will be influenced by many conditions and causes, such as the sample of corn used, the constitution and breed, as well as the age of the animal, its condition, powers of digestion, habits, health, etc. The very nature of the subject precludes

the possibility of exactly defining the results and proportions. At best we can only have some general average results and rules. The foregoing are deemed safe general averages.

Corn Salad, Lamb's Lettuce, Fetticus. This is a soft, mild salad plant, of no great account except that it can be used for greens in early spring before anything else is ready. Plant early in September in shallow drills; cover lightly with straw or leaves for protection through the winter; treated precisely as spinach, except that thinning the plant is not essential.



Corn-Stalk Cutter.

Corn-Stalk Cutter. One of the most useful and labor-saving machines upon the farm is a good corn-stalk cutter, to enable the agriculturist to save the stalks as manure to the ground and plow them under as readily as so many corn-cobs. See also Feed Mills.

Cornet, or **Coronet,** of a horse, is the lowest part of his pastern, that runs round the coffin, and is distinguished by the hair that joins and covers the upper part of the hoof.

Corns. Those who have been unfortunate and unwise enough to wear boots and shoes that were too tight have a painful appreciation of the sort of a thing a corn is. The remedies and "corn cures" that have been on the market and recommended by friends are as numberless as the sands of the sea-shore, almost. The best cure is a preventive in the way of large, heavy-soled boots and shoes. For treatment of corns we recommend the following:

Roll a lemon until it is soft; cut a thick slice and bind it on the corn on retiring at night. Several applications may be necessary. When the corn becomes white and disintegrate, pull it out with the finger nails, never using a knife. Raw cotton saturated with turpentine may be used the same way.

Another: Place the feet for half an hour, two or three nights successively, into a pretty strong solution of common soda. The alkali dissolves the indurated cuticle and the corn comes away, leaving a little cavity, which, however, soon fills up.

Another: Soak ivy-leaves in vinegar during the space of 15 days; then place a leaf or part of a leaf over the corn; renew it every morning and scrape off with pumice stone, dipped in vinegar, each time the hard portion of skin is detached. The vinegar acts by stimulating the absorbents; and the friction hastens their action. The pumice stone and vinegar will answer the purpose, if used every morning.

Corral, a Spanish word in common use in the West, signifying a yard or enclosure, especially for cattle, near a house. Used also as a verb.

Corridor (cor′ri-dor), a gallery or passage-way leading to apartments independent of each other.

Corrosive Sublimate is a subtle mercurial poison. When swallowed in improper quantities, the patient should swallow the whites of several eggs; albumen gives a white precipitate with salts of mercury, which is insoluble in the juices of the stomach. Or, take milk and cream; or a decoction of cinchona; or an infusion of galls. This dangerous poison should never be given to any animal as medicine. It is, however, used in solution in some skin diseases of animals, such as ring-worm and mange. When so used only a small portion of the body should be washed with it in one day. For this purpose take 4 grains of the sublimate to 2 ounces of rain-water. For a dog 2 grains to the ounce, in water, will be strong enough. In solution it is efficient to kill bed-bugs. It will be a long time before any return where this wash has been put.

Corrugated, wrinkled or folded, like the zinc of a wash-board.

Cosmetics, external applications to beautify the complexion. See Toilet.

Costiveness, same as Constipation, which see.

Cotswold, a breed of sheep: see Sheep.

Cottage, a cot or hut. This term was formerly limited to a poor or shabby habitation, but is now applied also to any small, neat and tasteful dwelling. See Residence.

Cotton. The cotton plant does well as far north as the Ohio river valley, but the cultivation of it is far more remunerative in the Gulf States. The most common kind is the "upland," so called in contradistinction to "Sea Island" cotton, the latter having longer fiber and of superior quality. American cotton of both kinds commands a higher price in England and the continent of Europe than that which comes from the East Indies; and as it is found by repeated trials that American seed, introduced into India, even under the management of American planters, deteriorates so much as to fail even to compete with the native variety, the citizens of this country can feel safe with reference to the production of this most important commodity. The area of cotton planting has, since the civil war, greatly increased. With improved methods of cultivation and careful rotation, there is no reason why this crop should exhaust the soil. The greatest draw-back to the profitable cultivation of the

plant exists in a few injurious insects, the "boll worm" being one of the most prominent. All sorts of manure and fertilizers are applicable, and many of them abundant, as marl, gypsum, lime, rotten limestone, fish remains, sea-weed, oyster-shell lime, besides all the waste products and manures about the house and stable yards.

Of late years cotton-seed oil has become a merchantable article, and large quantities of it are beginning to be manufactured throughout the South.

CULTIVATION, ETC. Clay loam and silicious soil and a clay sub-soil are best for upland cotton. Sandy soils over sandstone or limestone and rich bottom lands are productive. Other soils, properly treated, may be made available. The presence of mineral elements is indispensable. The Sea Island cotton grows only on low, wet land. Deep plowing is essential, as the plant has a long tap-root. Under draining is important—often absolutely necessary. Plowing is done in January, February or March, after which the land is allowed to settle until about three weeks before planting. Bedding up is the next step. A "scooter," or narrow-bladed plow, is run through the field where the rows are to be planted, from three to seven feet apart, according to the fertility of the soil. In this furrow the fertilizer used is placed. With a turning-plow, one furrow on each side, a ridge is made covering the fertilizer, and forming a bed for the plant. Run the "scooter" along the center of the ridge, drop the seed after they shall have been rolled in wet ashes. The covering is done with a board the width of the furrow, with scoop or groove cut in the center of it, and screwed to the scooter. The seeds should be in hills from 8 to 20 inches apart, six to eight seeds to the hill. When about two inches high, the plants are thinned to two or three stalks in a hill. Ten days afterward the crop is hoed, or has a little dirt thrown around the plants with a plow. Two weeks later it is again hoed and plowed, all grass and weeds being removed. In two or three weeks more, it is again hoed and plowed, after which there is nothing more to do. The planting is done immediately after the last frost in the spring. Two to five bushels of seed will plant an acre. Picking is generally done by hand, as soon as the pod is well open, in July or August. There is a machine for picking, but the old hand method is considered the best. After picking it is spread out to dry on scaffolds. When a seed pressed between the teeth will crack with some noise it is sufficiently dry. It has to be turned and stirred frequently. It is then ginned and baled.

Cotton-Seed Meal. How to use cotton-seed meal in feeding it to stock is a matter of no little importance. When fed too freely it may do much harm, and therefore should be used intelligently. It is worth now about $30 per ton, and is considered at that price one of the most useful foods when used with judgment. Analyses show that a ton of cotton-seed meal contains 38 pounds of potash and 56 pounds of phosphoric acid with 78 pounds of nitrogen. Being so rich in nitrogen and oil it should be used with food rich in starch, such as potatoes and roots. One pound of cotton-seed meal is considered by some equal to two pounds of corn meal. Thus it will be seen it is so rich that it must be fed only in small quantities. A Southern writer says two pounds a day are quite enough for a cow that is milking; a calf should not have more than two to four ounces; pigs will not thrive on it at all, as it is too rich for them, except when given in small quantities mixed with bran slops, or cut roots. Horses do well on it, if given two pounds daily with corn meal; two pounds of it equal ten pounds of oats. But, if fed too abundantly, the bowels are made very costive and the kidneys are affected. This is doubtless on account of its highly nitrogenous nature, as the waste nitrogen is eliminated from the system through the kidneys, and they are too actively excited by very rich food. The next ill effect is an inflammatory condition of the system, and in cows there is a danger of garget, and horses suffer from irritation of the skin, sore mouth, and hide-bound. It is as though a man were fed on extract of beef, rich pastry, and such food only. One pound of cotton-seed meal mixed with half a peck of boiled potatoes mashed together would make good feed for a fattening pig, or a milking cow, but the pig should have corn or bran for the second daily feed. These facts should be kept in mind, as there is little doubt that more of this food will henceforth be used in this country than has been heretofore.

Cottonwood, a familiar tree, of the class of poplars, growing in wet lands, to an enormous size. Being a very rapid grower, it has been introduced to some

Cottonwood Gall-Fly. (Pemphigus populi-monilis.)

a, fly (natural size indicated just above); b, c, d, f, antennæ (different stages, magnified); e, female.

extent upon the high, flat prairies of the West, but as the wood is not valuable and the tree not ornamental as a shade tree, its further propagation was many years ago abandoned. At the present day botanists are inclined to believe that there is but one species. The engraving illustrates the figure and work of an

insect which flourishes in central Colorado and southern Kansas, operating only upon cottonwood. Several species of the same genus are common pests in the garden and orchard. See Insects.

Coughs are brought on in many different ways, which it is not necessary to mention here. We give some of the more efficient remedies.

DRY COUGH. Take lemonade, made into a syrup by the addition of a considerable quantity of white sugar, and sip from a spoon and slowly swallow it. The acid of the lemon thins the secretion from the mucous membrane, and the sugar has a sheathing and soothing action, allaying irritation and promoting expectoration, which are the two great ends to be accomplished in all inflammations of the throat, nose and bronchial tubes. The use of opiates may allay irritation and smother up the cough, but they check the secretion, which is the natural mode of relief; and thus, instead of curing, they often aggravate the inflammation to such an extent that fatal disease is the consequence.

COUGH FROM COLD. Take ¼ pound of coltsfoot; ¼ pound of hoarhound; ½ pound white sugar; make into a syrup by boiling with 1 pint of water. Take occasionally during the day in doses of a tablespoonful. Or, ½ pound elecampane root; ½ pound spikenard root; ½ pound comfrey root; ½ pound blood root; ½ pound hoarhound leaves; put all together in 1 gallon of water and boil down to 2 quarts; then strain and add 1½ pounds white loaf sugar, and boil again until reduced to 1½ pints; for adults, 1 tablespoonful 3 times a day, doubled at night; children, 1 teaspoonful. Or, make a very strong tea or syrup of the following roots and herbs: equal parts of the spikenard, elecampane, comfrey, bloodroot and hoarhound herb; sweeten with honey or granulated sugar. Dose, a tablespoonful 3 times a day.

TICKLING COUGH. Take 6 tablespoons of molasses, and juice of ½ a lemon; simmer over the fire till well incorporated; take off and add 1 tablespoon of paregoric, and about the size of a horse-bean of refined nitre. Take 2 teaspoons when the cough troubles.

CONSUMPTIVE COUGH. Take sanctuary, hoarhound, bayberry bark, 2 pennyworth of each; and of agrimony, raspberry leaves, cleavers and ground ivy, 1 pennyworth; extract of licorice, 4 ounces; and ½ a teaspoon of cayenne pepper; gently simmer in 2 gallons of water for an hour.

Another: Take 1 pint of milk, warm it, and when it comes to the boiling point, add as much mustard as will turn it to a posset; take away the curd, and into ½ pint of the posset put 1 ounce of brown sugar candy, to dissolve. Take the posset as hot as you can at night, when in bed, and renew it for 3 or 4 times. This has given relief in asthma.

HACKING COUGH. Wring a towel from cool water, and put around the neck on going to bed, putting a dry one over the first. Continue this treatment for some time, and you will be relieved.

CHRONIC COUGH. Take equal parts chlorate of potash and burnt alum; pulverize and mix. Take ¼ teaspoonful of the mixture stirred into a teaspoon of molasses or honey from 3 to 5 times each day.

ASTHMATIC COUGH. Take 2 good handfuls of colt's-foot leaves, 1 ounce of garlic, and 2 quarts of water; boil down to 3 pints, strain, and to the liquor add 8 ounces of sugar; boil gently for 10 minutes. Take half a cup occasionally. See Asthma.

Coulter: see Colter.

Counter, in farriery, the breast, or that part of a horse between the shoulders and under the neck.

Counterfeit Money, to detect: see Money.

Coupling-Pole, of a wagon, sometimes called "reach," is the piece joining the two axletrees.

Coupon (coo' pon), a small slip of paper attached to a bond or other security, and containing an order for the payment of a stated portion of the interest or dividend accruing on the bond as it matures. It is detached when redeemed. Secondarily, the term "coupon" is often used to denote any kind of certificate, note or order attached temporarily to a ticket or other obligation.

Court Plaster, a kind of varnished silk, used to cover recent cuts, to keep the edges in contact and defend them from the action of the air. Its manufacture is simple and easy. Bruise a sufficient quantity of isinglass and let it soak in a little warm water for 24 hours, expose it to heat over the fire till the greater part of the water is dissipated, then supply its place with proof spirits of wine, which will combine with the isinglass. Strain the whole through a piece of open linen, taking care that the consistence of the mixture shall be such that when cool it will form a trembling jelly. Extend a piece of black or flesh-colored silk on a frame, and fix it in that position, then apply the isinglass (after it has been rendered liquid by a gentle heat) to the silk with a brush of fine hair. As soon as the first coating is dry, apply a second. If a very superior article is desired, supply a third coat. When the whole is dry, cover with two or three coatings of balsam of Peru. As every farmer and his family ought to have a good supply of this very convenient necessity, the above process will afford it cheaper and less injurious than that which is kept at the drug stores. Every laborer ought to carry a slip of it with him in his pocket. See Collodion.

Cover or **Covert,** in hunting, denotes the woods, underbrush, etc., which shelter and conceal game; as, to "beat a cover," to "ride to cover." The feathers covering the bases of the quills of the wing or tail of birds are also technically called the "covert."

Cow, the female of the ox genus. Perhaps no domestic animal is so highly prized as the cow. She furnishes food, not only for her own offspring, but for other animals, in its most easily taken and assimilable form; and the cow has become the sign and expression of all comfort and good living. She is the most profitable property kept upon the farm.

Most of our domestic brutes have been so long and so entirely subject to the control of man that their original type is unknown; but it may be inferred from the fact that the cattle on the boundless pampas of South America, Mexico and elsewhere, which have been allowed entire freedom from all human direction or restraint for hundreds of years, do not differ materially from the domestic herds—that our present races do not differ in any essential features and characteristics from the original stock. The milking qualities of our domestic cows are, to some extent, artificial, the result of care and breeding. In the natural or wild state, the cow yields only enough to nourish her offspring for a few weeks, and then goes dry for several months, or during the greater part of the year.

There is, therefore, a constant tendency to revert to that condition, which is prevented only by judicious treatment, designed to develop and increase the milking qualities so valuble to the human race. If this judicious treatment is continued through several generations of the same family or race of animals, the qualities which it is calculated to develop become more or less fixed and capable of transmission. Instead of being exceptional, or peculiar to an individual, they become the permanent characteristics of a breed. Hence the origin of a great variety of breeds or races, the characteristics of each being due to local circumstances, such as climate, soil, and the special object of the breeder, which may be the production of milk, butter and cheese, or the raising of beef or working cattle.

All of the various breeds of cows are noticed in the article Cattle; the laws and practices which regulate the improvement or deterioration of any of her varieties are dealt with in the article on Breeding, and under this head in the Cattle article; the criteria of her age are treated under head of Age of Cattle in the article on Cattle; the diseases to which she is subject are fully treated under head of Diseases in Cattle article; the proper treatment of her offspring is noticed under the article Calves, and the proper management of her products are very fully dealt with in the articles Dairy, Milk, Butter, and Cheese. We, therefore, have only to treat in this article of the selection of cows for dairy use; the points of good milkers; training the calf; management, parturition, spaying, etc.

Signs of a Good Cow. None but good cows should be found upon the farm for steady keeping: the inferior ones should be selected out for beef. A good constitution in a cow is indicated by large lungs, which are denoted by a deep, broad, and prominent chest, broad and well-spread ribs, a respiration somewhat slow and regular, a good appetite, and, if in milk, a a strong inclination to drink, which a large secretion of milk almost invariably stimulates. In such a cow the digestive organs are invariably active, and they make an abundance of good blood, which stimulates the activity of the nervous system and furnishes the milky glands with an abundance of milky secretion. Such a cow, when dry, takes on fat readily. In order to have no superfluous flesh, the cow should have a small, clean, and rather long head, tapering toward the muzzle. A cow with a large, coarse head will seldom fatten readily or give a large quantity of milk. A coarse head increases the proportion of weight of the least valuable parts, which is a sure indication that the whole bony structure is too heavy. The mouth should be large and broad, the eye bright and sparkling, but of a peculiar placidness of expression, with no indication of wildness, but a mild and feminine look. These points will indicate gentleness of disposition. Such cows seem to enjoy being milked, are fond of caresses, and often return caresses. The horns should be small, short, tapering, yellowish, and glistening. The neck should be small, thin, and tapering toward the head, but thickening when it approaches the shoulder; the dewlaps small. The fore-quarters should be rather small when compared with the hind-quarters. The form of the barrel should be large, and each rib project further than the preceding one, up to the loins. She should be well formed across the hips and in the rump. The spine, or back-bone, should be straight and long, rather loosely hung, or open along the middle part. The skin over the rump should be loose and flexible. This point is of great importance; and as, when the cow is in low condition or very poor, it will appear somewhat harder and closer than it otherwise would, some practice and close observation are required to judge well of this mark. The udder is of special importance. It should be large in proportion to the size of the animal, and the skin thin, with soft, loose folds, extending well back, capable of great distension when filled, but shrinking to a small compass when entirely empty. The milk veins along the belly should be large and prominent, and extend forward to the navel, losing themselves, apparently, in the best milkers, in a cavity deep enough to thrust in the end of a finger. The teats should be widely set, of moderate size, and not too fleshy, the apertures permitting the milk to escape by an easy pressure of the hand. In the following paragraphs we give in detail the precise points of a good "milker," under the head of—

Milk-Mirror, a peculiar quality and arrangement of the hair around and on the cow's udder and adjacent parts, affording a generally true index of her qualities as a milker. The marks called the milk-mirror, or escutcheon, consist of certain perceptible spots on and around the udder, on which the hair, instead of growing downward, grows upward. It seems well established that cows with the most perfect milk-mirrors, or escutcheons, are, with few exceptions, the best milkers of their breed. The milk-mirror is recognized by the upward-growing direction of the hair which forms it. As a matter of course, it is partly hidden by the thighs, the udder, and the folds of the skin, but is always recognizable if the hand be drawn downward. The direction of the hair of the milk-mirror being opposite to that surrounding it, may frequently be distinguished by the different shades of light reflected by it. The eye, however, must not be exclusively relied upon. According to their

position milk-mirrors may be divided into upper and lower tufts, or escutcheons and milk-mirrors, properly so called. The former are comparatively very small, and are situated very near the vulva. They are common on poor milking races, but rarely occur on the best milch cow. They consist of one or two bands of up-growing hair and indicate the duration or length of the milk-flow. The larger the tufts the shorter the period of the milk-flow. That portion of the mirror which occupies the space immediately around the

FIG. 1.

FIG. 2.

FIG. 3.

FIG 4.

Milk Mirrors of Jersey Cows.

udder may be found in all cows, the quantity of their yield being determined by its size. In other cases, the udder, the perineum (the space between the udder and the vulva), the thighs and the inner surface of the legs are covered with this up-growing hair or milk-mirror. There will, naturally, be many irregularities of form in the escutcheon, but the principle stated above with regard to its extent and perfection will be found sufficient to cover nearly all cases, and, in connection with other characteristic signs and configurations, which we have given for judging accurately what should constitute a good dairy cow, few mistakes need be made.

That it is correct as a rule, is sufficient to cause it to be given careful study and attention. We do not hesitate to say that he who will study carefully the illustrations we give, and the statements made, while he will find many varying signs, will not only be convinced of the accuracy of the system, but will be able, either in the cow or calf, to select with judgment. The milk sign also follows in the bulls. There is no point in judging a cow so little understood as the escutcheon. The conclusion of almost every one is, that her escutcheon is good if her band of up-running hair from the udder extends to the vulva and around it.

These cows with the broad vertical escutcheons are nearly always parallel cows, that is, with bodies long but not large and with the under line parallel with the back. Their thighs are thin, and the thigh escutcheon shows on the inside of the thigh rather than on the rear.

Next comes the wedged-shaped cow, with the body shorter but very large, deep in the flank, and very capacious. This form does not usually exhibit the vertical escutcheon running up to the vulva, but with a broader thigh may exhibit a thigh escutcheon which is preferable to the other: seeFig. 2. In both vertical and thigh mirrors, where the hair runs down, intruding on the udder, as low as above the dotted lines, as, in Figs. 3 and 4, it damages the escutcheon. If you find a cow with the hair all running down, and between the thighs, that is, with no up-running hair, stamp her as a cipher for yielding milk. There are times when the udder of a cow with an escutcheon like Fig. 4 will be enlarged by non-milking, for the purpose of deception. It is always safer to judge by the escutcheon rather than by the large size of the udder. The escutcheon of the best cows, those yielding the most and continuing the longest, will be found to be those which conform to Fig. 2. The vertical escutcheon of Fig. 1 would not injure it; but if that ornamental feature has to be at the expense of the thigh escutcheon, Fig 2 is the best as it is.

Many think that the escutcheon of the bull is of little moment, so that he has a good look. So far is this from being the case, that a bull with a mirror like Fig. 4, or worse, will stamp his escutcheon on, and to that extent damage, his daughters out of cows with escutcheons as choice as Fig. 2. In this way the daughters of some of the best cows come very ordinary, while, if you use a bull marked like Fig. 2, he will make a poor escutcheon better, and will improve the best. His injury or benefit will be double according to the escutcheon markings under the body in front of his scrotum. Hence the importance of the dam of a bull being unexceptionable in her udder and escutcheon. Her qualities inherited by her son will be transmitted to his daughters.

While careful as to escutcheons, we must not neglect the other essential features of a good cow—the back, skin, hide, rich colored skin, and the fine bone. Let the hair be soft and thickly set, and let the skin be mellow. This latter quality is easily determined by grasping between the thumb and forefinger the skin at the rear of the ribs, or the double thickness at the base of the flank that joins the stifle-joint to the body, or

that on the inside of the rump-bone at the setting on of the tail. Let the teats be well apart; let them yield

FIG. 5.—*Great Milk Mirrors on Holstein Cows.*

a full and free stream and be large enough without the necessity, in milking, of pulling them between the thumb and fore-fingers. And let it ever be kept in mind that the large yielder must be well fed.

TRAINING THE CALF. This is a very important feature in producing good milkers. If the calf has been raised by hand, that is, fed with milk from the pail, it will, or should have, become so gentle and familiar as to allow itself to be approached readily, and to respond to the call of its master. Many persons at this time name every calf, and thus they soon come to know their names when called. If firmness and at the same time gentleness have been used, so that the calf will understand that there is nothing to fear; if no struggle is made, it is well on the way to understand what is further expected of it. It should be rubbed and curried occasionally, especially on those parts of the body that itself cannot reach, as the head, neck and shoulders; or, if kept in the stable constantly, it should be brushed all over at least once a day. Here is one of the first and most important lessons. At first, the calf does not know what is intended. If the master gets angry and beats it, it will ever after associate currying and brushing with a beating; and when it gets older and stronger, in the constant successions of struggles to escape punishment, it will at length find it is the stronger animal of the two. Thereafter itself and not the man is master. The object of currying is not to give pain. It is an operation of cleaning that the animal cannot perform for itself, because confined in a stable. If the animal is turned out during the day, and confined only at night, or if it have the range of the yard and sheds day and night, the cleaning is not needed. Animals can and do perform these offices for themselves and for each other by licking, so far as necessary. The accumulating scurf in an outdoor life is a provision of nature for the protection of the animal. It should not be touched. In the stable, however, it is different. The lack of exercise tends to a sluggish movement of the blood, and hence a clean skin becomes one of the most active integers in preserving the health of the animal. In using the comb or brush, or, in the case of cattle, the card and brush, a light hand with the comb and card will do better work than a heavy hand. It should be unnecessary to say that about the bony parts the card or curry-comb should never be used.

Haltering. The first thing a calf should be taught is to stand quietly when tied and under all circumstances. If it is taught this by being tied up immediately upon being taken from the cow to be fed milk, or at from three days to a week old, there will be no difficulty.

TRAINING TO MILK. In training to stand quietly while being milked, the udder should be often handled while the heifer is growing up; the bag should be rubbed; it should be pressed and the teats gently pulled. This need take but very little time. The real work comes when the animal is to be milked. There are many things to be taken into consideration here. The heifer must be put in a pen where she cannot hurt herself, and where the milker can operate easily; a pen just large enough for the heifer to stand in, five feet high and tight enough so there will be no danger of the heifer injuring herself, and with an opening for the milker to operate through, will thoroughly subdue the wildest. Generally, all that is needed will be to tie the heifer by the head, and then patiently show her that she will not be hurt. She will soon come to associate the act of milking as easing the udder and thenceforward will stand quietly, unless the bag or

FIG. 6.—*Bad Management.*

teats hurt her. If so, seek the cause of the difficulty and cure it.

If the animal has never been tied up, but has been handled in the yard, one person may take the heifer by the horns, while another milks. If she be very refractory she may have to be "nosed." Seize the off horn firmly with the right hand, and thrust the two first fingers and thumb of the left hand into the nostrils, clasping the membrane tightly if she struggles

severely. So soon as the struggles cease, ease the pressure of the fingers in the nostrils. If she again struggles, again tighten the grasp. Let the milker use gentleness. It does no good to kick an animal; it may do much harm. If the heifer kick, it is probably because she is hurt. A person of ordinary strength need not be kicked while milking, unless in the case of a cow of extraordinary strength and viciousness. The wrist of the left hand holding the teat, if kept well against the stifle, and pressed firmly back when the foot is raised, will generally cause it to be set down in place again. Use soothing words when the animal is quiet, and low but firm words of command when refractory. If the udder is inflamed, as is very often the case soon after calving, bathe it carefully with cold water, so as not to shock the animal. She will soon come to associate a feeling of relief with the operation and like it. In fact, the whole art of training may be summed up in the sentence: Use discretion and judgment, and show yourself superior to the brute—in truth, its friendly master. The conquering of brute force by brute force is a relic of barbarism. There are vicious animals as there are vicious men; there are dangerous animals as there are dangerous men. Both may have been bred or educated thus. Vicious men are placed where they cannot injure their fellows; vicious animals had better go to the butcher—they are as unprofitable to breed from as they are useless for what may be got out of them.

FIG. 7.—*Result of Good Handling.*

As showing the effects of bad and good handling, we give the picture of a cow made wild and vicious by bad handling (Fig. 6), and that of a cow used to kind treatment and gentle but firm handling (Fig. 7). The reader can draw his own conclusions as to which is the better system.

FEEDING. Milch cows ought always to be maintained in good condition. When they are ill-fed in winter, they not only cease to give a due proportion, or even any proportion whatever, of milk, but they become so thin in their ordinary juices and so reduced in their whole substance that when restored in spring to a fair degree of feeding, they spend, in filling up the waste of their system, a large proportion of the time and the food which would otherwise be employed in the secretion of milk. Also, when they decline into poor condition during the months, or even weeks preceding calving, they afterward experience so severe and prolonged struggle between the process of secretion for making up their own substance and the process of secretion for supplying milk, that they will yield a decidedly scanty supply of milk throughout the better portion of the following season. They ought during the whole winter to be well fed, comfortably housed, abundantly littered, regularly supplied with clean water, occasionally combed, and in general treated with considerate and kindly regard to their sympathies, susceptibilities and wants. It is poor economy to attempt to keep too many cows for the amount of food the owner can furnish. One good cow, well bred and well fed, is worth two, and often three, ordinary scrubs, poorly fed and treated. The ordinary rules for feeding stock, elsewhere laid down under the head of "feeding," in Cattle article, apply to cows; yet there are special rules applicable only to milk-producing cattle. Feed regularly, and do not let cows become hungry and restless by waiting. If one goes into any well-regulated dairy establishment an hour before feeding, scarcely an animal will rise to its feet, but at the hour of feeding the whole herd will be likely to rise and seize their food with an avidity and relish not to be mistaken.

It is impossible to prescribe the exact food that should be given to cows throughout the country; in fact, no arbitrary rule is necessary. Locality and adaptability to products must determine this to a large degree. It has been found, however, in the practice of the successful dairymen, that in order to encourage the largest secretions of milk in stalled cows, one of the best courses is to feed in the morning with cut feed, consisting of hay, oats, millet or cornstalks, mixed with shorts, and Indian, linseed, or cotton-seed meal, thoroughly moistened with water. If in winter, hot or warm water is far preferable to cold. If given at milking time the cows will give down their milk much more readily. The stalls and mangers should first be well cleaned Roots and long hay may be given through the day, and at the evening milking, or directly after, another generous meal of cut feed, well moistened with water, and mixed, as in the morning. The process of digestion in a cow, or other bovine, goes on best when the stomach is distended, and for this purpose bulky food is almost as necessary as nutritious aliment. The flavor of some roots and vegetables, as cabbages and turnips, is more apt to be imparted to the milk when fed on an empty stomach than otherwise. Dairymen who wish to excel in the care of their cows curry them each day, though many do not practice this laborious treatment. An excellent feed for cows in the winter is the hay from the second crop of clover, well cured to prevent heating, becoming musty or rotting. The flow of milk from this kind of feed, accompanied by carrots or sugar beets, is greatly stimulated. Milk may be regarded as a material for the manufacture of butter and cheese; and according to the purpose for which the milk is intended to be employed the cow should be differently fed. Butter contains carbon, oxygen and hydrogen, and no nitrogen. Cheese, on the contrary, is rich in nitrogen. Food which contains much fatty matter, or

substances which in the animal system are readily converted into fat, will tend to increase the proportion of cream and milk. On the other hand, the proportion of caseine or cheesy matter in milk is increased by the use of highly nitrogenized food. Those, then, who desire much cream, or who produce cream for the manufacture of butter, select food likely to increase the proportion of butter to the milk. On the contrary, where the principal object is the production of milk rich in curd, clover, peas, bran, and plants which abound in the desired elements, should be fed. The practice of "soiling," or stall feeding, or feeding in the yard the year round—summer as well as winter—has been on the increase for the last 20 years. This subject is elsewhere treated under its appropriate head. It can be said here, however, that for the perfect feeding of cows for profit, when pastures become short in the summer or fall, green food, grown for the purpose, should be cut and fed to them, so that they may not fall off in flesh or milk production. Uniformity of feeding and abundance of food the year round should be constantly held in view by the keeper of cows. The most natural and healthful food for cows is, of course, green grass; hence succulent vegetables and roots are always grateful to milk cows, and plenty of good, pure water is a thing indispensable.

Shelter and Kindness. No animals feel the influence of kindly treatment and protection more than cows, and the milk-pails invariably show the character of their treatment in these respects. The less cows are exposed to the cold of winter the better. They eat less, thrive better, and give more milk when housed all the time than when exposed to the cold. During spring and fall, and even summer, there often occur violent storms, and in the two former seasons the weather is cold. At such times, though the herd has been turned out to pasture, the cows should be driven to shelter. Kindness of treatment is another important requisite in the management of cows. They should always be driven slowly, and never dogged into a run to and from the pasture. Quietness in the stable or yard during milking time, and a kindly tone of voice, will tell on the disposition of the cows. All whipping, pounding, kicking, or other maltreatment of cows should never be indulged in.

Milking. Frequent milking at perfectly regular intervals, is essential to the maintaining of a regular secretion of milk, and has a powerful effect in increasing the quantity of it. Every milking ought to occur at precisely regular intervals from the preceding; for if later than that interval, it will allow the udder to be gorged, and to throw back a portion of its contents into the cow's system by absorption; and if earlier than the interval, it will occasion the udder to have too small capacity for the milk which would naturally be secreted during the longer interval that is to follow. Every drop of milk, also, ought to be drawn off at each milking; for when any portion is allowed to remain, it seems to be absorbed back into the system, or to serve as an indication to the secretory vessels to secrete a proportionately less quantity during the following interval. Thus we see how easily a cow can be "dried up."

To Prevent a Cow Sucking Herself. A very simple, and said to be effective means, is to take a tough hickory stick 14 inches long, ¾ of an inch thick in the center, sharpened to a point at each end; cut a groove around the center, half an inch wide, and half the depth of the thickness of the wood. Whittle each end nicely to a point, or leave it somewhat blunt, and insert a sharpened piece of wire in each end. Make a hole in the animal's nose, in the soft portion, but close up to the hard membrane of the nostrils, as you would for ringing a bull, and small enough so it will require considerable pressure to slip the bulge of the stick until it reaches the middle notch, when it will remain fixed. This does not prevent the animal from feeding, nor being fastened in stanchions; and it must be an inveterate sucker that will draw her milk with this jewel in her nose.

Fig. 8.—*Nozzle Board, in Place.*

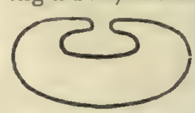


Fig. 9.—*Nozzle Board.*

To Prevent Kicking. Tie the cow in the stable with a good strong chain, then draw a strong cord quite tightly around the girth, or buckle a strap around the legs and fasten it to a ring in the wall behind, so the cord will be loose when at rest, and yet so tight that the cow cannot get her leg forward to do mischief.

Fig. 10.—*Self-Adjusting Cow-Halter.*

Tying a Cow. A most excellent manner of tying a cow is illustrated by Fig. 10. A short chain is fastened around her neck and to a ring which plays loosely around an upright post. This prevents her from becoming entangled in it and gives her power to move at will.

In making this tether use a piece of half-inch rope, 50 or 60 feet in length, and two iron stakes. These stakes should be of three-quarter inch iron, and 18 inches long, and pointed at the lower end, so as to drive into the ground readily. The upper ends are turned to form an eye, just large enough to admit the rope, each end of the rope being put through the eye in one of the stakes, and knotted. The rope being stretched in the desired portion of the pasture, the cow is attached to this by a rope or small chain,

10 or 12 feet long, or of such length as the abundance of the pasturage may make desirable. This, which is the tether proper, has at one end an iron ring, large enough to pass over the eyes at the ends of the stakes, and the other end is fastened around the cow's horns,

FIG. 11.—*A Double-Staked Tether.*

observing always to have a swivel in the center of this chain or rope. Use is shown in Fig. 11.

This will be found an excellent method of staking out cattle, as it is impossible for cows to snarl themselves up, as they are apt to do with a long rope fastened at one end. It is also a great saving, as the rope will last much longer than when a great length is drawn around through the wet grass. Another thing in its favor is, you can stake the cow on a long narrow strip, as on the border of a piece of grain, by shortening the rope or chain by which she is attached to the horizontal rope.

FIG. 12.—*Manner of Leading a Cow.*

By Fig. 12 we illustrate an excellent method of leading a cow. After the halter has been attached to the cow's horns take a half-hitch in it around one ear in such a way that it will not slip off. The engraving shows how this is done better than words can describe.

PARTURITION. This is an operation of nature which most farmers are familiar with, especially with cows. Before speaking of the delivery of the calf we give such information as will enable the farmer to tell whether his cow is pregnant or not.

Pregnancy. The symptoms of pregnancy in its early stage were formerly deemed unsatisfactory. The period of being in season, which commonly lasts three or four days, and then ceases for awhile and returns in about three weeks, might entirely pass over: and, although it was then probable that conception had taken place, yet in a great many instances the hopes of the breeder were disappointed. It was not until between the third and fourth months, when the belly began to enlarge, or, in many cases, considerably later, and when the motions of the fœtus might be seen, or, at all events, felt by pressing on the right flank, that the farmer could be assured his cow was in calf. The greatest of improvements in veterinary practice, the application of the ear to the chest and belly of various animals, in order to detect by the different sounds, which after a short time will be easily recognized, the state of the circulation through most of the organs, and, consequently, the precise seat and degree of inflammation and danger, has now enabled the breeder to ascertain the existence of pregnancy at as early a stage as six or eight weeks. The beating of the heart of the calf may then be distinctly heard, twice, or more than twice as frequently as that of the mother; and each pulsation will betray the singular double beating of the fœtal heart. This will also be accompanied by audible rushing of the blood through the vessels of the placenta. The ear should be applied to the right flank, beginning on the higher part of it, and gradually shifting downward and backward. These sounds will thus soon be heard, and cannot be mistaken.

Treatment before Calving. Little alteration needs to be made in the management of the cow for the first seven months of pregnancy, except that, as she has not only to yield milk for the profit of the farmer, but to nourish the growing fœtus within, she should be well, yet not too luxuriantly fed. The half-starved cow will not adequately discharge this double duty, nor provide sufficient nutriment for the calf when it is dropped, while the cow in high condition will be dangerously disposed to inflammation and fever, when, at the time of parturition, she otherwise would be susceptible of the power of every stimulus. If the season and the convenience of the farmer will allow, she will be better at pasture, at least for some hours each day, than when confined altogether to the cow-house.

The reason most commonly given for letting the cow run dry for a month or two before calving is, that after a long period of milking, her system requires rest, that she will give more milk and do better the coming season than if milked up to the time of calving. This is all true, and a reason sufficient in itself for drying off the cow some weeks before parturition; but there is another important reason for the practice, which is, that the mixture of the old milk with the new secretion is liable to end in an obstinate case of garget. To prevent any ill effects from calving, the cow should not be suffered to get too fat, which high feeding after drying off might induce.

Calving. The period of gestation is about 284 or 285 days; but cows sometimes overrun their time, and have been known to go 315 days, and even more, while they now and then fall short of it and have been known to calve in 220 days. If they go much over the average time the calf will generally be a male.

Cows are sometimes liable to slink their calves, and this usually takes place about the middle of their pregnancy. To avoid the evil consequence, as far as possible, they should be watched, and if a cow is found to be uneasy and feverish, or wandering about away from the rest of the herd and apparently longing for something she cannot get, she ought to be taken away from the others. If a cow slinks her calf while in the pasture with others, they will be liable to be affected in the same way. In many cases physicking will quiet the cow's excitement in the condition above described, and prove of essential benefit. A dose of 1 pound of Epsom or Glauber salts, and 1 ounce of ginger, mixed in a pint of thick gruel, should be given. First give the ginger and immediately follow with the salts in a little thinner gruel. When the cow once slinks her calf, there is great risk in breeding from her. She is liable to do the same again. When the slinking is caused by sudden fright or over exertion, or any offensive matter, such as blood or the dead carcasses of animals, this result is not so much to be feared. When about to calve the cow ought not to be disturbed by too constant watching. The natural presentation of the fœtus is with the head lying upon the the fore legs. If in this position, nature will generally do all. If the presentation is unnatural and the labor has been long and ineffectual, some assistance is required. The hand, well greased, may be introduced and the position of the calf changed; and when in a proper position, a cord should be tied round the fore legs above the hoofs; but no effort should be made to draw out the calf until natural throes are repeated. If the nostril of the calf has protruded, and the position is then found to be unnatural, the head cannot be thrust back without destroying the life of the calf. The false position most usually presented is that of the head first, with the legs doubled under the belly. A cord is then fixed around the lower jaw, when it is pushed back, to give an opportunity to adjust the fore leg, if possible. The object must now be to save the life of the cow.

The cases of false presentation, though comparatively rare, are so varied that no directions could be given which would be applicable in all cases. After calving the cow will require but little care, if she is in the barn and protected from changes of weather. A warm bran wash is usually given and the state of the udder examined. Calving, however, is often attended with feverish excitement. The change of powerful action of the womb to the udder causes much constitutional disturbance and local inflammation, may extend to the whole system and cause milk fever. For description and treatment of this disease, refer to it under head of Diseases, in Cattle article.

Retention of the Placenta, or Afterbirth. If the cow is gone her full time with calf, and is in a healthy condition, the afterbirth will not be retained long after she has given birth to her calf. When a cow does not cleanse properly and within a reasonable time, there is then something otherwise wrong with her health, such as debility or want of vitality in the system. It is this that must be looked to, and not the want of timely cleansing that demands attention, as being the cause of the cow not doing well after calving. Remedy these existing causes and the cow will cleanse well enough. Contrary to the generally received opinion of the farmers and others, the retention of the afterbirth for a day or two will do no harm provided that decomposition does not take place in the afterbirth; for, in such cases, the whole system of the cow is apt to be contaminated and poisoned.

Treatment. Cows not having cleansed properly within twenty-four hours after calving, should be given the following mixture: Epsom salts, 1 pound; powdered fœnugreek, 1 ounce; caraway seeds, ½ ounce; mix, and give in three or four bottles of warm ale, porter, or warm water, sweetened with molasses. This mixture not having the desired effect in twelve hours, the hand, well-greased, should be introduced, and the afterbirth at the attachments, called cotyledons, gently pressed. This must not be accompanied with much pulling, as pressure with the finger and thumb will be all that is wanted. This operation may be followed by giving the cow a little warm ale or molasses-water, with half an ounce of powdered ergot of rye; and, in half an hour, an additional half ounce. This will cause contraction of the womb and expulsion of the placenta. When decomposition or putrefaction of the afterbirth has taken place, which is known by the black color, the womb should be well washed out with a weak solution of chloride of lime. Administer, also, by the mouth, one ounce, three times in a day, of sulphate of soda for a week, to neutralize any of the poison of putrefaction that may have been absorbed into the blood. Give the cow good and nutritious feed to support her strength.

Spaying. This is the name given to an operation for the removal of the ovaries, or female testicles, from the milch cow and young female cattle. The object of the removal of the ovaries from young cows that never have had a calf, is to prevent them from ever having a desire for the male, so that she will be more easily fattened and fitted for market. Young cows so operated upon are continued to be called heifers.

The Advantage of Spaying Cows. The following are the reasons why dairymen should spay their cows, when not intended for breeding:

1. Spayed cows are more easily kept in good condition than cows not spayed.

2. They are less liable to sickness of an epizootic kind, and when sick, more certainly and easily cured.

3. When epizootic diseases are present in the vicinity, or even in the herd, spayed cows are always in condition and fit for the butcher. To prevent loss and save expense in the treatment, with the attendant risk of loss of some, and loss of condition and milk of all that are affected, they can be sold without loss—which is not the case with cows not spayed, and when pleuro-pneumonia is among them.

4. Spayed cows give the same quantity and quality of milk all the year round if they are properly fed and cared for.

5. Ten spayed cows will give the year around as much milk as double the number of cows not spayed, thus saving an interest on the outlay for ten cows, together with absence of risk from loss of some of the principal by death of one or more, by sickness or accident, not to speak of the feed of ten cows. Between the feed of ten cows and their manure, the farmer can best estimate the difference in value.

6. With spayed cows there is no risk to run from milk fever, nor trouble with cows called bullers.

7. To fatten a cow, spay her instead of giving her the bull, as is the present custom, by which feed and time are consumed, and the animal is not made very fat after all; for she has to provide the fattening substance to the calf in the womb, which, if she had been spayed, would have been appropriated to herself; nor is this all, for the calf in the belly is at once discounted by the butcher, as it is not a salable article in market.

8. Spayed cows have no calves to slink.

Having thus had a bird's-eye view of the advantages to be derived from spayed cows, let us look in the same manner at the disadvantages of spayed ones.

1. The expense of the operation and attendant risk of tbe animal dying—although this is not great—(about one in a hundred). The expense of the operation will be from $3 to $5, which will depend upon the distance the operator has to travel, and how many animals are to be operated upon.

2. Spayed cows are apt to accumulate fat and flesh, so that they will become dry much sooner than cows not spayed. Still there can be little loss, for a fat cow is always ready for sale. These, then, are the objections to spaying of cows, if objections they may be called.

Diseases. Notwithstanding the frequent and sudden changes to which our climate is subject, the diseases to which dairy-stock are liable with us are not numerous, and if judiciously treated may, in most cases, be made to yield to ordinary remedies. Pure air, pure water, good pasture, and thoroughly clean stalls, with a frequent, judicious, and gradual change of food, keep dairy-stock in a condition which is the best preservative against disease. Nature, unassisted, is then able to fight down any ordinary ailment. The barbarous antiquated methods of bleeding, boring the horns, and cutting off the tail, etc., should never be thought of by enlightened people of this day. For diseases of the cow and treatment, see Diseases, in Cattle article.

Cowhage (cow'hage), spelled also "cowage," "cow-itch," etc., is a plant whose pods have small bristles. The pods can be obtained at drug stores.

Care must be used in removing the bristles, for they are like nettles, and if they come in contact with the hands or face, or any part of the skin, they will produce a most distressing itching. The bristles or down which covers the pods is used as a never-failing remedy for worms, acting mechanically, by cutting and piercing them to death, when they are expelled by a brisk cathartic, to be given the next day. The manner of using it is to carefully scrape it from the pod in a little molasses, until you have got about a teaspoonful of the article into a tablespoonful or two of molasses; it is then to be put carefully into the mouth, and swallowed so that none of it gets upon the skin outside. Cowhage does not seem to make any impression on mucous surfaces, and therefore produces no injury to the patient after once fairly in the mouth and swallowed. With proper care, therefore, in handling, it may be regarded as a safe and very certain remedy for worms. The dose is from one to two teaspoonfuls, given in molasses, to be followed always, in about twelve hours afterward, with an active purgative. Should any of it get on the hands, or other parts, and produce itching, apply sweet oil or lard.

Cow Pea, the Southern bean; one of the most valuable forage crops of the South. It grows luxuriantly, smothering down all weeds; valuable even to plant between rows of potatoes, or other farm plants, to keep down weeds. Late in the season it is mowed off, and is easily preserved in silos for winter use. Or it can be pulled up and ensilaged, and during the winter the cattle will eat it roots and all. Where the seed matures, it makes a highly nutritious soup. There are different varieties—black, white and black-eyed.

Cow Pox, in farriery, a disease affecting the teats of cows. This disease appears in the form of bluish vesicles surrounded by inflammation, elevated at the edge and depressed in the center, and containing lymph. By the use of the virus of this disease has originated the present system of vaccination as a preventive of the dreaded small-pox.

Crabapple: see Siberian Apple, page 46

Cracker. The fundamental idea of cracker, as an article of food, is a small, unleavened, crisp cake, made from flour, and so dry that it will keep for a long time, deriving its name from the fact that it "cracks" between the teeth when one is eating it. This definition suggests, also, the main principles to be observed in making them. Home-made crackers are better than those sold at the groceries.

Common Crackers. Take butter, one cup; salt, one teaspoon; flour, two quarts. Rub thoroughly together with the hand, and wet up with cold water; beat well, and beat in flour to make quite brittle and hard; then pinch off pieces and roll out each cracker by itself, if you wish them to resemble bakers' crackers.

Soda Crackers. Take nine cups of flour, before sifting, one cup of lard, two teaspoonfuls of salt, one of soda (and two of cream tartar, if you like); rub all thoroughly in the flour, then add two cups of cold water, mix well and roll thin, prick with a fork and bake quickly.

Sugar Crackers. Flour, 4 pounds; loaf sugar and butter, of each, ½ pound; water, 1½ pints. Make as above.

Oatmeal Crackers. Sift three cups of oatmeal

and mix it with two cups of rich milk. Set in a cool place for six hours. Sift a cupful of Graham flour with a teaspoon of salt and one of baking powder. Work this into the oatmeal to make a dough. Roll the dough to the thickness of a quarter of an inch, using corn meal to dust the board. Cut into squares, lay on a greased tin, wash the surface with milk, and bake in a moderate oven for about fifteen minutes, being careful not to let them burn.

BREAD CRACKERS. Take 1 pound of bread dough after it has risen; add two ounces of butter or lard; work well in dough; let rise again; roll out very thin; cut in cakes and bake till dry.

GRAHAM CRACKERS. Have some soft water, either cold or tepid, in a mixing dish, and sift nice Graham flour slowly through the fingers into the water, stirring it in until too stiff to manage with the spoon; then mold the dough on a board with the hands until it is about as stiff as for common biscuit. Roll it with a rolling-pin about three-fourths of an inch thick, cut with a round cookie cutter, and lay on a baking tin, not greased but dusted with flour, so the cakes will not touch each other. Bake about thirty minutes in a pretty hot oven, making them sharp and crusty or tender as preferred. Take them from the oven into a pan or bowl and lay a napkin over them to steam awhile, then lay them in neat little piles on plates for the table. The "Graham crackers" sold at the groceries, either sweetened or unsweetened, are no more healthful than those made of bolted flour, for there is in reality very little Graham flour in them.

TO FRESHEN old crackers, put them into a hot oven for about three minutes.

The ADULTERATION of city-made or "store" crackers consists mainly in using poor flour, rotten dough, sulphuric acid, ammonia, etc. All cheap crackers are unfit to eat, while a high price in no wise insures a good article.

Cradle, for cutting grain, a scythe furnished with slender wooden fingers to gather and lay the grain evenly.

Cramp Colic: see Colic.

Cramps are irregular spasmodic contractions of the muscles of the whole or different parts of the body, causing most severe pain by the knotty and hardened state into which their fibres are contracted. Though cramp may involve the greater number of the muscles at once, the parts most generally affected are those of the feet, legs, thighs, abdomen and arms. The cause sometimes proceeds from the sudden application of cold to the heated body, damp sheets, wet feet, or wet clothes; the irritation produced on the nervous system by the absorption of lead, arsenic, or other mineral poisons, and the exhaustion on long-continued evacuations, as in cholera; from the specific action of some animal virus, as in the bite of venomous reptiles, and in bathing, from coming in contact with cold springs, and a too lengthened stay in the water.

TREATMENT. Friction will always be found the most valuable means for subduing cramps whether general or local; and if nothing else can be obtained the hand alone, or a piece of flannel, if properly used, may be always made of service. When a hot bath can be obtained, it should always be employed immediately, and friction used while in the water. For the more local kinds of cramp, fomentation, an embrocation of camphorated oil, turpentine and spirits of hartshorn is to be employed, rubbed in with the hand in the direction of the muscular fibers. The only internal remedy demanded is an occasional draught, composed of 1 ounce of brandy, ½ drachm of sal-volatile, 25 drops of laudanum, 15 drops of ether, and 2 ounces of water. See Drowning.

Cranberry. The cranberry is a familiar trailing shrub growing wild in swampy, sandy meadows and mossy bogs in the northern portions of the United States east of the Missouri river, and producing an elliptical, or oval, very acid, red fruit.

CULTIVATION. With a machine or otherwise pare off the surface of a swamp or meadow, where inundation is practicable, cover the surface with a few inches of sand, set out the plants 12 to 18 inches apart, either with or without their roots, keep them clean from weeds and grass two or three years, and they will cover the ground, producing the first year after this probably 50 bushels to the acre, the next year 100, and after that possibly 200 to even 400

FIG. 1.—*Bell Cranberry.*

bushels per acre; but 80 to 100 is the average. Peaty soil is good almost anywhere in the latitude of the Lake region. Flooding is not necessary until the third winter, unless destructive insects appear. To destroy insects the flooding should be continued to the first of June. It is well to have ground that can be drained somewhat. Cranberries can be raised upon clay land by covering it with sand and irrigating, but this process would hardly pay while the fruit grows so abundantly in the Northern and Eastern portions of the United States with scarcely any cultivation at all. A piece of ground 20 feet square will yield three to four bushels annually, which is quite enough for a family. The plants are easily procured, being generally taken up in square sods like grass. The planting can be done from March until the middle of May, or from September until the ground freezes. The fruit is gathered either by hand or with a cranberry rake, one man being able generally to gather about 30 bushels a day, and, for market, it is put in slatted bushel boxes.

Early and late flooding will keep off all insect pests, but in the Lake region the pale laurel, or wild sage, is

a most formidable enemy. Better gather all this shrub, root and branch, and burn it up, before setting out the fruit plants, and ever afterward treat it as you would Canada thistle.

VARIETIES. The Bell-shaped Black cranberry is the largest and most profitable. The fruit when ripe is a bright red color, but is the darkest red of all the varieties. Next are the Large and Small Cherry, then two kinds of Bugle, Oval or Egg-shaped, Large and Small, and the Small Gray, which are not so highly colored.

FIG 2—*Cherry Cranberry.*

Crane, in mechanics, swinging bar or frame, generally with pulleys, for raising heavy objects and swinging them around to another place, as in loading and unloading stone.

Crayon (cra' on), a piece of chalk, or other soft stone, usually in the form of a cylinder, or a composition of earths, variously colored, stiffened with some tenacious substance and made into sticks or cylinders, to be used in drawing. The best kind for home use is made of charcoal, thus: Saw the finest-grained, softest and blackest pieces of charcoal (willow is best) into slips of the size required, put them into a small vessel of melted wax, and let them macerate over a slow fire for half an hour, then take them out and lay them on blotting paper to dry. The same process will do for chalk of almost any color. Drawings made by such crayons are very permanent; and if the canvass or paper is warmed a little on the opposite side, the picture becomes as durable as ink.

Crape, BLACK, HOW TO CLEAN. Take skim milk and water and mix a little glue with it, and make it scalding hot. If chapped and pulled dry it will look as good as new.

CRAPE SCARF, TO WASH. Make a strong lather of boiling water and permit it to cool; then wash the scarf as quickly as possible, dip it immediately in hard water in which a little salt has been thrown (to preserve the colors), rinse, squeeze and hang it out to dry.

Cream, the fatty constituent of milk, composed of buttery globules covered with a thin film of cheesy matter. All that regards the treatment of cream in butter and cheese-making will be found under the heads "Butter" and "Cheese." When it is intended to send the cream to market, the same observations will apply to it as are made touching the keeping of milk. Cleanliness, a uniform, low temperature, and the least possible agitation are indispensable to the production of a first-rate article. As stated elsewhere, the greatest amount of cream is secured by the addition of a little water to the milk when it is set; but the milk remaining is correspondingly impoverished. Cream rises much more rapidly and in somewhat greater quantity on milk placed on shelves about six feet high than on the ground. Cream is usually skimmed from the milk at periods of 12 and 24 hours. The morning's milk is skimmed in the evening; the evening's milk in the morning.

At a temperature of 80°, all the cream will rise in 10 hours; at 77°, in 12 hours; at 68°, in 18 hours; at 55°, in 24 hours; at 50°, in 36 hours; and at 45°, in 43 hours.

Cream is raised by the use of the centrifugal machine, the principle being that the milk, which is heavier than the cream, will be thrown farther from the centre of the machine, forming an outer wall of liquid which may be easily drawn away from the inner wall of cream. This system is hardly adapted to dairies of less than 200 cows. The milk is at a temperature of about 80°, and the capacity of the machine about 500 pounds of milk per hour.

It is claimed that the Fairlamb milk-can (Fig. 1) is a great advance in the right direction, as far as cream-gathering is concerned. The exact amount of cream is shown in inches and eighths of an inch on a glass gage in the side of the can. Where cream is bought by the inch, as is the case with most creameries, the convenience of this arrangement to the farmer is manifest. The can is 17½ inches high, 12 inches in diameter at the top and 10½ at the bottom, provided with a tube in the center for cooling the milk. It has a tin cover with a rubber band around the rim, which renders the can, when covered, air-tight. It holds seven and a half gallons, or 70 pounds of milk. The inch of cream is held to be one pound. The objections urged against this system are: That in no can is an inch equal to a pound all the year round; that a can which will hold out full in June, will fall short from September till May; that whether or not an inch in any can will hold out depends on the manner of setting, the temperature, the time and frequency of skimming.

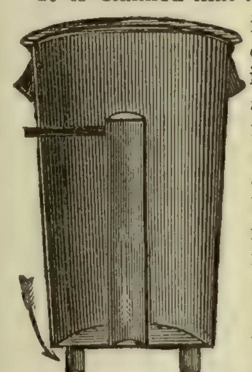


FIG. 1.—*Fairlamb Milk Can.*

The Cooley system (Figs. 2, 4, 5) consists in setting the cans of milk in a reservoir, where they are submerged in water of the proper temperature, namely, 45° to 55° in the spring and summer, and 40° to 50° in the winter, by which process the cream is all forced up in 12 hours. The cans have tight-fitting covers (Fig. 5) preventing the ingress of water. The cream is sweet, with all the natural aroma retained. The advocates of this system claim there are no disagreeable or unhealthful animal odors to be dispelled, and that only one-

FIG. 2.— *Cooley's Creamer.*

fourth the capacity of open vessels is required. The Cooley cans are 20 inches deep and 8½ inches in diameter. It is manufactured by John Boyd, Chicago, Ill. A. H. Reid's creamer is illustrated by Fig. 3.

FIG. 3.—*Reid's Creamer.*

By all these systems the housewife is relieved of much of the drudgery in making butter, and is enabled to make it more uniform and of a more excellent quantity. Or, by the use of these cans, the cream can be taken to a factory and the milk kept at home to be fed to animals.

Cream as a food is exceedingly nourishing, but where the digestion is not good it should be avoided.

FIG. 4.—*Cross Section of Creamer.*

Cream, as a special preparation for dessert, is a nice, delicate and popular dish. We give the best recipes.

COFFEE CREAM. Put three quarters of a pint of boiled milk into a stew-pan, with a large cupful of made coffee, and add the yolks of eight well beaten eggs and four ounces of pounded loaf sugar. Stir the whole briskly over a clear fire until it begins to thicken, take it off the fire, stir it for a minute or two longer, and strain it through a sieve on two ounces of gelatine. Mix it thoroughly together, and when the gelatine is dissolved pour the cream into a mold, previously dipped into cold water, and put the mold on rough ice to set.

LEMON CREAM. Pare into a pint of water the peels of three large lemons; let it stand four or five hours; then take them out and put in the water the juice of four lemons and six ounces of fine loaf sugar. Beat the whites of six eggs and mix it all together, strain it through a lawn sieve, set it over a slow fire, stir it one way until as thick as good cream; then take it off the fire and stir it until cold, and put it into a glass dish.

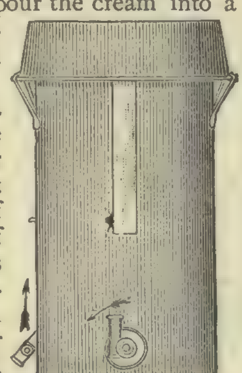


FIG. 5.—*Milk Can Creamer.*

ORANGE CREAM may be made in the same way, adding the yolks of three eggs.

TAPIOCA CREAM. Soak a teacup of tapioca over night in milk. The next day stir into it the yolks of three eggs, well beaten, and a cupful of sugar. Place a quart of milk on the fire; let it come to a boiling point and then stir in the tapioca and let the whole cook until it has thickened; then take it off the fire and stir in the whites of the eggs, beaten to a froth. Flavor to taste. A small portion of the beaten whites of the eggs can be saved to decorate the top. Stir into the latter a little sugar, put it into a paper funnel, press it out over the pudding according to fancy and place it in the oven a few moments to color; or the whole top of the pudding may be covered with the meringue, more white of eggs being necessary in this case. This is a delicious dessert.

VELVET CREAM. Put one ounce of isinglass into a stewpan with a large cupful of white wine, the juice of a large lemon, and sufficient sugar to sweeten it rubbed on the peel to extract the color and flavor. Stir it over the fire until the isinglass is dissolved, and then strain it to get cold. Then mix with it the cream and pour into a mold.

Cream Cheese. Take strippings (the last portion of a milking), or milk and cream, turn it with a little rennet, add a little salt and sugar, if desired, place in a small square vat, and press out the whey with a weight of two to four pounds; after about 12 hours, place it upon a board and turn it every day until dry. In about three weeks it will be ripe.

Creamery, a factory where butter (and also cheese) is made under systematic management. See articles Cream, Butter and Dairy.

Cream of Tartar, a neutral salt deposited by wine upon the sides of the cask, and afterward purified by boiling and crystallizing. It is generally boiled a second time, decolorized with charcoal and clay, allowed to cool slowly, and the resulting crystals form the "cream of tartar" of commerce. Used extensively in medicine and in cookery. Its medicinal properties are numerous. It is a cooling laxative, and diuretic. Seldom given alone, but combined with antimonials, mercurials, or sulphur, as an alterative in skin diseases, and used as an adjunct to aloes in purging-balls. Cattle require 2 or 3 ounces; when given in larger doses it should be given in plenty of warm water. Sheep require ½ to 1 ounce; dogs, 5 to 20 grains.

Creasote (cre´-a-sote), a volatile oil distilled from wood-tar, is of a peculiar smoky odor, and within the vital domain is irritant, narcotic, styptic and antiseptic. Often used upon indolent ulcers, aching teeth and in various general diseases. Creasote has had the credit of curing glanders in man, and is a good remedy in pleuro-pneumonia in cattle, and cases of farcy and glanders in the horse are greatly benefited by its use.

DOSE. For horses and cattle, use from 1 to 1½ drachms, made into a mass, with flour and molasses, and the whole crumbled down into some gruel. Make a drench to be poured down the throat. As an external remedy it is of great advantage in mange, sores, ulcers, caries of the bones, canker, thrush in the horse's feet, and the foot-rot, so troublesome in sheep. Indeed, the more the virtues of creasote are known to farmers, raisers and breeders of stock, the more will it be valued, and the greater will be the advantages derived from it.

Cress. This is a mustard-like plant, used as salad and for garnishing before the flowers appear. Plant on rich soil, finely pulverized, in drills six or eight inches apart. That grown in the cool of the season is of the best quality. The curled variety is the best; the plain or common is next, which has been called pepper-grass, probably a corruption of pepper cress. The famous English water-cress has to be planted in the margin of a running stream.

Creve-Cœurs (crave-curz'), a breed of domestic Fowls; which see.

Crickets. Crickets belong to the jumpers, which include crickets, grasshoppers and locusts. They are by far the most prolific and most destructive of orthopterous insects. There are a number of varieties, of which the common black cricket is the most abundant. Like the locust, scarcely anything in the way of herbage seems to come amiss. They are also destructive to many dry substances, as woolen or cotton cloths, left in the open air during the season of their feeding, especially in the fall. Crickets may be poisoned by laying in their way grated carrots or potatoes mixed with a small quantity of arsenic; but it is not feasible, since when scarce they do comparatively little harm, and when they swarm in countless numbers this means is not practical. Hogs are fond of them, and hunt them assiduously. Crickets eat such insects as they can master. They lay numerous eggs, which they deposit in the ground by means of their ovipositor. At the approach of cold weather the greater part of them die, but a few hybernate, sheltering themselves beneath stones or other places secure from water and the inclemency of the winter. The American crickets, unlike the European species, do not make their homes in houses. Those found in living-rooms are chance individuals which have wandered there. The large wingless crickets, or grasshoppers, generally live on the ground or on low growing plants; some are found in caves or under stones, while others are found on wild grass and herbage. Some species are found in immense numbers on the Western plains, where they feed upon weeds or any green plant that may occur in their vicinity. In the Eastern States many species inhabit the woods or dark, damp places, and if disturbed, hide under stones or rubbish; they are, however, at present not known to destroy the crops to any considerable extent; and if they do, the same remedies may be applied as above.

The cricket in this country injures grass, melons, squashes, potatoes and other roots and fruits. The eggs of the field cricket are deposited in the fall or autumn in the earth, and hatch the following season, some of the old insects surviving throughout the winter under stones, dead fallen trunks of trees, etc. To destroy house-crickets, vials half filled with beer, milk, or any liquid will attract and drown them. A deep, glazed earthenware jar, having a little food, such as boiled potato or sliced cucumber in it, will serve as a trap for crickets, for when once in, they are unable to jump out again. Pills made of arsenic or Paris green and flour, or these poisons mixed with grated carrots or mashed potatoes, will poison them; but if such deadly poisons are ever used, great care should be taken that the dead insects do not fall into any of the domestic kitchen utensils, nor should they be swept where domestic fowls can find and eat them. If field crickets are very numerous and annoying, many of the remedies recommended for grasshoppers, such as plowing up the earth and exposing it to the winter's frost or rains, or rolling the ground very early in the morning, will be of utility; but fowls, turkeys, and insectivorous birds are of inestimable value in destroying such insects as are found around the gardens and houses, if they can only be kept out of the gardens themselves.

Crimp, in cookery, to cause to contract, or to render more crisp, as the flesh of a fish, by gashing it, when living, with a knife.

Crimping-Iron, an iron instrument for crimping and curling the hair.

Crockery, To Mend. Use white of an egg and lime. Take enough of the egg to mend one article at a time, shave off a quantity of lime, and mix thoroughly. It hardens very quickly, and only a small quantity should be made at a time.

Crop, the season's yield of any given product of the farm. To "crop" a piece of ground is to raise some cultivated product upon it. See Farming, Rotation of crops, etc.

Crops, How to Estimate. Frame together four light sticks exactly a foot square inside, and with this in hand walk into the field and select a spot of fair average yield, and lower the frame square over as many heads as it will enclose. Shell out the heads thus enclosed carefully, and weigh the grain. It is fair to presume that the product will be the 43,560th part of an acre's produce. To prove it, go through the field and make ten or twenty similar calculations, and estimate by the mean of the whole number of results. It will certainly enable a farmer to make a closer calculation of what a field will produce than he can do by guessing.

Crops, Rotation of: see Rotation of Crops.

Cross and Cross-Breeding: see Breeding and Varieties.

Cross-Cut Saw, a large saw worked by a man at each end, for cutting logs.

Cross Tining, a harrowing by drawing the harrow back and forth across the same ground.

Croton Oil, an oil obtained from an East Indian plant, of a brownish yellow color, and hot, biting taste. This is the most powerful purgative known. One drop will operate upon the bowels in about forty minutes. A drop taken on the tongue will often move the bowels. It is so powerful that it should be very cautiously used. The dose is from one to three drops on a little sugar. Used externally it is a counter-

irritant, producing redness of the skin and inflammation. It is a dangerous medicine when improperly used, but a useful one, nevertheless, when in the treatment of animals hasty action of the bowels is wanted, as in milk fever in cows.

DOSE: For the cow, 10 to 15 drops, given along with Epsom or Glauber salts.

Croup. This dangerous and distressing disease, which is so prevalent among children, is an inflammatory affection of the windpipe. If the application of remedies were sooner made in cases of croup, the mortality from this formidable disease would be very much lessened. Unfortunately many parents are not familiar with those slight yet often distinctive symptoms that mark its early stage. In some few cases the attack is sudden, but generally it is preceded by the symptoms of a common cold, accompanied with hoarseness and cough. At this time the dangerous termination cannot always be perceived, but very often, in addition to the quickened breathing, the cough is rough and has a peculiar, shrill-like sound, something like the crowing of a cock or the barking of a dog. When the child draws in its breath there is a roughness in its sound which may be distinctly heard by placing the ear close to the mouth of the child. Even in this stage the windpipe is often painful. The child raises its hand to its neck as if to invite attention to the seat of the uneasiness. If proper measures would be taken at this stage most children would recover, but if parents wait till the breathing becomes much quickened and hoarse and the cough hard and tight and till fever has set in, the disase will be found difficult to control. Parents can better afford to be deceived half a dozen times than once to overlook a case of croup. We therefore earnestly recommend all parents immediately after discovering a roughened breathing and a resonant cough, and particularly if there have previously been symptoms of a cold, to lose no time in resorting to treatment. As the disease progresses the fits of coughing become more and more distressing, the child makes a great effort to breathe, the face is flushed, and the head is usually thrown back to escape suffocation.

Before giving the treatment for this dreaded disease we wish first to tell how it may be prevented. Croup seldom occurs during the first year of infantile life, most frequently in the second year and upward. When it has once attacked a child it is very liable to occur at any period before the thirteenth year of age. It is then very proper that the mother should be made acquainted with the means of prevention. They consist in being careful in the protecting of the child from cold or damp weather, particularly in the spring, or after heavy rains, or in cold, damp changes in the atmosphere; for croup is then more prevalent. The croup is often produced by the child sitting or playing in a room, newly washed out, when there is a predisposition to the disease. Then the child, every morning upon rising from bed, should be sponged all over with tepid water in which is put some salt, and rubbed well with a coarse towel. The clothing should be warm, the neck and arms well covered, flannel worn next to the skin throughout the year, and the bowels kept regular.

TREATMENT. In the treatment of croup we give a number of prescriptions, so if some remedies are not at hand others, which are about as efficient, may likely be. The best remedy which can be given to a child attacked with croup, is an emetic. A wine-glassful of lard oil or goose oil will often answer this purpose where no better medicine can be obtained. An effective emetic can be given to a child in the croup, in a heaping teaspoonful of powdered alum, mixed with molasses or honey. This can be given every ten minutes until it vomits freely. The alum operates on the salivary glands, and makes them pour out the saliva or spittle in great quantities. In many cases this has acted like a charm, and relieved children supposed to be in the last stage of this disease. The tincture of lobelia in teaspoonful doses may be given every six or eight minutes till free vomiting takes place. The lobelia can hardly be given too freely in croup; in some cases, where the disease has been very alarming, as much as a tablespoonful has been given at a time with success. As soon as the emetic begins to operate, it should be promoted with a strong tea of sumac and bayberry. On first discovering the disease, give a quick tepid or warm bath, bathing well the head, throat, and chest; then give the emetic last named, and apply a wet bandage, well wrung out, about the throat, the seat of the disease, and warm applications to the feet, so as to produce prespiration as quickly as possible, the body being wrapped in a warm blanket immediately after bathing, so as to prevent the slightest exposure to taking cold. The warm applications to the throat should also be renewed from time to time, as may seem necessary; and the bowels kept freely open, perhaps, with castor oil and molasses mixed. A plaster of snuff and hog's lard, laid upon the chest, is often the best means at hand for relaxing the system and subduing the inflammatory action. A teaspoonful, mixed with a little lard and spread upon a rag, composes the plaster. It will sometimes make the child very sick at the stomach and vomit severely. When this is the case, or the vomiting continues long, it will be advisable to remove it until the sickness subsides. The drink should be flax-seed or slippery-elm tea, or some other mucilage. Equal parts of squills and castor oil, given in a dose of a teaspoonful every hour until it operates on the bowels, is one of the best remedies that have ever been administered. It quickens the secretion of the windpipe, at the same time producing general relaxation of the system by evacuating the bowels. A tea made of the Seneca root, or bloodroot, is a good solvent of the tough, slimy matter which clogs up the trachea or windpipe. Great care, however, should be taken not to administer medicine too fast. While the child is vomiting, nothing else should be given, unless it be a little drink.

It is always better to raise a sweat before you give

any medicine to purge the bowels, as the two operations can not be well carried on at the same time. The purging of the bowels lessens the perspiration. Hive syrup should always be kept in every family, where there are young children; it will be found in this disease a most valuable remedy. The dose is about a teaspoonful, every ten minutes, until vomiting is produced. In the first stage of this complaint, a portion of raw cotton, wet with camphor, whisky, or vinegar, warm and applied to the throat, will be found useful. When the disease is far advanced, and not yielding to the treatment, a poultice should be applied to the throat, of red pepper, lobelia, slippery elm, pulverized, wet with hot water, and renewed when it becomes cool. After the removal of the poultice, some stimulating liniment should be employed to anoint the throat, composed of spirits of hartshorn, ½ ounce; spirits of turpentine, ½ ounce; laudanum, ¼ ounce; sweet or olive oil, ½ ounce; mix together; or if this liniment cannot be conveniently obtained, make applications of hot water or simple poultices of any kind, to the throat, as warm as they can be borne, changing them as they get cool.

An application of coal oil to the throat and chest has been found to be a very efficient remedy. Saturate a flannel cloth with the oil and tie around the neck. Some give it internally. Give 1 teaspoonful to a child three or four years old.

Powdered alum placed down the throat of the child will operate upon the salivary glands and make them pour out the saliva in great profusion. Ipecac is always a safe remedy, but is not powerful enough. Place the feet in hot water, keeping them there until vomiting takes place, laying cloths wrung out of hot water upon the breast and throat, changing often enough to keep them hot. But the non-medical method is to seat the patient in a warm place, or in a hot sitz-bath, where fresh air is constantly passing the face; put his feet in hot water, keep cold wet cloths upon the throat and head, and give a gentle emetic. If the attack is renewed the following night, do the same and send for a physician.

To control the fever give tincture of aconite and belladonna as follows: Put 5 drops of each in a half a glass of water and give the child 1 teaspoonful every half hour, until the fever subsides.

Crow. No other bird has been so strongly condemned by the farmers of this country as the crow. Indeed, so persistently has it been hunted that it has become the most wary of birds, and "as cunning as a crow" has become a proverb. There are few wild birds more energetic in hunting insects and verminous animals. They also eat such substances as would otherwise putrefy and taint the air. They are therefore always worthy of preservation and should be harbored rather then hunted to death. Should they molest the grain at planting time, which they will doubtless do, but to no great extent, the following very amusing and efficient remedy may be resorted to:

Take a piece of foolscap, or any other stiff paper; roll it into a funnel shape, and fasten with mucilage or needle and thread. Drop a few kernels of corn into the "foolscap," smear its sides with bird-lime, which may be obtained at the drug stores, and drop in the corn-field. The crow will reach in for the corn and find himself caught. There is considerable amusement in this sport, besides saving the loss of corn dug up by these black marauders. Don't kill the crows. They destroy myriads of insects that are injurious to vegetation.

The crow is easily domesticated and without great difficulty may by instructed to do many tricks and even to speak some words with amazing distinctness, and with the voice of a human being. When domesticated they become much attached to those who pet them, and will soon learn to follow them about the fields. It must be confessed, however, that they are exceedingly mischievous and are apt to carry away and hide small articles that come in their way.

Crown Scab, a cancerous sore formed around the corners of a horse's hoof.

Cruelty to Animals. Without the assistance afforded by the domestic animals mankind would be very helpless. The horse, the sheep, the ox, the ass, the camel, the elephant, the llama, the dog and the reindeer, are fitted peculiarly for the regions in which they are found, and each is indispensable to the comfort or safety of man. Some of these are no longer found in their wild condition, and are so completely domesticated as to have lost much of their natural instinct of self-defense and preservation. Many of these animals possess a sagacity that is wonderful. They have perception, memory, recollection, and often seem endowed with powers of reason and judgment. Some possess ardent affection for their masters, and a fidelity that nothing can disturb.

That man should treat such faithful servants with anything save the greatest kindness seems to be unreasonable; and yet, alas for man's weakness and passion! it is often true. It would seem that self-interest alone, without any higher or nobler motive, would prompt every man to take great care of the poor brutes, upon which he is so dependent; but even his own property is often made the sport of his baser nature.

Animals that afford us pleasure or profit should be treated with humanity, and every attention paid to their wants. If the innocent and helpless brutes, that are ill-fed, overworked, unsheltered, and injured by all manner of cruelty, could make an appeal to our sense of justice and humanity, how eloquent and how touching it would be! Neglect and abuse not only injure the pecuniary value of the animal, but what is of infinitely more importance, the moral constitution of the man; for he who has no feelings of kindness and consideration for the poor dumb animal that labors for him, would probably have as little feeling for one of his own kind in circumstances of distress.

Animals that furnish us food should not be overdriven and abused simply because they are destined

soon to be killed. Men are accustomed to see many forms of cruelty, and think nothing of it, because it is so common. It seems to make no impression that chickens are taken to market tied together in bunches and suspended by the legs from the back of a hard-trotting horse. Such cruelty is indefensible. If it is necessary to bring them alive, they should be taken in coops. Poor, innocent calves and pigs are often securely tied by the legs in such a way as to destroy the circulation of the blood, and cause the parts to become intensely painful. In this manner they are often carried long distances and exposed to the extremes of heat and cold.

If any one has a doubt as to the humanity of this method of transportation, let him tie a string tightly around the base of his forefinger and let it remain half an hour. The ligature alone, without the jolting ride, will soon convince him that there might be more gentle methods of treatment. Such usage is not only a cruelty, but a serious injury to the flesh of the animal when prepared for market. It is said that the Hollanders always kill their fish when they take them from the water, because, when left to die by degrees in the air, the flesh is injured. Might we not add the argument of humanity as an additional reason why they should be quickly killed when taken from their own element?

When animals are to be killed for food, they should not be tortured or hurt. Not one pang of needless distress should be inflicted, but they should be dispatched in the speediest manner, and with the least pain. There is an element of barbarity in the torturing of any living thing, that is abhorrent to every kind and noble sentiment in our nature. Animals that are injurious to ourselves or our property may be destroyed, but it need never be done in a cruel or vindictive manner. They simply act in accordance with their nature, and although they may do us great injury, it is not because they have any sense of right or wrong; it is the operation of their instinct. To retaliate on a dumb and unreasoning brute, even a snake, by unnecessary cruelty in killing it, is inhuman and savage.

As all animals were made for the benefit of man, directly or indirectly, there is no wrong in hunting and killing such as are either useful for food or clothing, or are injurious to the crops or other animals in his employ. While it is entirely proper to kill those that are either useful for food or injurious, it is wrong to deprive any of life merely for sport. It is cruel to kill anything that breathes merely for the love of killing, and there can be no excuse or apology for it. It is pitiable to witness the spirit of wantonness frequently manifested by men and boys in the destruction of little singing birds, so pretty, so innocent, and, at the same time so valuable to the farmer and to the fruit-grower.

If such birds could be used for food, or if their feathers were valuable, or if any purpose were served that is economical, the outrage against nature would be pardonable. It is sometimes urged that such birds are injurious to vegetation, and that it is a matter of economy to destroy them. Were it not for the birds that frequent the gardens, and insects which prey upon each other, the number of destructive insects produced would be such as soon to overpower the industry of man, and put an end to his miserable existence.

By experiments made by Charles V. Riley, Ph. D., Chief of the United States Entomological Commission, in his report upon the usefulness of birds, showed that 20 old plovers would eat 3,000 insects each day, or 90,000 in a month. If these plovers had ten nests, which averaged four young ones each, and the young ones consumed 60 insects each per day, or 2,400 every 24 hours, or 72,000 per month, the 20 plovers and their progeny would consume 162,000 insects each month. At this same rate 1,000 plovers and their young would consume, in one month, 8,100,000 insects. That many locusts removed in one year from a farm of 160 acres would probably render it capable of producing crops even when these insects are doing their worst.

It has been computed that a pair of sparrows carried to their young in one week not less than three thousand three hundred caterpillars. Of 54 little victims whose crops were examined from the 18th of April to the 24th of May, 47 had eaten insects alone, and seven had their crops filled with grain and seeds. Of 46 old sparrows that were dissected at the same time, only three proved to be grain-eaters, while all the rest had been feasting on beetles and caterpillars.

These facts are not only in favor of the sparrows and plovers, but as much may be said for all kinds of these beautiful creatures. The little harm they do in taking fruit and grain is more than paid for by their incessant labor in ridding the fields and forests of injurious insects. But self-protection is not the motive that prompts their destruction; it is simply the satisfaction of trying to shoot them. If skill in using fire-arms is only achieved at such a sacrifice, it is not worth what it costs.

In this connection a plea may also be urged in behalf of the little birds' nests. As no profit can be derived from their destruction, it is a cruel invasion of the rights of the birds to disturb them. Every argument is in favor of the encouragement and protection of the birds; they are pretty, gentle, innocent and valuable.

As before stated, there can be no objection to the taking of wild game birds by the gun; but when poor, little domestic doves, the emblems of innocence and love, are sprung from a trap into the air in order to be shot for sport, there can be no excuse or palliation for the deed. Such sport is only worthy of unrefined, uncultivated, semi-civilized men.

Crupper, (croop'er), the rump of a horse; also the strap which extends along the back and around the base of the tail, in order to keep the saddle or the back-band from working forward, or to aid the check-rein in holding up the head. See Harness.

Cucumber. This is a tender annual plant, a native of the tropics, and very generally cultivated in the

gardens of the United States. They require a warm location. For early cucumbers the seeds should be germinated under hand-glasses or gauze protectors. Plant after the ground has become warm, in hills four feet apart for smaller varieties, and five feet for the larger sorts. Manure with ashes, guano or well rotted compost, working the manure just under the surface. The usual stiff clay of the West should have a liberal proportion of sand worked into it. The frame cucumbers can be successfully raised in this country by giving them a well-sheltered location, plenty of manure, and hills six by six. As vermin and other accidents will destroy some of the plants, set out about twice the number sufficient to cover the ground, then thin the hills that may remain too strong. For pickling cucumbers the seeds are planted from June 15 to July 1, in the North. The vines will come in full bearing about the middle of August, and continue until frost.

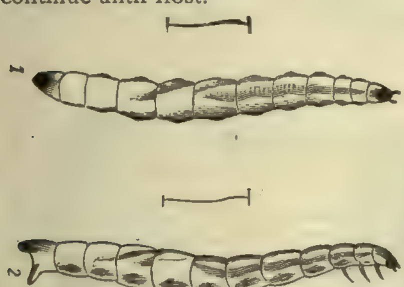



Fig. 1–*Striped Cucumber Beetle*(Galeruca vittata.)

Probably the greatest insect pest of the cucumber is the familiar striped beetle, represented by Fig. 1. The insects attack both roots and leaves. (See Insects). Among the older remedies recommended and either thoroughly or partially tried, we may mention the following: Treating the vines with a solution of Glauber salts, tobacco water, infusion of elder, walnut leaves, etc.; applications of ground plaster of Paris, powdered soot, sulphur, snuff, aloes, etc.; placing burning torches among the vines at night, etc. But at present there are but two remedial agencies which are considered worthy of trial. One is to cover the young vines with boxes open at the bottom and covered on the top with millinet or some kind of open gauze. The other is sprinkling the vines with Paris green and flour, or the Paris green solution as prescribed for the Colorado potato beetle. White hellebore is considered by many as equal to Paris green. Frequent dusting will chase and keep the bugs away. Or, young plants can be protected by a thin film of cotton batting fastened down with stones or earth, and when the plants grow too large for this, use London purple carefully.

Varieties. *Early Russian.* The earliest of all varieties; grows about four inches long.

Early Green Prolific. The most productive; fine for cutting up green as for pickles.

Early Frame. Short, early, prolific.

Long Green and *Short Green.* Old standard sorts.

Russian Netted. Hardiest of all; flesh white; skin covered with a pretty, brown network of a peculiar appearance.

Norbiton Giant. The longest and one of the most prolific.

Carter's Champion and *Sion House* yield but very few seed.

Marquis of Lorne. A celebrated Frame variety, short neck, smooth skin, and the fruit very straight and prolific.

Fig. 2.—*Early Frame, or Table Cucumber.*

Boston Pickling and *Short Pickling* and *West India Gherkin* are the chief varieties for pickling; the latter is difficult to germinate; the Improved Long Green Prickly makes a hard, brittle pickle.

Many other varieties are advertised by seedmen, some of which are probably as good as those above mentioned. For a curiosity, the Snake cucumber, which grows six feet long and coiled like a snake, is extraordinary. See also Pickles.

Cud, that portion of food which is brought up into the mouth by ruminating animals from their first stomach, and chewed a second time, passing them into the third stomach to be fully digested into the fourth stomach; also, the inside of the mouth or throat of a beast that chews the cud.

Cultivation. Cultivation is that branch of agriculture which relates to causing increased growth, by means of implements for loosening the soil, thereby enabling the dew and rain to penetrate easily; and also in the destruction of weeds. This cultivation gives the soil proper aeration and enables the roots to easily penetrate the soil and readily assimilate proper nutriment. The motto, "plow deep," should not be carried out indiscriminately with all soils, for some, indeed, it may injure, by simply burying what little good soil there is on the surface. If the sub-soil is not very compact, there is no object to be gained by deep plowing. The only two objects in surface cultivation are the destruction of weeds and the pulverization of the ground, the latter to enable the soil to gather nutritious gases from the atmosphere. Heavy rains and a hot sun bake the surface, and at the first opportunity after every rain the surface should be broken up finely; and for this purpose a plank or roller, besides the use of the harrow or cultivator, is very important. The ground cannot be stirred too much when it is dry enough to pulverize well; when wet and pasty it should never be touched, except it may be necessary to go through and pull up weeds by hand. Fall plowing supersedes spring plowing, for most purposes. Whenever the ground is friable, it cannot be stirred too frequently during the early part of the season, or the earlier stage of the growth of the plant. Make the seed-bed firm, by harrowing, rolling, etc. See Farming, Rotation, Manure, Fertilizers, Harrow, Plow, etc., and the various plants.

Cultivator, as a farm implement, has come to mean, in the progress of improvement, an apparatus with a number of blades for stirring the soil. They are now supplied to the market in all imaginable shapes and styles, with or without seed-sowing attachments, handles, levers, riding-seats, etc., the simpler forms, on the one hand, approaching the double or treble shovel plow, and the larger, on the other, the harrow, gradually shading off both ways until they become one or the other. They are a great improvement over the old-time plow for superficial stirring of the soil. In no other branch of agricultural implements have there been more improvements made than in cultivators. The variety is so great that the farmer can now find a cultivator to loosen the soil around any product of his farm that needs cultivation. It would be impracticable, and well-nigh impossible to speak of all the different machines made to cultivate the soil. We do, however, give cuts of such as illustrate the general principles upon which all are based.

The principal features of the cultivator illustrated by Fig. 1. are the great height of the axle, and strength of the double-arched wrought-iron frame, cultivating the tallest corn with the least injury to the growing plant; advantage evener and whiffletrees lowered to the direct line of draft, relieving the horses' necks of all pressure; varied adjustability and improved safety pin; steel couplings, which give the freest lateral and vertical motion of the beams—more durable and less liable to break than any other; single tongue, affording greater facility in turning. Shields are furnished

Fig. 1.—*A Walking Cultivator.*

with each cultivator. Its single-trees are adjustable to direct line of draft. It is essentially a wrought-iron machine. A fifth shovel is attachable for putting in small grain; it is made with wood or iron beams.

All cultivators are made either with or without gauge wheels on the fore end of the beam, and with blades of all styles.

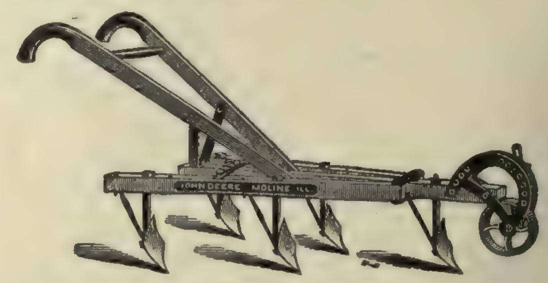


Fig. 2.—*Five-Tooth Cultivator.*

Fig. 3 illustrates a tongueless cultivator, for which the following advantages are claimed:

1. Runners do not conform to every inequality of the ground, and therefore are steadier, giving no

Fig. 4.—*Adjustable-Arch Barshare Cultivator.*

wabbling motion as wheels do, which is a serious objection to wheel tongueless. 2. It has no jointed arch nor complicated castor wheels, and is not liable

Fig. 3.—*Tongueless Cultivator.*

to become tangled in turning or to upset on hillsides. 3. When the shovel rigs are suspended by the hooks for moving about from field to field, or in turning, they are nicely balanced, and need no additional runners for such transportation, as is the

case with wheeled machines. 4. In moving down a slight incline or hill, when so suspended, they do not slide forward on the horses' heels, as is the case with wheeled tongueless machines, and which sometimes occasions serious trouble.

The three cultivators above illustrated are made by Deere & Co., of Moline, Ill.

For the kind illustrated by Fig. 4, manufactured by the Long & Allstatter Company, Hamilton, O., it is claimed that it enables the farmer to plow closer to the young corn than with ordinary shovel, or "bull-tongue" plow; to get into his corn a week or ten days earlier in wet seasons; to open such furrows as will permit the air and sunshine to enter and warm the soil; to run steady and do good work in the toughest or hardest soil. The bar-shares, moreover, can be reversed, to "lay the corn by," and when used in combination with shovels, either level culture or an open furrow can be left as desired.

The "Deere Riding" cultivator, represented by Fig. 5, is a fine sample of the riding cultivator. The spring which connects the shovel rigs is flexible and allows them to be spread apart by the plowman, and has power to draw the shovels back into position, when dodging crooked hills, relieving the plowman of much hard work and insuring more thorough cultivation. Seat slides back or forward to accommodate weight of driver. Shovel rigs are held upright and the desired distance apart by cross bar and spring attached to upright standards. Width between shovel gangs is readily adjusted by cross bar and spring, without stopping the team. By means of levers working in ratchets the depth of shovels can be instantly changed while the team is in motion, and each side can be changed independently. By means of the treadles with spring attachment the shovels are easily raised clear of the ground, for turning at the ends, or for clearing the shovels of trash.

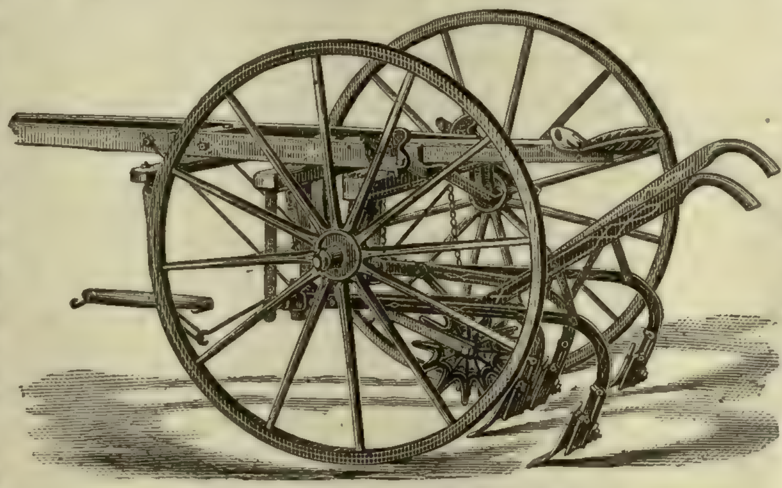


Fig. 6.—*Cultivator, with Rotary Shields and Treadles.*


Fig. 5.—*A Riding Cultivator.*

Fig. 6 represents the "New Junior" cultivator, with iron or wooden beams, four shovels, rotary shields and treadles, as manufactured by P. P. Mast & Co., Springfield, O. It has a force-feed seeding attachment, which combines all the advantages of a corn cultivator, a fallow or field cultivator, and a broadcast seeder. The quantity sown is regulated without any change of gears, simply by moving the indicator on the dial on the rear of the hopper, in plain view of the operator, and can be varied as much or little as the size or condition of the grain may demand. Cultivators of this style are adapted to either walking or riding, and the seed-sowing attachment is adapted to any kind of grain, including even flax seed.


Fig. 7.—*Cultivator.*

Fig. 7 is the cut of a nice cultivator manufactured by the Long & Allstatter Co., which can be used with or without extra blades, according to the nature of the crop, and can be adjusted for either shallow or deep plowing.

At this day of progress in the world of gardening, it is simply foolish for one to scrape over vast surface of soil with the tedious hoe, when with

a cheap "cultivator," either drawn by horse or run by hand, he can just as well go over five to ten times as much ground. The hoe is to be used only in those close quarters which cannot be reached by a machine. It is economical, therefore, to plant in rows as far as practicable, with the view of using the cultivator. Fig. 9 is an engraving of one of the best, the Matthews. It is said that with one of these a man can do about six times as much as he could with a hoe. A drill and cultivator combined (Fig. 10) is also a great convenience for gardeners. The cut shows the cultivator attachment removed. The machine works in either capacity, or in both at once. The seeding apparatus is capable of sowing nearly all kinds of seed. The last two implements are manufactured by Everett & Small, Boston, Mass.

FIG. 9.—*Hand Cultivator.*

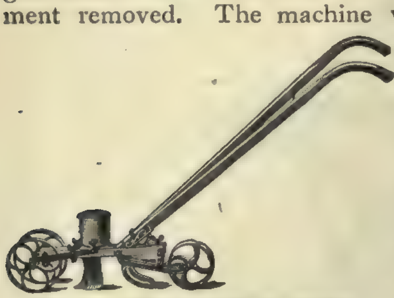


FIG. 10.—*Drill and Cultivator Combined.*

Cupboard. The most important thing to say concerning this essential article of kitchen furniture, is that extraordinary pains are required to keep it free from foul odors. Victuals of all kinds, when cold, absorb deleterious gases from the air. Butter is particularly "sensitive" to such exposure, and when kept in a cupboard, soon begins to lose flavor, and the family suspects that it is the nature of the butter to deteriorate under any circumstances, when, if kept in the right place—in pure cold air—it would keep sweet and well flavored a long time. The next observation, in practical importance, is perhaps the situation of the cupboard. While the victual cupboard should be in a cool, clean place, the dish cupboard, containing all the conveniences of cooking, should be near the range or cooking stove.

Curculio: see Plum.

Currant. This is one of the most valuable of all small fruits, as it can be used to such advantage in a variety of ways, whether in a green or ripe state, and is so easily grown. It is indispensable in every small garden. When green it is used in pies, tarts, etc., stewed like gooseberries. When ripe, it is much used as a table fruit, with plenty of sugar; but it is almost universally used in a jelly that is both delicious and wholesome. It also makes an excellent wine, at a cost of not more than two or three dimes per gallon. The black currant is chiefly used in a jam or jelly. Currants ripen in midsummer, and if protected from the sun will remain on the bushes until October. A free use of this fruit is exceedingly healthful. Very fine summer drinks are made of the currant, it being a good substitute for the lemon. The expressed juice, diluted with water, sweetened, and flavored with vanilla, makes a beverage for hot weather about equal to lemonade, and is even preferred to the latter by some people.

CULTIVATION. Nothing is easier of culture. Cuttings about a foot long, of well-ripened wood of the month of October, are set in moist, rich soil, and nothing more is generally required except manuring and mulching; indeed, the currant can stand more of this than any other plant that is cultivated. Cut square across just below a bud, if to be grown in standard form, and cut out all the eyes except two or three of the upper ones; if in bush form, which generally is preferable, this may be omitted. All sorts of refuse from the kitchen, cellar, stables and privy vaults are in order in the currant garden. Better fruit, however, can be produced by preventing the growth of suckers, by shortening the most vigorous branches, and by keeping the bushes well shaded. Some recommend keeping the bush in the form of a little tree. Of course a good horticulturist will have pride in pruning out all the defective canes and keeping the bushes neat in appearance. The old bushes in six or eight years begin to decline, and it is not remunerative to expend any labor upon them. They should be replaced with new plants.

While the currant is not subject to any disease, there are two or three insects which do it some damage. By far the greatest amount of mischief is done by the famous currant borer, which has not yet appeared in some sections of the West. White hellebore, in the form of powder, is an effectual remedy, but as some persons fear that it is too poisonous to be used in such close connection with an article of diet, the next best thing is to cut off the infested parts, about May 20, and burn them; or sprinkle powdered carbolate of lime over the bushes two or three times; or dilute carbolic acid (one per cent.); or coal oil and soap suds. If this work is done earlier the diseased parts cannot be discriminated; if later, some of the worms might escape. Sometimes the currant is infested with a species of louse, for which no efficient remedy is offered.

VARIETIES. *Black English.*— This currant, which is scarcely distinguishable from the Black Naples, is by some considered equal to it in value, and by some quite inferior; probably depending

upon differences of taste, or soil, or of cultivation.

Black Naples. This is a beautiful fruit, and is the finest and largest of all the black currants, often measuring nearly three-fourths of an inch in diameter. Its leaves and blossoms appear earlier than those of the English, but the fruit is later, and the clusters as well as the berries are larger and more numerous.

The two foregoing varieties are all of the black currants recommended for Western cultivation.

Attractor. Berry large, in a rather short bunch, sweet and good; leaf peculiarly narrow and toothed.

Cherry. This is the largest of all the red currants; is a moderate bearer, but strong grower; leaves thick, dark green; fruit dark red, quite acid; clusters short. The bushes hold their foliage well and this is one of the best varieties for late use.

The *Long-Bunched Holland*, or *Long-Bunched Red*, is becoming a popular variety in the West. The berries are large, deep red, the bunches long, the clusters a little larger than those of the Red Dutch, and the plant is very productive. The fruit will hold on until frost. It also stands the heat of our climate better than the Red Dutch; is not preyed upon by insects, but is rather difficult to propagate by cuttings; the best way is to make stools or mound up among the plants so they will take root.

Red Dutch. This is by far the most popular currant in this country, and everybody is acquainted with it. The plant is hardy, easy of cultivation, and the fruit when well ripened is not so sour as some other kinds.

Versailles, Fertile D'Angers. This currant is a very vigorous grower, with large, coarse foliage, and productive. Fruit is next in size to the Cherry currant, is very beautiful and superior to it in agreeable flavor. It is highly recommended by Western horticulturists.

Victoria, May's Victoria, Houghton Castle, etc. A late variety, with large and very long bunches of bright red, acid fruit. The plant is vigorous, is a moderate bearer, and the fruit hangs on the bushes some two weeks longer than most currants. The bunches are rather longer than those of the Red Dutch and the berries a brighter red.

White Dutch. This variety has several other names in other parts of the world, but is known only by this name in the Western States. It is precisely similar to the Red Dutch in habit, but the fruit is larger, with rather shorter bunches, of a fine yellowish-white color and a very transparent skin. It is considerably less acid than the red currants and therefore preferred to them for table use; by many it is considered the best currant for home consumption. It is also a few days earlier than the Red Dutch; plant very productive.

White Grape. Berries very large, whitish yellow, sweet and good; bunches moderately long; branches more horizontal than White Dutch; less vigorous, but very productive.

White Provence. Good habit of bush; leaves usually, but not always, edged with white or yellow; fruit large and handsome.

For ornamental varieties of the currant, see Ornamental Trees; to can currants, see Canning.

Currants, To Dry with Sugar. Take fully ripe currants, stemmed, 5 pounds; sugar, 1 pound; put into a brass kettle, stirring at first; then as the currants boil up to the top, skim them off; boil down the juicy syrup until quite thick and pour it over the currants, mixing well; then place on suitable dishes, and dry them by placing in a low box over which you can place musquito-bars to keep away flies. When properly dried, put in jars, and the paper over them. To prepare them for the table, put cold water upon them and stew as other fruit for eating or pie-making, adding more sugar if desired.

Currant Sherbet. Take the expressed juice of fresh, ripe currants, dilute in four times its quantity of water, and flavor with vanilla. An excellent summer drink, equal to lemonade.

Current, now passing or in vogue. "Account Current," or "Statement" of account, is an account of credits and debits since the last settlement. "Price Current," a published list of the market value of articles in a given line. "Current year," "current month," etc., the present passing year, month, etc.

Curtain: see Window. To renovate lace curtains, see Laundry.

Curry, a stew of fowl, fish, etc., cooked with curry sauce, which is made of pepper and other strong spices.

Custard, eggs and milk cooked together. In making custards always avoid stale eggs. The whites should be beaten separately and put in the last thing. Never put eggs in very hot milk, as it will poach them. Always boil custards in a vessel set in boiling water.

Apple Custard. Pare, quarter, and core 6 mellow, tart apples; set them, with 6 spoonfuls of water, in a pan, on a few coals; and as they soften, turn them into a pudding-dish, and sprinkle on sugar. Mix 8 eggs, beaten with rolled brown sugar, with 3 pints of milk; grate in half a nutmeg, and turn the whole over the apples. Bake about twenty-five minutes.

Boiled Custard. Boil a quart of milk with a little cinnamon and half a lemon-peel; sweeten it with nice, white sugar; strain it; and when a little cooled, mix in gradually 7 well-beaten eggs, and a tablespoonful of rosewater; stir all together over a slow fire till it is of proper thickness, and then pour it into glasses. This makes a good boiled custard.

Common Custard. Boil a pint of milk with a bit of cinnamon and lemon-peel; mix 1 tablespoonful of potato flour with 2 of cold milk; put in a sieve, and pour the boiling milk upon it; let it run in a basin; mix in by degrees the well-beaten yelks of 3 eggs. Sweeten and stir it over the fire a few minutes to thicken.

Cream Custard. Beat 8 eggs and put into 2 quarts of cream; sweeten to the taste; flavor with nutmeg and cinnamon.

CUSTARDS TO TURN OUT. Mix with the well-beaten yelks of 4 eggs a pint of new milk; half an ounce of dissolved isinglass; sweeten with loaf sugar, and stir it over a slow fire till it thickens; pour it into a basin, and stir it till a little cool; then pour it in cups to turn out when cold. Add spice as you like to the beaten eggs.

ICE-CREAM, OR FROZEN CUSTARD. Take 10 eggs, the whites for the cake beaten to a stiff froth; 1 tumbler of sugar; 1 tumbler of flour, not quite as full; 1 teaspoonful of cream of tartar or baking-powder (no soda); flavor, stir together carefully, and bake. Previously have a pan two-thirds full of new milk over a kettle of boiling water for the custard. Put into the milk 2 cups of sugar, beat the yolks of the eggs with 2 tablespoonfuls of corn starch, and stir into the milk when at a boiling-point two minutes; strain through a sieve; when cool flavor and freeze.

LEMON CUSTARD. Take half a pound of loaf sugar, the juice of 2 lemons, the peel of 1 pared very thin, boiled tender and rubbed through a sieve, and a pint of white wine. Let all boil for a quarter of an hour, then take out the peel and a little of the liquor and set them to cool. Pour the rest into the dish you intend for it. Beat the yolks of the eggs and the whites, and mix them with the cool liquor. Strain them into a dish, stir them well up together, and set them on a slow fire in boiling water. When done, grate the peel of a lemon on the top, and brown it over with a salamander. The custard may be eaten hot or cold.

RICE CUSTARD. Mix a pint of milk, half a pint of cream, an ounce of sifted ground rice, 2 tablespoonfuls of rose water; sweeten with loaf sugar, and stir all well together till it nearly boils; add the well-beaten yelks of 3 eggs. Stir and let it simmer for about a minute; pour it into a dish, or serve it in cups, with sifted loaf sugar and a little nutmeg over the top.

Cuticle (cu'ti-cl), the external or scarf skin, which protects the more vital, true skin. It gradually scales and wears off and is constantly renewed, like the hair and nails.

Cutter-Bar, the cutting apparatus of a mowing or reaping machine; also the coulter of a plow.

Cuttings of cions for grafting, as well as for simple insertion in the ground, are best made during the winter season, but not when frozen, or in the late fall or very early spring, when the vital forces are most at rest. Until they are used they can be preserved in moist sand or earth in the cellar at a temperature next to freezing. The grafts, after they are made, may be preserved in a similar manner. A good way of preserving grape cuttings, and also some other kinds, is to pack them vertically in a box of moist sand or earth, let the surface freeze, and then put them away in a place where they will not thaw out until spring.

Grape cuttings should contain two or three buds, according to the method adopted for cultivation or nature of the variety, and gooseberry and currant cuttings should be about eight inches in length and from the strongest shoots of the present year's growth. They should be of the best and ripest wood. Many prefer, with most plants, what is called "mallet-cutting," which is the taking of a small portion of the old wood in addition, forming a mallet-shaped cion. In this case a greater amount of stored-up vitality is kept with the cion, to aid in giving it a start. See also Grafting, and the various fruits.

Cut-Worm. See Insects, and respective vegetables, fruit-trees, Corn, etc.

Cypress, the name of several species of trees flourishing in the Southern States. The cypress vine is a beautiful climbing plant of the morning-glory family, hardy in the North.

D

DAIRY, the place, room or house where milk is kept and converted into butter and cheese. The operations of the dairy have been fully described under the heads of "Cream," "Cheese," "Butter" and "Milk." Here the dairy will be treated simply as the place where these operations are performed. Should they in any case not be extensive enough to warrant the erection of separate buildings, the principles and rules laid down here will, with due qualification, be perfectly applicable. Where they are prosecuted in anything approaching a large scale, a separate building is indispensable. The dairy requires, proportionally, just as many conveniences as any other manufactory.

The site of the dairy-house will necessarily depend both on the nature of the locality and the convenience of those managing it. It should not be too far from the house, nor too near the cow-house. If possible, it should be constructed over a spring of running water, which is the great essential in every dairy, or in the near vicinity of a well or spring worked by a windmill by which a constant flow of pure, cold water can be secured. It is needless to state that the building should be at a convenient distance from the milking-sheds of the farm, the feeding-troughs of the cows or the piggery, and equally handy for feeding the whey to the cows or pigs as it may be at any time determined upon, and to which it may be run by spouts from the dairy room. The building should be so placed as to be screened from the sun's rays, and the building so constructed as to prevent, as far as possible, the external temperature from affecting that of the dairy-rooms. The ice-house should be immediately contiguous to the dairy-house, for obvious reasons. The house should have a cellar, and water should be so convenient as to be easily drawn or pumped into the vats used for running up the curd or for washing the dairy utensils. The walls may be of any convenient material. Where brick is cheap and easily obtainable, the walls are sometimes built double or hollow in the interior. These effectually prevent the passage of heat. Such construction is, however, more necessary for the milk-room than elsewhere. In case the building has to be of wood, the sides may be made double and the intervening space filled with sawdust or any other non-conducting substance. Strong, thick slates, with lath and plaster below, are sometimes used, but the expense is heavy. Proper drains should be made for carrying off the water. The floors of ordinary dairies are usually paved with brick or tile, but it is difficult to recommend either, for they are neither level nor closely jointed enough to prevent the spilled milk from lodging in them and creating an unpleasant odor exceedingly damaging to the milk, and, consequently, to the butter and cheese. Brick and tile absorb much wet, too, and are slow in drying, producing in winter a chill which gives rise to dampness and mouldiness. Good-sized paving stones are, in every respect, preferable; slate, where procurable, may be advantageously used for the purpose. The best form is three feet square by one-half inch thick. They should be laid in mortar, or which is much better, a bed of concrete four inches thick should be laid under the mortar. The floor of the cellar should have a fall to a trap in the corner leading into the drain. Experiments have shown that slate absorbs only one two-hundredth part of its weight in water, and exposed to a temperature of 60°, dries in about one-fourth of an hour; while tile absorbs about one-seventh of its weight, and under similar conditions, does not dry perfectly in less than seven days.

Deep excavations in the earth constitute good conservatories, as the temperature is uniformly right and the earth walls are the best deodorizers. . (See Ice-house).

For an ornamented dairy, Minton tiles may be used. The sides of the interior should be plastered or stuccoed. The windows should be double, but made to open with lattices covered with wire-gauze, to keep out the flies, with double wooden shutters to guard against severe cold in winter. The shelves may be made of flag-stone, marble, or wood covered with lead or slate. The latter is the best material. A large table in the center of the room will be found useful. Ventilation will be best obtained by a funnel running through an aperture in the roof. A complete dairy should consist of several rooms, according as butter only, or both butter and cheese are to be made. There should be a separate room for the milk while it is throwing up the cream, a room to serve as a dairy scullery, and a third for churning. Cheese may perhaps be made in this last; but, if there is much of it, a fourth room should be devoted to this purpose.

Winter dairying will become a very important industry if the proposed system of ensilage should prove to be a success. See Ensilage.

Dam, a wall or embankment across a stream, restraining the current; the mother—said of domestic four-footed animals.

Damask, a kind of stuff with raised figures in various patterns, as flowers, etc., woven in the loom. It

is made of silk intermingled with flax, cotton or wool. Imitation damask is made of linen.

Dandelion, a genus of hardy, perennial-rooted herbaceous plants. It is a very common and exceedingly well known weed of meadows, pastures and road sides. It is diuretic, tonic, and aperient, and has a direct action in removing obstructions of the liver, kidneys and other viscera. It is peculiarly valuable in all liver complaints, derangement of the digestive organs, and in dropsical affections. Were this plant not so common and so cheap, it would be prized like gold! An infusion or decoction may be made of the roots or leaves. But the extract is the best, thus prepared: Take up the roots in September, clean them, bruise in a mortar, and press out the juice; strain and put it upon a plate in a warm room to evaporate, and render it thick and solid. Dose, from a scruple to a drachm three times a day.

Dandelion Beer. Dandelion root, ½ pound to 1 gallon of water; boil well and when cooled add 1 pound sugar, 1 ounce ginger, a lemon, and 1 ounce cream of tartar. Add a little yeast. It is very good for the liver and digestion.

Dandelion Coffee. Good coffee, 3 parts; hard extract of dandelion, 1 part; chickory, 1 part. Reduce them to a coarse powder, and mix and grind them together. Good for the digestion and affections of the liver.

The young leaves of the plant are much used in early spring as "greens" or a salad, when other fresh grown herbs are exceedingly scarce and greatly wanted.

Dandruff, branny scales from a morbid skin, especially of the scalp. To free the head from dandruff it should be well stimulated night and morning by means of a strong hair-brush, and the free use of a small-toothed comb. A lotion of 2 drachms of borax, dissolved in a pint of rosemary water may be applied three times a week. Glycerine and rose-water are also prescribed. Should this fail to cure the evil, an ointment composed of 1 ounce of white cerate mixed with ½ a drachm of creasote, is to be rubbed into the roots of the hair every night for a week, at the expiration of which time the person should have the head thoroughly washed with soap and water, take a hot bath, bathe the head with the rosemary and borax, and with a clean brush the next day remove any exfoliation which may have been thrown out.

Many decoctions of herbs and roots have been prescribed. A solution of sulphur with the sulphide of potassium is also recommended; but no violent drug should be permitted to remain on the skin but a moment. Probably the virtue of all the remedies prescribed in the world for this trouble is due to washing and friction. Try soft cold water and rubbing twice a day, and keep up the habit several times a week, all your life.

Dashboard, a board placed on the fore part of a carriage, sleigh or other vehicle, to ward off water, mud and snow. See Carriage.

Date Plum, the persimmon; more strictly, the fruit of a foreign species of persimmon.

Dates, the fruit of the date-palm tree, sweet, palatable and nutritious. They are often employed in cookery, as raisins are, and are sometimes stewed separately. The cheapest in the market are generally too dirty for use. The best are large, softish, not much wrinkled, of a reddish-yellow color on the outside, and with a whitish membrane between the flesh and the stone.

Day Book, a book in which are recorded the pecuniary transactions of the day, in the order of their occurrence. See Book-keeping.

Days of Grace, the three days allowed by law to a debtor after his obligation becomes due, in which to pay the debt.

Dead Center, in machinery, either one of the two opposite points in the orbit of a crank, which are in line with the piston rod, and where the power has no bearing in propelling the machinery. Those in charge of a heavy engine generally avoid stopping the machinery with the connecting rod "on the dead center," as in such a case it is difficult to start again. Locomotive engines are always double, one working at right angles with the other and thus mutually aiding in passing the dead center.

Dead Heat, a heat or course between two or more race horses, in which all come out exactly equal, no one winning.

Dead Set, the fixed position of a pointer dog in indicating game.

Dead Shot, an unerring marksman.

Dead Wall, a solid wall with no doors, windows or other openings.

Deafness. This troublesome complaint is not uncommon. It may be due to any one of the following causes: 1. Too much wax in the ear; 2. a common cold; 3. scarlet fever; 4. gout, etc. To remove the accumulation of wax inject warm water with a syringe. Avoid picking and poking at the ears. A little oil dropped into the ear helps to dissolve the wax. Deafness arising from cold will be removed by the cure of the cold. In scarlet fever, deafness arises from the connection which exists between the throat and the ear. For ordinary cases of deafness either of the following remedies may be resorted to: Drop three or four drops of glycerine in the ear before retiring at night; in the morning syringe the ear with warm water, and continue this practice faithfully for some time; or, take pure olive oil, say 1 ounce, and ½ ounce each of tincture of lobelia and tincture of cayenne; mix, and, from a warm teaspoon, drop into the ear four to six drops of this twice a day, shaking the vial well before using it. This is relaxing, softening and stimulating, and in all ordinary cases will answer the purpose. Turkey oil (or grease) is said to be still better than olive oil, and may be used instead of it in this prepa-

ration; or, take a common eel, remove the skin and intestines, hang it before the fire, and let the oil drip into a pan or vessel; when done dripping bottle the oil, and of this drop into the ear once or twice a day five or six drops from a warm teaspoon.

Death, Apparent. In this connection we treat of apparent death from hanging, intoxication, lightning, etc., while under the head of Drowning and Freezing we very fully treat of apparent death by drowning and freezing.

FROM HANGING. In addition to the means recommended for the apparently drowned, bleeding, to relieve the pressure of blood on the heart and lungs should early be employed by a medical assistant.

FROM NOXIOUS VAPORS, LIGHTNING, ETC. Remove the body into cold, fresh air. Dash cold water on the neck, face and breast frequently. If the body be cold apply warmth, as recommended for the apparently drowned. Use the means for inflating the lungs as directed above. Let electricity (particularly in accidents from lightning) be early employed by a medical assistant.

FROM INTOXICATION. Lay the body on a bed, with the head raised; remove the neckcloth and loosen the clothes. Obtain, instantly, medical assistance; in the meantime apply cloths soaked in cold water to the head, and bottles of hot water, or hot bricks, to the calves of the legs and to the feet.

On restoration to life, a tea-spoon of warm water should be given, and then, if the power of swallowing be returned, small quantities of weak brandy and water, warm; the patient should be kept in bed, and a disposition to sleep encouraged, except in cases of apoplexy and intoxication. Great care is requisite to maintain the restored vital actions, and to prevent undue excitement. The treatment is to be persevered in for three or four hours.

Death Watch, a small beetle sometimes heard making a clicking noise in the wall or book-case resembling the ticking of a watch; supposed by some superstitious people to forebode death in the family. See page 112.

Debit (deb′it), a recorded item of debt; to charge with debt.

Decanter (de-can′ter), a vessel from which fluids are poured out gently to leave the sediment behind.

Deciduous (de-sid′u-us), not evergreen.

Decoction, a tea; the virtues of any vegetable matter boiled out into water. An "infusion" consists of the virtues of a substance soaked out in cold water; a "tincture," the virtues drawn by and into alcohol or whisky; an "extract," anything drawn out by heat, distillation, spirits or other chemical process.

Dedication is the granting to the public, for use, any land for roads, churches, schools, cemeteries, etc., by the owner, with intent that it shall be used as designated. It must be accepted by the public. The grant may be direct by deed, or implied from acts. Acceptance is by direct acceptance or by occupancy and use. A constant use by the public for twenty years, with knowledge of the owner, will be, in most States, sufficient to presume dedication. Land dedicated for one purpose cannot be used for another, except by consent of the original owner.

Deed, a sealed instrument in writing, duly executed and delivered, containing some transfer, bargain or contract. In former times any writing signed and sealed was termed a deed; now the law confines the meaning to instruments for the sale of land. In this country no land can be transferred excepting by a deed, which must be properly signed, sealed, witnessed, acknowledged, delivered, and recorded. In some of the States, seals are not necessary to the validity of a deed. A deed should be written or printed on parchment, as paper is more perishable in character. The person making the deed is called the grantor; the person in whose favor the deed is made is called the grantee. The deed should be signed by the grantor with his full name, written clearly in ink of the best quality. A person accepting a deed signed with a lead pencil places his rights in jeopardy. If the grantor cannot write his name, he may make his mark. The name of the grantee should be written clearly, with good ink, in the proper place in the deed.

In the States which require a seal great care must be given to see that only those recognized in law are used. Strictly speaking, a seal is a piece of paper wafered on, or a piece of sealing-wax pressed on the paper. In the New England States and in New York, the law does not acknowledge any other kind. In the Southern and Western States, the written word "Seal," with a scrawl around it, placed after the signature, constitutes a legal seal.

A deed must be delivered in order to render it valid. There is no special form necessary to constitute a proper delivery. If the deed comes into the possession of the grantee with the knowledge and consent of the grantor, however it may have been gotten possession of, it is a valid delivery. If a man makes a deed and fails to deliver it, and dies with it in his possession, the deed is of no effect whatever. A deed to a married woman may be delivered either to her or her husband.

Some of the States require that deeds shall be attested by two witnesses. New York requires but one. Other States do not require any witnesses; but in all cases a deed ought to be witnessed by at least two persons, whether the law requires it or not. It is best to have adult witnesses; but minors may act in this capacity if they be of sound mind. The witness must have no interest in the deed. For this reason a wife cannot witness her husband's signature.

As a general rule, deeds are valid between parties even when not acknowledged. It is always best to have them acknowledged, however, as an unacknowledged deed cannot be recorded. The acknowledgment must be made before a person authorized by the law to receive it. In some places a deed may be acknowledged by either of the grantors, but the old cus-

tom of an acknowledgment by all the grantors is the safest as well as the most general. Where a wife joins with her husband in conveying away their land, or does it separately, a particular form and mode of acknowledgment is generally required to show that she acted without undue influence from him, and of her own free will. It is the duty of the justice taking the acknowledgment to state in his certificate exactly how it was made before him.

A deed must be recorded to be valid, that is, the grantee must deliver it to the recorder of deeds, or other officials appointed by law for that purpose, who must cause it to be copied in full in a book kept in his office for that purpose. A deed is regarded as recorded from the moment it is placed in the hands of this officer, and he generally writes upon it the year, month, day, hour, and minute when he received it. Deeds should be presented for record at the earliest possible moment. Sometimes the ownership to land conveyed may depend upon the exact minute at which the deed was delivered for record. This system of recording deeds enables a person to trace the title to property with absolute certainty.

When a deed is filed for record it is notice to all the world, and if the recorder make a mistake in recording or indexing, it will not affect the title of the grantee. He has complied with the law in filing it for record, and is not affected by subsequent mistakes of officers.

All erasures or additions to a deed should be noted at the end of it, and properly witnessed. Any such changes without being thus provided for renders the deed null and void.

In order to make a valid deed, the grantor must be true and lawful owner of the property; must be of legal age; and must be of sound mind.

A deed to a FARM includes, in addition to the land and growing timber, fences and rails or lumber laid out along a line for a fence. Boards piled up on the farm all in bulk, although intended for fencing, do not pass. Loose boards in barns, out-houses etc., do not pass with the deed, but are personal property. Growing crops usually pass when they belong to the owner, unless especially reserved; also, all buildings, and lumber which has been in a building or crib, even if torn down and laid away for future use. A furnace set in brick, either in the house or outside, passes, and everything that is so attached to the buildings as to mar them by removal. Pumps, water pipes, and iron kettles set in brick work, and a large bell attached to any of the buildings or on a post set in the ground all pass.

When a deed is filed for record it is notice to all the world, and if the recorder make a mistake in recording or indexing, it will not affect the title of the grantee; he has complied with the law in filing it for record and is not affected by subsequent mistakes of officers.

Deeds, To Make Legible. To make the writing in deeds legible, when sunk or obliterated, take five or six galls, bruise them and put them into a pint of strong white wine; let it stand in the sun two days; then dip a brush into the wine and wash the part of the writing which is sunk or faded, and by the color you will see whether the wine has enough of the galls. The writing fades because the gallic and tannic acids contained in the ink perishes, through age, but the iron still remains. When, therefore, the fresh gallic and tannic acids are re-supplied, the ink again becomes black.

Delirium Tremens (de-lir′ i-um tre′ mens), a fitful brain disease of drunkards, victims of opium and other narcotics, wherein the patient imagines that snakes, demons, etc., are about him. The principal reliance in the treatment of this terrible and peculiar disease is in opium and brandy, or narcotics with alcoholic stimulants. Induce regular sleep by first taking an emetic and an enema, a shower bath, and then every three hours 15 to 18 grains of ipecacuanha. Nicely made broths and gruels should be his diet. Or give sulphate of quinine, 12 grains; sulphate of morphine, 1 grain; mix, and divide into 6 powders. Dose, 1 powder every hour. Also, a preparation of cinchona is popular, for this purpose, at the present.

Demijohn (dem′ i-jon), a glass vessel or bottle with a large body and small neck, enclosed in wicker-work.

Deodorizers: see Disinfectants.

Demulcent, a bland or mucilaginous medicine which protects raw internal surfaces from exposure.

Depilatories (de-pi′la-to-riz), substances used for eradicating the hair. The safest depilatory is a strong solution of sulphuret of barium made into a paste with powdered starch; apply immediately after being mixed and allow to remain from five to ten minutes.

Brudet's Depilatory: Mix 3 parts hydro-sulphuret of sodium, 10 parts finely powdered quicklime, and 11 parts starch. Do not apply longer than two to four minutes, although it is perfectly safe.

Chinese Depilatory: Mix 8 ounces of quicklime, 1 ounce dry pearlash and 1 ounce of sulphuret of potassium, and apply as in the last recipe.

Dessert (dez-zert′), a service of pastry, fruits or sweetmeats at the close of a meal. See Pies, Cakes, Custard, Creams, etc., and the respective fruits.

Devon (dev′on), a breed of cattle. See Cattle, page 200.

Dewberry, a low trailing blackberry, growing sparingly throughout this country.

Dewlap, the flesh that hangs from the throats of cattle, which laps or licks the dew in grazing.

Diabetes (di-a-be′-teez), a disease attended with a persistent, excessive discharge of urine. Most frequently the urine is not only increased in quantity, but contains saccharine matter, in which case the disease is generally fatal. Proper diet is an important matter. This should consist principally of fresh meats, beef being the best. Eat little or no vegetables. Avoid everything from which sugar can be extracted, and drink as little as possible.

Dial, an instrument for showing the time of day by a shadow in the sunlight. The dial-plate is the face of the instrument, as also the face of a clock or watch, on which the hours are marked. Those who have not a reliable time-piece at hand, have sometimes to observe the time of day by shadows cast by objects standing in the sunlight. Mistakes are often made by supposing the shadow to move at a uniform rate, both winter and summer; whereas, while the shadow of a perpendicular object at mid-day moves over 15 degrees of an arc within an hour, early in the morning and toward evening it scarcely moves over the arc at all, but merely shortens or lengthens. Therefore, in the construction of a sun-dial, one must mark the hours and parts of hours on the floor, ground, platform, or plate (as the case may be), with the aid of a time-piece. Then, to be more precise, an almanac indicating the daily variation of the sun from true clock time should be consulted, for the sun is sometimes as much as 16 minutes too slow or too fast.

Diarrhœa, looseness of the bowels, continuing from day to day and accompanied by straining when at stool. Sometimes a kind of constipation may co-exist. Brought on by acrid and indigestible articles of food, accompanied with cold feet, exhaustive labors, etc.; often produced or aggravated by medicines. This is another complaint for which almost everybody has one or two "sure and safe" remedies. Perhaps the most simple and safe remedy is to take ½ teaspoonful of extract of Jamaica ginger in a litttle water. Sugar may be added to make it more pleasant. Continue this for three or four times and it will relieve ordinary attacks. Every farmer should keep an ounce bottle of this ginger in his house.

Another remedy: Bruise catnip leaves, press out the juice and mix with an equal quantity of sweet cream. Take a teaspoonful once an hour. This simple remedy has cured cases of chronic diarrhœa considered hopeless.

Another: One tablespoonful of double burnt coffee; 1 teaspoonful of ground cloves; 1 teaspoonful of white-oak bark; 1 teaspoonful of dried blackberry root; 1 pint water; boil hard three minutes. Dose, 2 or 3 tablespoonfuls immediately after a passage.

Another: Tincture kino, half ounce; Epsom salts, half ounce; prepared chalk, half ounce. Mix well in half pint of water. Take a wineglassful three times a day.

The non-medicinal treatment is: Warm, tepid or cool injections, according to the sensations; bland diet; and close observance of all the laws of health as given in this work under the head of Hygiene. Astringent medicines produce costiveness, which is followed by aggravated looseness again, by way of reaction, and so on. In most cases drugs cure one disease by producing another, the other disease being generally an obscure and chronic morbid condition.

Diaphoretic (di-a-fo-ret´ic), a medicine tending to promote insensible perspiration. Almost any diffusible stimulant or aromatic, in certain doses, is of this character, and there are thousands of them.

Dibble, an instrument to make holes in the soil, used in transplanting plants with little root. Commonly it is no more than a short section of a spade handle, the lower part shod with iron, and sharp. Steel transplanting trowels are used for larger plants and a small stick for very small plants or cuttings.

Diet: see Food and Hygiene.

Dill, an aromatic plant, the seeds of which are used in flavoring fancy articles of food.

Diphtheria, a disease of the throat, accompanied with general fever, in which a false membrane is formed in the throat, partly visible to one who looks into the back part of the mouth under a strong light. One or more whitish patches may be seen, with unusual redness in the surrounding parts. For treatment, bind a piece of fat bacon or salt pork to the throat externally, and give gargles of sulphur and water. A little of the solution may be swallowed; and even though the case be some other disease than diphtheria, no harm will be done. Of course, all the general principles of treating fever must also be observed. See Fever.

Discount, what is counted off; also, to count off. When a note, for example, is redeemed at 15 per cent. discount, only 85 cents on the dollar is paid for it.

Disease, a deranged condition of some of the organs of animals, or vitiated conditions of their blood, or their secretions. The nature of disease, in general, is an effort of nature to throw off foreign or effete matter,—sometimes to repair a wound or a weak place, or general debility. Some can be traced to very obvious causes, while many are exceedingly obscure in origin; yet most are known to arise either wholly or chiefly from the effects of improper food and bad air. If farmers used due care that all the food of their animals was sound and seasonable, that their barns and cattle-houses were well ventilated, and that no pond or marsh should exist to create miasmata, they would lose comparatively little stock except from accident and old age. In this volume the diseases of mankind are briefly treated under their respective heads, while the diseases of animals are treated alphabetically in the respective articles on the animals, as Cattle, Horse, Sheep, Swine, Fowl, etc.

Hereditary Diseases. No one, of any observation, can deny that hereditary influence exists in the production of disease. This influence must not, in the production of disease, be considered as invariably reliable. The fact of horses or mares having a disease, is no reason why their young will have the same disease also. It was through change or alteration of structure, action or function, that existed in either of the parents, that disease fastened upon them; and these same forms which existed in them are likely to be transmitted to the offspring, thus carrying the various forms of structure which will ultimately, in all

probability, produce the same disease. A great number of the affections which are usually styled hereditary do not make their appearance until years after their birth, because it requires time and work to develop them. Few persons would expect a horse with cow hock to become curbed without work, as a secondary cause. There is one other point worthy of remark, in speaking of hereditary diseases, which is that many animals, after being poorly bred, have been badly fed and cared for; whereas, if good feeding and care had been bestowed on them, it would have gone a long way in lessening the certainty of developing hereditary diseases in them and their offspring. This is every day being illustrated in the family of man. There are several rules laid down to be observed as measures to prevent and modify conditions which result in producing diseases of hereditary predisposition. Although these rules cannot, in all cases, be applied to animals, nevertheless, much can be done. The better way will be to avoid breeding from diseased animals. So long as like begets like, there will be hereditary diseases. As a prevention of contagious diseases see Contagion and Disinfectants.

Disinfectants, substances used to destroy the germs of contagion. Deodorizers destroy foul smells, without necessarily destroying also the contagion. The principal disinfectants are chlorine, the chlorides of lime, soda, and zinc, charcoal, carbolic acid, bromochloralum, copperas, the fumes of nitric, nitrous and sulphurous acids, onions and ventilation. Chloride of lime is generally the most available for the disinfection of privy vaults, while copperas water is the best deodorizer of the same. The following compound, although a little more costly, is much better for both purposes combined: sesqui-chloride of iron, chloride of manganese, chlorine and carbolic acid. The sesqui-chloride is prepared by dissolving the hydrated form in chlorohydric acid, and adding ten per cent. of carbolic acid. The other drugs are then added, and the whole diluted in an abundance of water at the time of using. For stables and slaughter-houses one of the best compounds is a mixture of the chloride and the hypochlorite of zinc. In a sick-chamber, sliced onions, spread out in dishes and set in various places about the room, constitute the most innocent and safe disinfectant in the hands of the unskillful; but a more effectual agent is nitrous acid vapor, produced as follows: Warm a half ounce of sulphuric acid in a glass or earthen cup in sand over a lamp, adding a little niter occasionally. Several of these vessels are placed about the room and adjoining passages, 20 feet or more apart. Carbolic acid, diluted and evaporated, is a convenient disinfectant. For washing a foul surface in or about the body, it is the best material known. For this purpose it must be diluted in about 100 times its volume of water. Druggists generally have it in some diluted form all ready for use.

We cannot here refrain from repeating the general advice, Avoid, as far as practicable, all occasion for the use of any drug, by cleanliness and pure air. The pure air and exercise obtained in out-door life is more than equal to all other health laws together.

The chloride of manganese is as economical a disinfectant as can be used by farmers. It is cheap, efficient and not dangerous like chloride of zinc. For stables and houses filled with animals nothing will answer as well as chloride of lime applied to the floor once a day. For empty houses chlorine gas will be found as convenient and good as any. For its use, see Chlorine.

Heat and cold are two agents highly useful as disinfectants. Heat prevents fermentation and decay by drying and changing the chemical state of substances, as it were, by working, whether by fire or the sun. Cold, again, is the most powerful antiseptic and disinfectant. Frosts prevent decay and disease, and at the same time have the connection existing between them.

Creasote is a most powerful antiseptic and disinfectant when applied to a part, but it is not easily managed. See Creasote, Contagion, Chlorine, Chloride of Lime and Charcoal.

Disinfectant for Rooms, Meat and Fish. Common salt, ½ a tea-cup; sulphuric acid, 2 or 3 ounces; put about ½ ounce of the acid upon the salt at a time, every 15 minutes, stirring, until all is put in. This will purify a large room; and for meat or fish, hang them up in a box, having a cover to it, and thus confine the gas, and tainted articles of food will soon be purified by the same operation.

Coffee, dried and pulverized, then a little of it sprinkled upon a hot shovel, will, in a few minutes, clear a room of all impure effluvia, especially of an animal character.

To Disinfect Water. Bits of iron will prevent water from becoming putrid. Sheet iron or iron trimmings are the best. The offensive smell of water in vases of flowers would be avoided by putting a few small nails in the bottom of the vases.

Unpleasant Odor of Perspiration. This is frequently a source of vexation to gentlemen and ladies, some of whom are very much subject to unpleasant odors arising from perspiration. This may be removed by the following simple process: Mix a tablespoonful of the compound spirits of ammonia with a small basin of water. By washing the arms, arm-pits, and hands with the solution, the skin will be left clean and sweet. The wash is cheap and harmless, and is much preferable to the perfumes and unguents which disguise but do not relieve the trouble.

Dislocation, a displacing of the articular surface of the bones of living animals from their proper situations. The reduction of dislocations is a very important part of human surgery, but in consequence of the very powerful resistance offered to it, and of the imperfect state of mechanical means for overcoming this, the reducing of locations is very seldom attempted in veterinary practice. In man all dislocations are characterized by the same symptoms, pain, shortening of the limb, a depression in one place, near a joint, and an enlargement or swelling opposi e. When a bone of the arm or leg is dislocated, place the patient on the floor on his back with a pillow un-

der his head, fold a damp towel around the arm or leg below the dislocation, tie a handkerchief around the towel, sit down on the floor and pull with a slow, steady strain until the joint is set. Sprains should always be treated by perfect rest to the parts, and cold water should be applied constantly. Take a lump of ice, wrap it in a woolen cloth and keep it constantly applied where needed. Never permit warm applications, poultices, or liniments to be applied.

Distilling. Any condensed vapor is a distilled product. To obtain the purest water, get a tin or granite-lined worm (coiled pipe), fix it in a cask, the lower end projecting through a hole near the bottom, the cask to be kept filled with cold water. A pipe leads from the upper end of the worm to a boiler at a little distance. Let the water boil for a few minutes disconnected from the worm in order to expel the volatile gases or organic matter, then put in the connecting pipe, and let the water boil rather slowly afterward or simmer. The cold worm condenses the vapor into water and deposits it into a clean bottle or jug set for the purpose. If such stills were supplied in the general market, it would pay any family to purchase one, in order to have such pure water that no disease of the biliary or urinary system need be feared, and the general health be better every way.

Diuretic (di-u-ret′-ic), a medicine tending to promote the secretion of urine. Diuretics operate more easily and powerfully upon the horse than upon man, and therefore require in veterinary practice to be used with much judgment and considerable caution.

Dock, to amputate the tail of any domestic quadruped, especially of the horse. This practice has been advocated by some for the three reasons of throwing into the rest of the system the portion of blood which would otherwise be expended upon the amputated tail; of improving the appearance of the animal; and of promoting the convenience and comfort of the riders and drivers of horses. The first of these reasons is imaginary and absurd; the second is a matter of vitiated taste, and the third is, in a considerable degree, a misnomer for mere fashion and caprice. All right feeling and all good taste revolt from the cruelty of inflicting upon an animal the violent pain of amputation, and of, at the same time, depriving him of means of defense with which the beneficent Creator has provided him against thousands of torturing attacks of insects; yet so long as blind custom (which is not so prevalent as some years ago) and a reckless regard to a little convenience in man, insists on the docking of the horse, let the operation be performed with as little cruelty to its victim as possible. The amputation should be made at one stroke, against the resistance of a hard board, and without any subsequent application for stopping the hæmorrhage, or at the worst, with the use of a very moderate cautery, so applied as not to touch the bone. Every precaution should be taken that the act of amputation go clear through a joint of the tail without grazing, far less splitting, an articulation of bone. The precise joint of the tail through which the amputation is made is a matter of mere caprice, some persons preferring to leave a considerable portion of the tail, and others to cut almost the whole away so as to leave nothing but a hideous stump.

The docking of lambs is quite common in some sections. It is claimed this promotes cleanliness and prevents the attraction of insects.

Doctoring, medical practice. Of all the crudities of past ages, there was none transmitted to this century so gross and irrational as practical medicine. We would wonder why men noted for learning and intellectual power received it as something approximating to science, and to be treasured as among the most precious gifts to humanity, did we not go further and trace the connection between it and the natural history of man, which gave it its greatest if not its only charm. Up to the time of the Alexandrian school the physician's vocation was confined to the observation of disease, the administration of simples, and the practice of such arts as would forcibly impress the minds of superstitious persons who receive their ministrations. At this time the study of anatomy excited the interest of some of the best minds of the age, and, associated with physiology and chemistry, it has continued to engage the attention of those who could not otherwise have been attracted by it. The complex mechanism of the human body could not but attract the attention of those who were endeavoring to rend the covering of the dark ages and come out into a fairer light. And thus, we will find that in the fifteenth, sixteenth, and seventeenth centuries there were many physicians who became noted, not so much for their success in the cure of disease as in unraveling the tangled web of man's structure and relations to surrounding objects. As regards the practice, it was so gross and many times so absurd as to excite the ridicule of the non-professional.

Such was practical medicine at the beginning of the present century. Disease was looked upon as some fiend to be driven out by harsh usage, and medicine was looked upon as the only weapon which could be effectually employed, and upon which the lives of the sick depended. And this medical weapon was used as a Celt would use his shillalah, striking right and left, and satisfied if it came in contact with something.

Those were the days of copious purgatives, salivation, continued nausea by tartar emetic, copious bleedings, large and painful blisters, shaved heads, etc. They were the days when the tortured patients would cry for water, as did Dives from the burning of hell, but not a drop could they have to cool their parched tongues. They were the days when the sick so lost their strength that they would have to be turned and lifted on a sheet; when ghastly bedsores on the nates and back added to the tortures of the victim. And, lastly, they were the days when the sick slowly recovered from the ill effects of the doctoring, found themselves with diseased joints, carious bones, impaired digestive organs, and impoverished

blood, so that at times it seemed almost impossible for them to regain their health.

This is not a very pleasant picture, but it is faithfully drawn; and such was the heritage of this century as regards practical medicine. It savored too strongly of the dark ages and of the inquisition for a period of rapid enlightenment, and there was a popular demand for its reformation that could not but be heeded. The most rapid progress has since been made by all the schools of medicine. Indeed, not only has the profession advanced in the science and art of healing, but the public are much wiser and better posted in the treatment of diseases than formerly. They are not so easily duped and humbugged by the quacks, apothecaries, traveling doctors, soothsayers, fortune-tellers, certain clairvoyants and "spiritual mediums," and the like, as they were a few years ago. People are beginning to realize the fact that every one has the care of his health in his own hands so long as he is mentally and physically able to attend to it, and not until he is helpless or has an ailment he does not understand or cannot treat, should he have physicians or others to take charge of him. Hence we have what is called "domestic medicine," or "home treatment." In every case of emergency there are certain things which the patient can safely do, and should do, until the surgeon or doctor arrives. What is mostly deprecated is the practice of "going it blind," administering powerful medicines, on the theory that "they will do no harm, even if they do no good." Most of unprofessional treatment is undertaken on the strength of a report of some apparently similar case where such a medicine was given and the patient got well. Often they think they have seen with their own eyes the administration of the given medicine with favorable results, but "somehow in the present case it doesn't work just right." When the physician arrives he reproves them for presuming so much and "handling sharp-edged tools in the dark," and claims, often with justice, that they have made the case much worse. Hence, we advise to touch not the powerful drugs until a doctor is called and his advice is obtained, or you have some reliable and safe instructions. The treatment recommended in this work for the various diseases are standard and popular remedies, and such as any good physician might prescribe, should the symptoms be properly diagnosed and found to be similar to those for which the certain treatment is advised. At all times and in all cases, with or without a physician, the patient should have hygienic measures faithfully attended to, as, keeping the head cool, feet warm, breathing pure air, abstaining from improper food, etc. See Hygiene.

Domestic treatment has often cured cases given up by the family physician, and the question has actually been seriously raised by medical professors whether there is not more "quackery" inside the regular profession than out of it. The most common error among all classes of people is the notion that, because a sick person within their knowledge took a certain course of treatment and got well afterward, he therefore was cured by it; for nearly all acute cases will recover anyway, even if let entirely alone. The last thing taken in a course of medicine generally gets the credit of the cure.

In home treatment the most serious difficulty to overcome is to obtain a clear knowledge of the nature of the disease. For example, all fevers set in so much alike that it is generally impossible, the first day or two, even for a skilled physician, to tell just what kind of a fever will be developed. In his haste to satisfy the sufferer and his friends he sometimes names the fever too soon, and when he subsequently discovers his error, he slyly covers it up by remarking that "the fever has changed type."

Every one knows that almost every substance and process in existence is recommended for almost every disease, and this fact alone shows that most people are too forward with their advice. When really asked for advice one is inclined to do a little more careful thinking before giving it. Our endeavor in this volume is to give merely the best or most reliable remedies for common cases. Some cases require a radically different treatment; some of these a skilled physician can discriminate, and some he cannot.

In the selection of a family physician it is best not to take one simply on the ground that he appears to have performed a remarkable cure in the vicinity, or because he is a friendly neighbor, but choose the one who does not pretend to know everything, or to be competent for every case that may be presented,—one who "thinks twice before he speaks once," is punctual in making his calls, is careful in making his promises, and seems to have a moral principle at heart in everything he undertakes. A doctor who is rough in his manners, extravagant in his language, or is given to drinking and lounging, should be passed by unnoticed. How difficult it is for us to recognize the fact that a man may bring about a remarkable cure, in a case now and then, and yet be a very incompetent physician! Doctors make it a rule to *appear* to be adequate to the case in hand whether they are in reality or not; and obscure diseases they can very easily name at random and doctor, without being suspected of error. Any shrewd man can learn in an hour or two a sufficient number of "big words," such as diaphoretic, pneumogastric, gastrocnemius, zygomaticus, etc., to enable him to pass for a learned doctor almost anywhere. We see no way of salvation for the people from becoming the victims of presumption and pedantry.

Most advertising physicians are swindlers. Nearly all "specialists," advertising that they cure private diseases, are as incompetent as those who do not so advertise. The advice of solid men is, Trust no stranger with the care of your body, any more than you would with your money-purse—and for about the same reasons. No matter how long he may have been plying his vocation in a certain city, at a certain number, the "specialist" physician is no more competent and trustworthy on that account. Such is the state of American society that fraud and humbug can flourish along side

by side with honesty and industry for many long years. It seems that there should be some more efficient remedy adopted against incompetency in the medical profession—both by law, and by local bureaus furnishing evidences *pro* and *con.* as to the reliability of each doctor in the community. On the other hand, such is the growth of science and useful art that the principle of "subdivision of labor" must be carried into medicine as elsewhere, and to insure the greatest competence each physician should have his "specialty."

MEDICINES, PATENT MEDICINES AND "QUACKS." There is no better man in the world than the true physician, and no more base wretch than the ordinary "quack" or medical charlatan. The physician enters the home, learns its secrets, and indeed holds in his hands, to a great extent, the lives of its inmates. How careful then should we be in selecting one whom we expect so to trust! It is because of the vital importance of this question, and the seeming indifference manifested in the matter by the masses that we treat this question of doctoring so fully.

To be able to detect the spurious from the reliable in medicine, and how to judge between the pretentious quack and the true physician, is our motive in writing this article. We hope to make it valuable, in a practical sense, to those who are exposed to the crafts and villainies of apothecaries, quacks and patent medicine men.

Could the public know what trash in the matter of drugs it pays for—how filthy, vile and often poisonous and hurtful materials people buy for medicine at extortionate prices—they would be dumbfounded—how, even the syrups which they drink in soda drawn from costly and splendid fountains, are often made from the most filthy materials, and are not fit for the lower animals, not to say human beings, to drink.

While there have been great changes in the drug trade during the past fifty years, necessary to the increasing demand for drugs, the establishment of wholesale houses and some specialties, and, in cities, the substitution of cigars, soda water, patent medicines, etc., for groceries and provisions, the dispensing apothecary is nearer to what he was hundreds of years ago than any other professional we know of. The paraphernalia of the shop is nearly the same. There is no improvement in pot, in jar, in tables, in spatula; the old, ungainly mortar is not substituted by a mill; the signs of ounces and drachms remain the same, though so near alike they are often mistaken one for the other, and the prescription before the dispenser is prefixed by a relic of the astrological symbol of Jupiter, "the god of medicine of the ancient Greeks and Egyptians," as a species of superstitious invocation. In the largest cities, even in the shop windows, the mammoth flashing blue bottles, "a relic of empiric charlatanry," still brighten the street corners and frighten horses at night, as in the days of our forefathers. Besides these bottles the front windows contain patent medicines and the flashy signs that announce their virtues. Should you have a prescription filled at one drug store and then go to another for a second quantity of the same, we ask the patient, no matter who or where he is, Did you ever get the same kind of medicine, in look, color, quantity, and taste, the second time, from the same prescription? You will often find it difficult to get the same put up at the very store you got the original prescription compounded.

One of the greatest cheats with druggists is the "substituting" business. Horse aloes may be bought for ten cents a pound. Podophyllin costs seventy-five cents an ounce. They each act as a cathartic, and often the former is used in place of the latter. How is the physician to know the cheat? How is the patient to detect it? Perhaps the former stuff, aloes, may have given the victim the hemorrhoids. One dose may be quite sufficient to produce that distressing disease. This only calls for another prescription. So it looks a deal like a "you tickle me and I'll tickle you" profession at the least. Thus the patient becomes disgusted, and resorts to patent medicines.

Besides the mistakes and humbuggery of the druggists, the conflicting "isms" and "opathies" of the medical fraternity, their quarrels and depreciations of one another, their expositions of one another's weaknesses, frauds and duplicities, so disgusted the common people that they resorted to the irregulars, to astrologers, and humbugs of various pretentions.

"While there is life there is hope," and invalids have and still continue to seize upon almost any promised relief from present pain and anticipated death. Speculative and unprincipled men have seldom been wanting, at any period, to profit by this misfortune of their fellow-creatures, and to play upon the credulity of the afflicted, by offering various compounds warranted to restore them to perfect health. At first such medicines were introduced by the owner going about personally and introducing them; subsequently, by employing equally unprincipled parties, of either sex, to go in advance, and tell of the wonderful cures that this particular nostrum had wrought upon them. To listen to these lauders, one would be led to suppose that they had been afflicted with all the ills namable. The physician created the apothecary, the two opened the way for the less principled patent-medicine vender.

Next we have the mountebanks. These were attendant upon country fairs and in the market places of the cities. They mounted upon a bench (hence the name), cried the marvelous virtues of the medicine, and, by the assistance of a decoy in the crowd, often drove a lucrative business. Finally, upon the general introduction of printing, physician, apothecary, mountebank, speculator, all seized upon the "power of the press" to more extensively introduce their "wonderful discoveries." This has proven more lucrative than all the other plans. When you notice the name—and O, ye gods, such names as are patched up to attract attention!—to a new medicine, systematically and extensively advertised in every paper you chance to pick up, you wonder how any profit can accrue to the manufacturer of the compound after

paying such enormous prices as column upon column in a thousand newspapers must necessarily cost. "If their articles cost anything at the outset," you go on to philosophize, "how can the manufacturers or proprietors make enough profit to pay for this colossal advertising? The solution of the problem is embodied in your inquiry. They cost nothing, or as near to nothing as possible for worthless trash to cost. This is the secret of fortunes made in advertised medicines. When we know the complete worthlessness of the majority of the articles that are placed before the public, yea, their more than worthlessness, for they are, many of them, highly injurious to the user, the fact of their enormous consumption is truly astonishing. The drug-swallowing public has grown lean and poor in proportion as the manufacturers and venders of these villainous compounds have grown fat and wealthy.

Said the proprietor of "Coe's Cough Balsam" and "Dyspepsia Cure" to a friend, "If you have got a good medicine, one of value, don't put it before the public. I can advertise dish-water and sell it just as well as an article of merit. It is all in the advertising." As the above preparations were advertised on every board fence, and in every newspaper in the country, did his assertion imply that those articles were mere "dish-water?"

Mr. Johnston, who engineered the advertising of "Spaulding's Glue," stated "it cost but one eighth of a cent a bottle." Yet, what a run it had at hundreds of times that amount!

The pain-killers and liniments are the most costly, on account of the alcohol necessary to their manufacture; and in fact, the principal item of expense in all liquid medical articles, put up for public sale, is in the alcohol essential to their preservation against the extremes of heat and cold to which they may be subjected.

There is an article which "smells to heaven," the acidiferous title of which glares in mammoth letters from every road-side, wherein the audacious proprietor obviates the necessity of alcohol for its preparation or preservation. It is merely fermented slops, "dish-water" minus the alcohol. Take a few handfuls of any bitter herbs, saturate them in any dirty pond water, say a barrel full, add some nitric acid and bottle without straining. Here you have "Vinegar Bitters!" The cheeky proprietor informs the "ignorant public" if the medicine becomes sour (ferments), as it sometimes will, 'being its nature so to do,' it does not detract from its medical virtues. True, true! for it never possessed "medical virtues." The cost of this villainous decoction is scarcely half a cent a bottle. Soured swill! It is recommended to cure fifty different complaints! It sells to fools for "$1.00 a bottle," and will go through one like so much quicksilver. "Try a bottle," if you doubt it. The "dodge" is in advertising it as a temperance bitters. Having no alcoholic properties, it in no wise endangers the user in becoming addicted to stimulants.

Sarsaparilla humbugs are second only to the above. But a few years since an immense fortune was realized by a New York speculator in human flesh on a "sarsaparilla" which contained not one drop of that all but useless medicine; nor did it possess any real medical properties whatever.

Pectorals, wild cherry preparations, etc., are cheaply made.

Oil of almonds produces the cherry flavor. Prussic acid, a virulent poison, and morphine or opium, constitute the medical properties.

The bitter and cathartic properties of nearly every pill in the market, whether "mandrake," "liver," "vegetable" or what else, are made up from aloes, the coarsest and cheapest of all bitter cathartics. One is as good as another. You pay your money, however; you can take your choice. One holds the ascendency in proportion to the money or cheek invested by the owner in its introduction. A great Philadelphia pill now sold in all the drug stores of America was introduced by the following "dodge." The owner began small. He took his pill to the druggists, and, as he could not sell an unknown and unadvertised patent pill, he left a few boxes on commission. He then sent round and bought them up. Their ready sale induced the druggists to purchase again for cash. The proprietor invested the surplus cash in advertising their "rapid sale," and with a little more buying up he got them started. He necessarily must keep them advertised or they would become a "drug" in the market.

Soothing syrups, nervous cordials, etc., owe their soothing properties to opium, or its salt, morphine. From "Opium and the Opium Appetite," by Alonzo Calkins, M. D., we are informed that an article sold as "Mrs. Winslow's Soothing Syrup," for children teething, contains nearly one grain of the alkaloid (morphine) to each ounce of the syrup. Taking one teaspoonful as the dose (that is, one drachm) and there being eight drachms to the ounce, consequently about one-eighth of a grain of morphine is given to an infant at a dose. Do you wonder that it gives the children a quietus? Do you wonder that the mortality among children is greatly on the increase? that so many of the darling, helpless little innocents die from dropsy, brain fever, epileptic fits, and the like?

When a man tells you, point blank, he is selling an article for the profit of it, believe him; but when he asserts that he is advertising and offering a remedy solely for the public good, for the benefit of suffering humanity, he is a liar. Beware of such. Furthermore, when he publishes an advertisement in every paper in the land, announcing that himself having been miraculously or "providentially" cured of a variety of diseases by a certain compound, the prescription for which he will send free to any address, you should hesitate until satisfied of the disinterestedness of the party, and, in the meantime, ask yourself the following question: Provided this be true, why don't the unparalleled benevolent gentleman publish the recipe, which would cost so much less than this persistent advertising that he will send it to any requiring it;

and you are next led to ask, Where is the dodge? for money is what he is after.

Documents, Legal, WHEN OUTLAWED: see Limitations.

Dodded, hornless: applied to cattle. Generally known in this country as "muleys."

Dog. To no animal is mankind more indebted for faithful and unswerving affection than to the dog. His incorruptible fidelity, his forbearing and enduring attachment, his inexhaustible diligence, ardor and obedience have been noticed and eulogized from the earliest times. This valuable quadruped may be emphatically termed the friend of man; as, unlike other animals, his attachment is purely personal, and uninfluenced by the changes of time or place. The dog seems to remember only the benefits which he may have received, and instead of showing resentment when chastised, exposes himself to torture, and even licks the hand from which it proceeds. Without the aid of this almost reasoning animal, how could man have resisted the attacks of the savage and ferocious tenants of the forest, or have procured sustenance in the ages of the world when agriculture was unknown? Whoever would write the history of dogs must write the history of man, for in periods as remote as history reaches we find this animal associated with him as his useful servant; and, with the growth of agriculture from an almost despised pursuit to a leading place among the industrial sciences, the development of the dog has kept pace until he has become, in each of the various pursuits for which his particular class has been bred, a specific and indispensable aid to man. Though the origin of many, if not all, of the different breeds, is clouded in obscurity, yet the peculiar traits which characterize many of them are so marked as to adapt them perfectly to their own peculiar sphere of usefulness, whether for the farm, the field, the forest, or the pit and prize-ring.

CLASSIFICATION. Some of the latest and best writers have divided dogs into three general divisions, subdividing these again into a variety of classes, embracing the peculiar features which distinguish the different specimens of the race:

DIVISION I.—DOGS USED IN FIELD SPORT.

Group 1. Those that pursue and kill their game, depending entirely or mainly on sight and speed, and little or not at all on their scenting powers, with varieties bred directly from them, such as greyhounds, deerhounds, whiffets, lurkers, etc.

Group 2. Those hunting their game by scent and killing it; as bloodhounds, foxhounds, beagles, etc.

Group 3. Those finding the game by scent, but, instead of rushing on it as the hound, assuming a staunch position called a "point," in which they indicate to the sportsman by the direction of their noses the position of the game.

Group 4. Other varieties, used with the gun in questing and retrieving.

DIVISION II.—DOGS USEFUL TO MAN.

Group 1. Those specially used as assistants in man's work; as pastoral dogs and dogs used for draught, shepherds' and drovers' dogs, etc.

Group 2. Watchers, and defenders of life and property, life-savers, companion and ornamental dogs, etc.

Group 3. Vermin-destroyers, such as terriers, etc.

DIVISION III.—HOUSE DOGS AND TOY DOGS.

Group 1. Those of distinct varieties from the foregoing; as pugs, poodles, Blenheims, etc.

Group 2. Those that are merely diminutives of the already mentioned species; as the various toy terriers, etc.

DIVISION I.—GROUP 1. The *Greyhound.* The source from which this species derives its name is a matter of conjecture, and will probably remain so. Its most prominent physical features are, elongated head, high, proportionate stature, deep chest, arched loins, tucked-up flank, and long tail. Physically the greyhound is one of the most beautiful of dogs, with wonderful powers of speed and endurance in the pursuit of game, and courage and vital force in the killing.

The Greyhound, as a distinct class, may be traced back many centuries. He is found in greatest numbers and perfection in Great Britain, to which country he peculiarly belongs, though found in other countries of Europe at a very early date. His color varies, as also the character of his hair, the latter being smooth in the English, and rough in the Scotch and other species of greyhounds.

The *Scotch Deerhound* is in form similar to the common Greyhound, only more massive, nearly thirty inches high, strong straight limbs, back and quarters, oblique shoulders, neck muscular and of moderate length, long head, broad between the ears, which are small and set on well back and high on the skull. The hair is long and coarse. This breed in its purity is rapidly becoming extinct.

The *Irish Wolfhound*, in all its original purity, is, at the present day, nearly if not quite extinct. His origin is of very early date, being known and highly prized by the Romans. He resembled the Greyhound in general conformation, but was much larger and more powerful than any present known race of dogs, being more than equal to the capture and killing of a wolf.

The *Scotch Rough-Haired Greyhound* is a variety of dog now rarely met with, except at shows and similar places, the popularity of modern coursing having apparently rung his death knell; and although he still exists in an out-of-the-way-place, in his native country he is becoming absorbed in the more modern smooth-skins. The shape of this species corresponds closely with that of the Deerhound, but he is not so large and powerful.

The *Lurcher* proper is a cross between the Scotch Colley and Greyhound, about three-fourths the height of the latter, or from 20 to 22 inches, more strongly built, and heavier boned, yet lithe and supple, his whole conformation suggestive of speed, just as his

blinking, half-closed eye, as he lies pretending to sleep, impresses one with his intelligence and cunning. He is bred and used for poaching, and every attribute of his nature adapts him to fill his sphere, whether defending his master, watching at gate or stile to ward off danger while the net is being spread, driving the game into the fatal trap, or creeping up and seizing it while in cover, hunting by sight or smell as necessity demands, and retrieving the game on the one hand or stealing on the other as opportunity may offer, or necessity may require.

The *Whiffet*, or *Snap-dog*, is in appearance a small Greyhound with a dash of Terrier, and in Durham, England, his peculiar community, he is used for racing, and for rabbit coursing, for which he is superior.

The *Siberian Wolfhound* is a dog of the Scotch Deerhound type and much the same in size. The most striking difference is in the color. The grizzle almost universal in the Deerhound gives place here to a mixture of colors. The "Barsee," as this dog is called—is white, with a mixture of dark and light grey and white. In general form and appearance it resembles the Deerhound, and is strikingly handsome and majestic. Mild in disposition and intelligent, faithful and courageous, it is eminently adapted for a companion or an ornament.

The *Persian Greyhound* is a graceful, delicate and rather rare species, being found at English bench shows more frequently than anywhere else. They are similar in form to the greyhound, but more slimly built, with less muscular development, appearing to be an enlarged type of the Italian Greyhound.

GROUP 2. DOGS THAT HUNT THEIR GAME BY SCENT, AND KILL.

The *Bloodhound* stands first in this group as the Greyhound in Group 1. He derives his name from his peculiar power of scenting a wounded animal, so that once on his trail he will single him out from among any number of his fellows, and stick to him through any foils or artifices which he may have recourse to. From this property he has also been used to trace human beings, and as his nose is remarkably delicate in hunting even without blood, he has always been used for that purpose, whether the objects of pursuit were sheep, thieves in England or slaves in Cuba. They were used in the early border warfare. In appearance they are from 24 to 26 inches high; ears from 8 to 10 inches long; lips loose and hanging; throat also loose and roomy in the skin; deep in the frisket; round in the ribs; broad and muscular in the loin and thighs; legs and feet straight and good; of a black-tan, or deep and reddish color; bark, loud, long, deep and melodious; and the temper courageous and irascible, but remarkably forgiving and susceptible to kindness. They are at present most numerous in the South and in the West India Islands, having detriorated in numbers and quality in Britain.

The *Foxhound* is the hunting dog upon which the breeder of coursing dogs has bestowed the greatest pains, and his efforts have been rewarded by the attainment of the highest degree of excellence, in the union of fine scent, fleetness, strength, perseverance and temper. He stands usually from 20 to 22 inches high at the shoulders, and is of a white color marked with large spots of black or tan. He has been known to get over four miles in seven minutes, and his powers of endurance are equal to his speed. Foxhounds are hunted in packs, and following the hounds is in England the most popular field sport.

The *Otterhound* is supposed by some authorities to be a cross between the Bloodhound and Terrier, by others, a cross between the Southern Hound and Water Spaniel, while some assert that his hardiness, courage and tenacity are derived from a cross with the Bulldog. In general appearance (always excepting the coat) he resembles the bloodhound, symmetrical, strongly built, hardy and enduring, with unfailing powers of scent, and a natural antipathy to the game he is bred to pursue. A native of Britain.

The *Harrier* is so called from being bred and kept almost exclusively for the pursuit of the hare. He is in appearance much like the Foxhound, with head heavier in proportion, skull flat and broad, the ears set on low, and close and fine in texture. The coat is short, fine and dense, while the color is a variety of combinations. Delicacy of scent, and perseverance, are the essential qualities of the Harrier.

The *Beagle* is a miniature hound that resembles, in appearance and form and trait of character, the Harrier; is old as a class, being used in Elizabeth's time and earlier. They vary in size and appearance, being made to suit the fancies of owners and breeders. They might not improperly be called a fancy hound.

The *Basset* is a low hound of French and Belgian nativity, his name being derived from the French word *bas*, meaning *low*.

The *Badger* Dog is a short-coated, long-backed dog, on very short legs, weight from 18 to 20 pounds, the bitches being somewhat lighter than the dogs. They are self-colored; the color most in fashion just now is fallow-red, and black and tan, though there are good specimens of various shades of red, more or less smutty, as well as brown with tawny markings. The head resembles that of the Bloodhound, and the ears are long and pendulous, eyes lustrous and mild, and a general conformation which admirably adapts them for the purpose for which they are used, drawing their game from the burrow.

The *Swiss Hound* is a German hound of medium height and long, strong body, medium-sized head and tolerably long ears, broad chest and sloping shoulders; hair short and greyish brown. A native of Germany.

GROUP 3. DOGS THAT FIND THEIR GAME AND INDEX IT FOR THE GUN.

The *Setter*, as a hunting dog, has been developed by the most careful and scientific course of breeding until he has reached a very high state of perfection, both in Britain and America. There are several species of Setters, the principal ones being the English, Irish, and Gordon, and the English is subdivided into two classes known as the Laveracks and Llewellyn, the latter designated by Mr. Purcell Llewellyn.

Fig. 1.—GREYHOUND FAMILY.

The general appearance of a well-bred Setter is very pleasing to the eye. He is so nicely put together as to present a well-balanced whole, showing capabilities of speed and endurance, and his expression shows a high order of intelligence; his disposition is gentle, and he exhibits a strong desire to please. No breed excels him in elegance of form, and his beauty is increased by his long, silky coat, and profuse though not over-abundant feathering. The head is lean and long, not so thick as the pointer's, and with a high, full top showing plenty of brain; and the jaws should be long and level, with clean, white, strong teeth that meet together evenly (a feature on which dog fanciers lay great stress); face dipped below the eyes; nose wide and black or liver-colored, varying with the color of the dog; lips clean cut, and loose eyes, set straight, bright, clear and animated, of a brown color and shaded according to the color of the dog. The ears are of medium size, set low, and hang straight, and are thin, and covered with fine, silky hair that hangs down two or three inches below the leather. The body is strongly and handsomely formed, the legs strong, straight in front, bent at the hock behind, and well fringed; the tail is of medium length, slim (an important feature) and well fringed, and is carried at a gentle curve. No other dog is more intelligent or tractable, or capable of a finer development under skillful training. He is taught to work a field in quest of game, to right and left before his master, to stand and point when he winds the game, and hold a rigid position till the hunter arrives and bids him put up the bird, to drop when the bird takes wing and lie till the gun is reloaded and he is bidden to advance, which he will then do cautiously, till the next bird is scented, when he again points, repeating the performance until the entire covey are killed; then he will carefully hunt up and retrieve the dead and wounded birds without injuring the appearance of a feather, showing throughout the whole a desire to please his master, which supersedes every other instinct. So highly is he esteemed by all classes of society, both in the Old and New World, that he is undoubtedly the leading dog of this day.

FIG. 2.—*Irish Wolfhound.*

The *English Setter* is found in two distinct strains, the Laverack and Llewellyn, the former the oldest, as a separate family, though the two bear close resemblance to each other. They are white and black, or liver-colored, usually, though the lemon and white is often found.

The *Irish Setter*, in general features, resembles the English Setter, being generally of a lighter and more wiry appearance; his color is deep red with white spots that should be as few and small as possible. He comes originally from Ireland, and can be traced back as far as any family of Setters. He is inclined to be headstrong, susceptible of fine training, and is an untiring worker. There is no class of Setters more highly valued among sportsmen.

The *Gordon Setter* is supposed by some good authorities to have sprung from a cross of the English and Irish dogs, and some assert that they possess a mixture of Colley. He gets his name from being bred by the Dukes of Gordon, in an early day. He is also called "Black and Tan," from the fact that he is distinctly marked by tan spots on the feet, feathers of the leg, under the stern, on the vent, cheeks, lips, and in spots over the eyes. He is heavier built than the English, and more docile than the Irish Setter, and is capable of enduring great fatigue. The Setter is supposed either to have descended from the Spaniel, or else both are off-shoots of the same stock.

The *Pointer* was introduced into America from England, and is supposed to have been taken there from Spain. He has always been considered in Eng-

land a distinct species, used and trained only for the one purpose of hunting and pointing birds; he possesses a strong innate tendency to point, and a keen scent; is somewhat taller than the Setter, though not so large a dog as formerly, the size having been reduced by breeders with the object of increasing their speed. They are more easily trained than the Setter, though less companionable. They are rapid workers, and careful retrievers when well trained. Well-bred and developed Pointers possess good bottom, fine form, and symmetrical proportions. The color is varied, and as an indication of value in breeding, is immaterial; superior dogs in the field being found in all colors, though the most prevailing colors are white and black, white and lemon, white and liver, or wholly liver-colored; or sometimes, but more rarely, black, the favorite colors, though, being white and liver or lemon, or liver-colored.

The *Spanish Pointer* need only be referred to as the source from whence the Pointers of the present day are derived; he is a dog of the past.

The *Dropper* is a cross between the Setter and Pointer, and often as good a field dog as either, but of no value for breeding.

GROUP 4. DOGS USED WITH THE GUN IN QUESTING AND RETRIEVING.

The *Spaniel*, which is one of the kindest, most companionable and intelligent of dogs, has been bred in England for many centuries, and used for hunting and retrieving. The different varieties are in many cases named from the particular game which they are designed to hunt, though the many different varieties of the present day are to a certain extent the result of the variety of efforts and tastes of many different breeders.

FIG. 3.—*Bloodhound.*

The *Black Spaniel* has a long head, long muzzle, rather deep than square or pointed, ears set low, long, lobe-shaped, and well feathered with long silky hair, dark, full eye, long, muscular neck, well covered with hair, long barrel and muscular back, heavy muscular shoulders and deep chest, strong short limbs, moderately round feet with hard, thick soles; tail medium length, well feathered, and not carried higher than the back. Coat jet, glossy black, free from rustiness, soft and silky in texture, long and free from curl. A few white hairs on the chest are no detriment.

The *Cocker Spaniel* resembles the Black in general conformation; he is found in all colors, liver, black, white with liver or black, and in these mottled on fore legs, etc. He is a beautiful, intelligent, clever, companionable dog, though at the present time yielding place among breeders to the larger varieties.

Clumber Spaniel is an English variety, highly prized in some parts of England. He is heavier and more sedate than those just described, an untiring worker and a good retriever, with a keen nose, and, though grave, a good disposition. In general form and physical features resembles those described; in color, he is white and lemon.

Sussex Spaniel is one of the oldest known breeds of English sporting dogs. He had become nearly extinct, when, in 1870, a number of prominent English breeders set to work to revive the breed, meeting with great success. The Susex Spaniel should weigh from thirty-three to forty pounds, and be of a liver or golden liver color.

The *Norfolk Spaniel* belongs to the Springer branch of the family. The Norfolk Spaniel weighs about 40 pounds, and generally liver and white in color.

The *Irish Water Spaniel* has no equal as a retriever from the water, and is unexcelled in his companionable qualities. His prominent features are endurance, pluck, sagacity and intelligence. His coat is a succession of hard, short curls of a dark liver color, his face is smooth and surmounted by a triangular topknot of hair, which, when full grown, is four inches in length, the apex being downward and terminating be-

FIG. 5.—SPANIEL FAMILY.

tween the eyes. The ears are very long and heavily fringed, and tail is thick and covered with curly hair for about three inches from the body, when it becomes smooth and runs to a sharp point. The fine specimen of this dog illustrated on page 330 is the dog Sinbad, owned by J. H. Whitman, of Chicago, Ill.

The *English Water Spaniel* is a somewhat taller dog than those already described, weighs from 30 to 40 pounds, coat thick and closely curled, usually white and liver in color, the whole face and skull covered with smooth short hair, and heavily feathered on the legs. His point of excellence is retrieving water-fowl.

The *Retriever* is a dog used for recovering dead or wounded game. The term "retriever," as applied to any particular race of dogs, is indefinite, any dog that is well broken to recover game being in the full sense of the word a retriever, though several classes are bred in England, at the present time, especially for retrieving; but they are the productions of other breeds, and are too indefinite in feature to make a minute description possible.

DIVISION II.—GROUP I.—DOGS USEFUL TO MAN.

The *Colley* is, to the rural classes of this country, unquestionably the one of the most interest and value. His sagacity, intelligence, hardihood, devotion and affection for his master are remarkable. The name "Colley" is often applied to any shepherd's or drover's dog, but the Colley proper is the Scotch shepherd dog. There are, also, the Britain, the Southern shepherd dog, and a larger species, called the Drover's dog. These have all been imported, more or less, to this country, and form a valuable addition to our dog races. The Scotch Colley is a rough-haired dog from 12 to 14 inches high, and is regarded as purer bred than any other race of Shepherd dogs. The Southern Sheep dog is somewhat larger and smoother haired, and the Drovers' dog is taller than either, of a black and white color, and is principally used in driving droves and flocks. Shepherds train their dogs for sheep by separating them from the litter and suckling them on the sheep, keeping them in the pen and never allowing them away from the sheep or with other dogs, or in the family of the owner, being even regularly fed in the sheep-fold. In color the Colley is nearly always black and tan, with little or no white, hair thick and woolly, nose sharp but not long, ears short and sharp, tail long, bushy and curved, and on the hind legs can always be found one or two dew claws if he is well bred. The eye and face are unusually bright and keen, and indicate the high order of intelligence which he possesses. There is no limit to the amount of education, in his own field of usefulness, of which he is capable, though he shows little or no tendency to learn tricks for exhibition.

FIG. 4.—*English Setter.*

The *German Sheep Dog* is a small, wiry, active, long-haired dog, of a dark or tawny color, bright, active and affectionate.

The *Esquimaux* dogs are natives of the northern part of America, and are employed to carry burdens, or draw the sledge, to which they are harnessed in teams of from seven to eleven in number. Each dog is capable of drawing 100 pounds. In summer they are turned out to hunt their own living, and they fatten on the offal of the walrus and seal. The Esquimaux is difficult to describe, being found in all colors and shades from black to white, and in all sizes from

FIG. 9.—ST. BERNARD DOGS.

22 to 30 inches high, and including the draught dogs of Siberia, Greenland, Kamtschatka and Labrador.

GROUP 2. WATCHERS AND DEFENDERS. The *Newfoundland* is undoubtedly a native of the island from which it takes its name and where it is used as a beast of burden. In its native isle he is of great size, reaching to the height of 30 inches, with a form proportionally stout and strong, but loosely put together, smallish head, wide between the eyes, eye and ear both small, the latter drooping, evenly formed body, strong, though not long legs, broad feet, coat long, hair shaggy, shining and black, with sometimes a mixture of white or liver color, reddish dim or dark brindle, but rarely. His principal features are his propensities to "carry" and "fetch," to bring objects from the water, and to guard property and persons against danger.

The *Landseer Newfoundland.* A class of dogs which is claimed by its admirers to be pure-bred Newfoundland, is the large black and white dog so often seen in this country. Opinions differ very considerably on this point. The best informed authorities are unanimous in pronouncing the species to have been originally a splendid mongrel, possessing many prominent Newfoundland points, but deficient in some characteristics of the pure breed. As a companion this dog is highly appreciated, and his markings certainly render him handsomer than the black dog.

The *St. Bernard*, of the present day, is a powerful animal, with close, short hair of a sandy, red, tawny, greyish or liver color, pendulous ears, and giant frame. They are kept by the monks of the Hospice of St. Bernard, for the purpose of rescuing travelers lost in the mountain snow storms. They are sent out in pairs, one bearing a flask of spirits the other a cloak, and conduct the traveler when found to a place of safety if he is conscious; and if not they arouse the monks by their loud bark, while they dig him from the snow and endeavor to drag him to a place of safety. Their scent is keen, and their sagacity unsurpassed.

The *Mastiff* equals the Bull-dog in courage and excels him in strength, intelligence and mildness of disposition, not attacking without considerable provocation, and bearing with the greatest good nature the teasing of children; sagacious and faithful as a watch dog; very much attached to its master, but soured in temper by confinement. It stands 30 inches high, is powerfully formed, heavy head, pendulous lips and ears; long, tail and short, thick hair of a buff color.

The *Bull-dog* is the least sagacious and most ferocious of all the dog fraternity. He is smaller than the Mastiff, strongly built, short nose, small ears, partially erect, projecting under jaw, strong limbs and tail, and brindled or black and white color, sometimes a reddish lemon. His chief characteristic trait is his tendency and ability to hold his grip. He is essentially a fighting dog, and though used for a watcher, there are better dogs for that purpose. He usually bites without barking.

FIG. 6.—*Irish Setter.*

The *Dalmatian*, or coach dog, is a beautiful animal, of a white color, thickly marked with even-sized, round, black spots. He is exceedingly fond of horses, and his home is in the stables or carriage-house. He is handsome as an ornament, and though sometimes useful as a watcher, there are more valuable dogs.

GROUP 3. *Terriers* are of many varieties, and are a small but very distinct breed, being probably one of the oldest known. Three distinct varieties exist in this country,—the English, smooth and graceful in form, sharp muzzle, erect ears, compact body, strong, though slender limbs, and tail curved aloft. His color is black, with legs sometimes tan. The Scotch differs from the English in being of a shorter limb and muzzle, and a rough, wiry coat of dirty, greyish or white color. The Skye is distinguished by

FIG. 8.—*Dandie Dinmont Terriers.*

the length and coarseness of its hair, the shortness of its limbs, and the length of its body. It is of a light drown color. The Terrier has no equal in usefulness as an exterminator of rats and other vermin, and as a watch dog he is exceedingly wakeful, acute, and noisy.

FIG. 7.—*Gordon Setter.*

DIVISION III.—HOUSE AND LAP DOGS.

The *Pomeranian*, or *Spitz*, is a native of Germany, and of little use, except as a toy, for he is too snappish in disposition to make him a safe companion for children. He is a woolly dog, with an ample frill, which effectually protects him against wet and cold. His intelligence is not of a high order.

Pugs are beautiful and bright little toy dogs from six to ten pounds weight, low and thick set, with short legs and body close to the ground, possessing an elegant outline, fine hair, of a fawn color with black shades. The nose is short, though not turned up, and a bright, sharp countenance, as is shown by the illustration, Fig. 12.

The *Blenheim*, the *King Charles*, and other toy spaniels may be generally described as resembling in form and outline the English Water Spaniel in miniature, weighing only six or seven pounds.

The *Maltese* is a Skye Terrier in miniature, with a far longer and more silky coat and a shorter back, and weighs six or seven pounds.

The *Lion* dog appears to be a cross between Poodle and Maltese.

The *Shock* dog is a cross between Poodle and Spaniel.

The *Italian Greyhound* can be called only a toy dog, for though of typical conformation as a greyhound, its size is only that of a toy dog, not exceeding ten pounds. Its color is fawn in various shades, and its hair is of the shortest. Its home is Spain and Italy.

As a dog which it is difficult to class with any of these may be mentioned the *Marylander*, bred from a pair of small Newfoundlands taken to that State about 1807. They are a medium-sized, hardy, sagacious and useful race of dogs, both as watchers and retrievers from water.

The *Cur* was formerly defined as a cross between a sheep dog and a hound; but the accepted meaning of the present day is a mongrel, or a dog of no particular breed or cross.

Of all domesticated dogs the *Poodle* seems to be, take him all in all, the most obedient and the most intellectual. Accomplishments the most difficult are mastered by this clever animal, which displays an ease and intelligence in its performances that appear to be far beyond the ordinary canine capabilities.

A barbarous custom is prevalent of removing the greater portion of the poodle's coat, leaving him but a ruff round the neck and legs, and a puff on the tip of the tail, as the sole relic of his abundant fur. Such a deprivation is directly in opposition to the natural state of the dog, which is furnished with a peculiar luxurant fur, hanging in long ringlets from every portion of the head, body and limbs.

FIG. 10.—*English Curly Coated Retrievers.*

The *Skye Terrier* has obtained considerable popularity omong dog-owners. When of pure breed the legs are very short, and the body extremely long in proportion to the length of limb; the neck is powerfully made, but of considerable length.

TRAINING. The value of a dog in the field depends on the manner in which he has been trained, and though training a dog is a science which can only be successfully manipulated in all its details by a professional, yet much may be done by an amateur who is willing to conbine patience, kindness and good sense in making his efforts. The first step in making a good hunter of a young dog, is to gain his confidence and

FIG. 13.—SCOTCH DEERHOUNDS.

affection; the first lessons should be directed to securing absolute obedience. When he is taken into the field and when first scenting a bird, great pains should

FIG. 11.—*Fox Terrier.*

be observed to teach him to stand and await the action of his master. Now step in front of him and raise the bird, making him drop as it takes wing; and a shot should never be fired over him until he will do this satisfactorily. There is no part of his training with which it is more necessary to take pains than this, if you would have a good dog. Having well taught him to drop to wing and remain, until started, it will be in order to commence shooting, never firing a shot, however, at a bird which he flushes, or upon which he has not worked well. Teach him to work the ground for any live birds that may remain, before retrieving dead ones, and never allow him to retrieve until bidden. Keep him close at first, gradually giving wider range and teach him to quarter (work to right and to left) the field. Do not be afraid to use the whistle to keep him under command, and turn him to right or to left by a motion of the hand. A dog should never be shot at, to enforce obedience, but chastised with the whip; and when punishment is necessary, do not call him in, but go to him. Be kind, firm, and persevering. If he handles dead birds so roughly as to injure them, he can be broken by putting sharpened wires through a dead bird in such a manner that they will hurt him when he grips the bird too tightly; but this should not be done until he is well broken to retrieve; then unknown to him substitute the prepared bird for the one just killed and let him retrieve it. If gun-shy, he can be broken by coupling him to a good hunter with couples made for the purpose, and a day or two will usually suffice. Another way is to starve the dog until he will eat without fear while a gun is being fired over him. A rank dog may be taught not to break in, by the use of a check cord, to which many good sportsmen add a spike collar.

The training of a farmer's dog for the purposes of aiding the shepherd or the drover, is a task that requires patience and judgment. A good plan of training a sheep dog has already been suggested, and the same idea may be practically carried out with the cattle dog. Take him from the litter to the stock yard, keep him with you amongst the stock, be kind and patient, use him as much as you can to aid you in driving, etc. His natural instinct, if he is a good pup, will aid you, and by degrees you will work him into intelligent and useful habits that will render him valuable.

In many most important respects dogs are just like horses: they will do what you want of them if they only understand what you do desire. Many people are very stupid in expressing themselves, and because they are not understood they cruelly treat the person or animal they spoke to. The

FIG. 12.—*Pug.*

dog has all the sensibilities and affections of mankind, and if he is only treated on the same general principles of kindness and clearness of expression, he is

susceptible of being educated to a wonderfully high standard as a companion of man. Always be sure and let the animal know what you want of him, and you will seldom have occasion to punish him.

There is but little more that can be said in a work of this kind on the subject. Dogs differ so widely in disposition that no cast-iron rules can be laid down for training, which will not leave a great deal for the judgment of the trainer to suggest. Kindness, firmness, perseverance and common sense will all be necessary for success.

DISEASES. It is important to know at the outset that the normal temperature of the dog is about the same as that of man, namely, 99° Fahrenheit; and that the pulse of a dog in health varies from 100 to 120 beats to the minute, according to variety, the smaller dogs having the higher rate. The pulse is easily examined by laying a hand over the region of the heart or by a little pressure upon those parts of the legs where arteries come near the surface, say just above the knees. If the animal in a perfect state of repose has a higher rate of pulsation than above stated, he has internal inflammation or a fever. As the attack becomes more violent the symptoms increase in number and violence, and the creature will have reddened eyes, hot nose, coated tongue, want of appetite, listlessness, indisposition to play or to respond to the sallies of friends. In simple fever the tongue loses its rose color and becomes coated, the gums and throat will also show corresponding changes. If the tongue be much furred, with red edges, and there is a constant thirst for water in small but frequent quantities, inflammation of the stomach or bowels may be suspected. If the tongue remains brown and streaked, with less action of the pulse, variable appetite and decrease of pain, derangement of the liver may be apprehended. If, in connection with some or all of the above symptoms, the breathing be labored and painful, with a disposition to remain in the erect or sitting position, with great anxiety and general distress, he perhaps has an affection of the lungs. Thus, if the cause of the trouble is not obvious, like a wound, for example, we must look carefully into the case, ferret out the cause and conditions as closely as possible,

FIG. 14.—*Landseer Newfoundland.*

so that we will not be groping in the dark in our treatment of the patient. Symptoms and diseases in the lower animals are scarcely different from those in man, only most of the brute animals are not subject to so many varieties of disease. The treatment of disease among the inferior animals is also the same, as nearly as practicable.

It is much wiser, of course, to avoid sickness as far as possible by right living. A dog should never be starved; he should not be compelled to live too much on unnatural food, or on filthy food, which, by the way, in also unnatural; he should not be compelled to stay our in intense cold continuously without a comfortable place for retreat and rest when he wishes it; and his bed, too, should be frequently renewed with fresh material. Madness is by some thought to be due to intense cold, or sleeping in a filthy place or eating decayed flesh. The latter material is very apt to have poison points developed in it, which constitute virulent sources of disease.

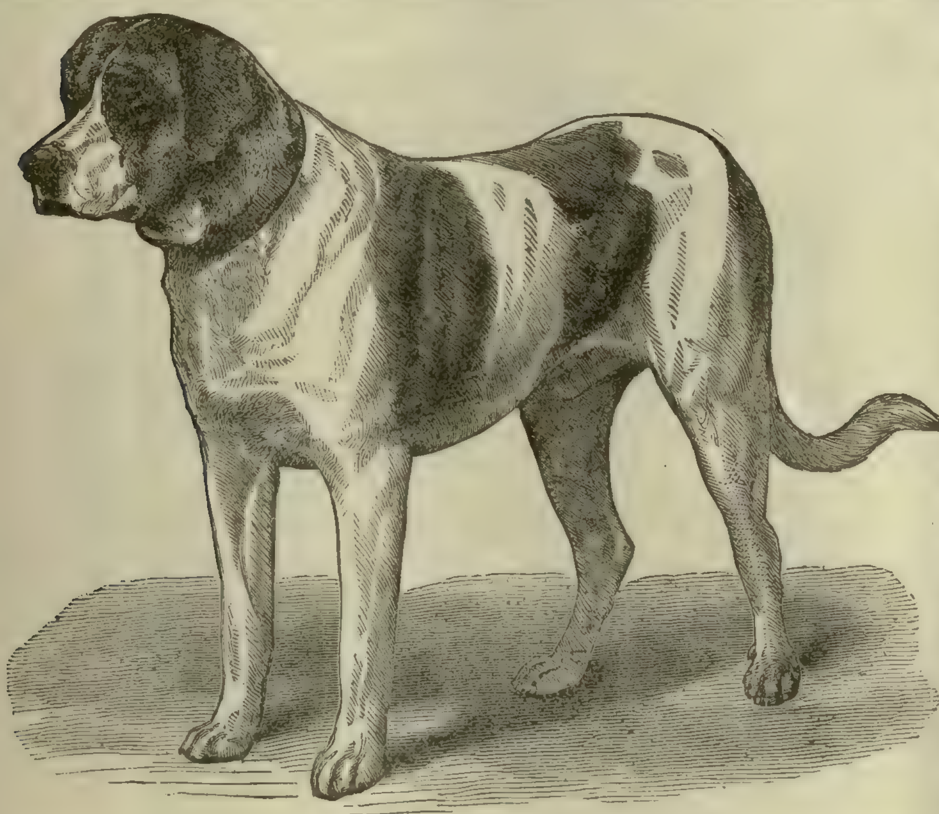


FIG. 15.—*The Mastiff.*

ASTHMA. Dogs, especially old ones, that are shut up in damp cellars and deprived of pure air and exercise, are frequently attacked with asthma. Endeavor to ascertain the cause and remove it. Let the patient take exercise in the open air. Let his diet consist of cooked vegetables, with perhaps a small quantity of boiled meat. Raw meat should not be given.

Treatment: Take 1 teaspoonful each of powdered bloodroot, powdered lobelia, marsh mallows, and licorice; mix and divide into twelve parts, and give one night and morning. If it produces retching, reduce the quantity of lobelia, as the object is not vomiting but relaxation of the muscular system of the air passages.

BOWELS, INFLAMMATION OF THE. Evinced by indisposition of the dog to move about, and signs of acute pain when the bowels are pressed by one's hand; indeed, he always gives signs of suffering when he is moved.

Treatment: For allaying the irritation of the bowels and reducing the inflammation there, take pleurisy root 1 teaspoonful, marsh mallow root 1 tablespoonful, mix and divide into three parts, one to be given every four hours. Should vomiting be a predominating symptom, give a small quantity of saleratus dissolved in spearmint tea. If this fail, make a fomentation of hops and apply it to the abdomen, and give half an ounce of manna. The only articles of food and drink should consist of barley gruel and mush; if, however, the dog betrays great heat, thirst, panting and restlessness, a little cream of tartar may be added to the gruel. The bath and clysters (injections) may be repeated if occasion suggests. Or, put the animal into a warm bath, and rub his belly gently while in the bath, and foment it well; the drink should consist of warm broth or warm milk and water; use warm water injections for hardened fæces; the presence of these is ascertained by the insertion of a finger; after the symptoms have abated somewhat, give castor oil, syrup of buckthorn, and the spirit of white poppies, etc. Or, put the dog into a warm bath for five minutes; take out and rub the surface dry, but rub gently, as the part is very painful; then inject into the bowels 4 ounces of linseed oil mixed with a gallon of water.

DISTEMPER. The symptoms are loss of appetite, dullness, watery discharge from the eyes and nose, followed by general debility, especially in the hinder extremities; the excretions from the bowels are morbid, sometimes constipated; the urine may be high-

Fig. 20.—GERMAN POINTER.

colored; sometimes there is diarrhœa, accompanied by scantiness of urine and vomiting; sometimes even fits are brought on by the progress of the disease.

Treatment: First give an emetic. The three general methods for this purpose are, according to the various schools of practice, calomel and tartar emetic; 1 teaspoonful of powdered lobelia in a gill of warm water, administered at one dose; salt and warm water; warm water alone. The last is preferable, of course, if effectual, and it is safest to try it first, as no harm is admitted to be done by any school of practitioners. If the first dose is not effectual, repeat it, and accompany the treatment by severely pressing and kneading the stomach of the dog externally. After thorough vomiting is induced, the animal ought to recover in a few days; but if he does not, further treatment consists in the administration of antimonial powder, nitre, and digitalis, in proportion of half a grain to a whole grain of digitalis, 2 to 5 grains of the powder, and 3 to 8 scruples of nitre, to be administered twice or thrice a day; or, powdered mandrake, 1 tablespoonful; powdered charcoal, 2 teaspoonfuls, mixed with 1 tablespoonful of powdered marsh mallows, divided into 6 parts and administered 1 part for a dose, in honey, night and morning for the first day; afterward one powder daily will suffice; the diet to consist of mush, together with a drink of thin arrowroot. If his strength fails, give beef-tea, and should diarrhœa persist, give a drink of hardhack tea.

DROPSY. This is generally preceded by loss of appetite, cough, diminution of urine, and costiveness; the abdomen shortly afterward begins to enlarge. The disease is generally fatal, but sometimes relief is obtained by puncturing the abdomen and pressure upon it to force out the superabundant water. The general health must be carefully looked after.

Treatment: A course of iodine or potassium nitrate; or, mix ¼ ounce of powdered flag-root, powdered male fern, the same quantity, with a teaspoonful of scraped horse-radish; divide into 8 parts, and give 1 night and morning. Good, nutritious diet should be allowed.

EAR, DISEASES OF THE. The afflicted dog will show that he has some ailment in the ear by holding his head to one side, or by frequently putting his paw up to it. If canker or polypus is discovered and can be reached, apply nitrate of silver. For abscess, in the early stages, foment the part twice a day with an infusion of marsh mallows; as soon as the abscess breaks, wash with an infusion of raspberry leaves, and if a watery discharge continues, wash with an infusion of white oak bark. For ulceration wash twice a day with 2 ounces of pyroligneous acid mixed with eight ounces of water, and after a healthy appearance of the part is assumed, touch with a tincture of gum catechu. For ordinary soreness of the ears, apply marsh-mallow ointment or slippery-elm poultice, or make a constant application of wet cloths.

FIG. 17.—*Bull Dog.*

WEAK EYES. It often happens that, after an acute attack, the eyes are left in a weak state, and water

FIG. 18.—*Irish Water Spaniel.*

runs from them. Wash them night and morning with pure, cold water, and improve the general health by the administration of the following: 1 ounce of manna; 1 teaspoonful of powdered gentian, and ½ teaspoonful of powdered mandrake; rub together in a mortar, and give a pill every night about the size of a hazelnut. When the manna is dry use a little honey to amalgamate the mass.

SORE EYES. Take a teaspoonful of finely pulverized marshmallow root, add hot water enough to make a thin mucilage, and with this wash the eye frequently. Keep the patient in a dark place and on a light diet, and if the eye is very red and tender, give a pill composed of 20 grains of extract of butternut and ten grains of cream of tartar. He should be kept clean with frequent bathing in warm water, and kept in a dark place and on his accustomed diet. For purulent discharge some advise, bathe the eye with infusion of chamomile or red rose leaves, and give the following: Powdered pleurisy root, powdered bloodroot, powdered sulphur, of equal parts; dose, ½ tablespoonful daily, given in honey. When the eyelids adhere together wash with warm milk.

SORE FEET. The cause and character of the affection will generally indicate the course to be pursued. Where pus is collected, apply the sharp knife or lancet and let it out, and wash the parts thoroughly with clean water. Do not put on any kind of drugged material, as salt, lye, urine, etc., but only softening poultices, as of slippery elm, etc. Do not cause the dog to be on his feet any more than is unavoidable. For a sprain, absolute rest with frequent warm baths are necessary. For soreness between the

FIG. 19.—*Dalmatian or Coach Dog.*

claws, apply a poultice composed of equal parts of marsh mallows and charcoal for a few days, then wash twice a day with pyroligneous acid, 1 ounce of it to 6

ounces of water; or with carbolic acid solution.

FITS. These in the dog are of the epileptic character, and attack the animal in all ages and apparently in nearly all conditions, sometimes even in the chase. As the specific cause is obscure, we can only treat for the convulsion itself, thus: Take extracts of gentian and quassia equal parts, and of 5 grains of each make 2 pills, and give one pill in the morning and one in the evening; or, administered in the same proportions and in the same way, powdered columbo and carbonate of iron. A seton in the back of the head will aid in preventing attacks; also blisters and friction to the spine are serviceable. Or, every 4 hours give a wine-glassful of mullein infusion, and keep the animal on a vegetable diet; for constipation of bowels, give 30 grains of extract of butternut, or an infusion of senna and manna with a few caraways added. Hygienic: Plunge the patient into a tub of warm water and give an injection of the same, to which a teaspoonful of salt may be added. Give no medicine during the fit, but afterward, some advise to give a teaspoonful of manna with ½ teaspoonful of salt, with water.

FLEAS AND VERMIN. Bathe with an infusion of lobelia for 2 successive mornings, and afterward wash with water and Castile soap. Or, occasionally wash with carbolized soap, which may be obtained at almost any drug store. Remove and burn old bedding, and sprinkle the floor of the sleeping place or kennel with a solution of 1 ounce of carbolic acid in a quart of water.

MADNESS, RABIES OR HYDROPHOBIA. The usual remedy is powder and lead from a gun, and probably in a majority of cases it is the best; but for sincere medical treatment the following seems to be the most effectual, so far as discovered: Whenever a dog is bitten by another supposed to be mad, he should be confined until certainties are developed, so that no risk shall be run in endangering the safety of persons and other animals. The first symptoms are, a slight failure of the appetite and a disposition to quarrel with other dogs; then a total loss of appetite; he will not yelp on being struck, or show any sign of fear on being threatened; in the height of the disorder he will bite any other animal or a person; when not provoked he usually attacks only such as come in his way; eyes do not look red or fierce, but dull, and have a peculiar appearance not easy to describe. Mad dogs seldom bark, but occasionally utter a most dismal and plaintive howl. They do not froth at the mouth, but their lips and tongue are dry and foul, or slimy. They cannot swallow water, but the idea that the sight of water always throws them into convulsions is false. Now, as to the treatment: Take 1 ounce of sulphur, 2 ounces of lobelia and several gallons of boiling water in a wash-tub; as soon as it is sufficiently cool, plunge the dog into it and let him remain several minutes; then give an infusion of either yellow broom, plantain or Greek valerian,—1 ounce of herb to a pint of water. An occasional teaspoonful of the powdered plantain may be allowed with the food, which must be entirely vegetable. Wash the wound with a strong infusion of lobelia, and bind some of the herb upon the part. Continue this treatment for several days, or until the dog recovers and all danger is past.

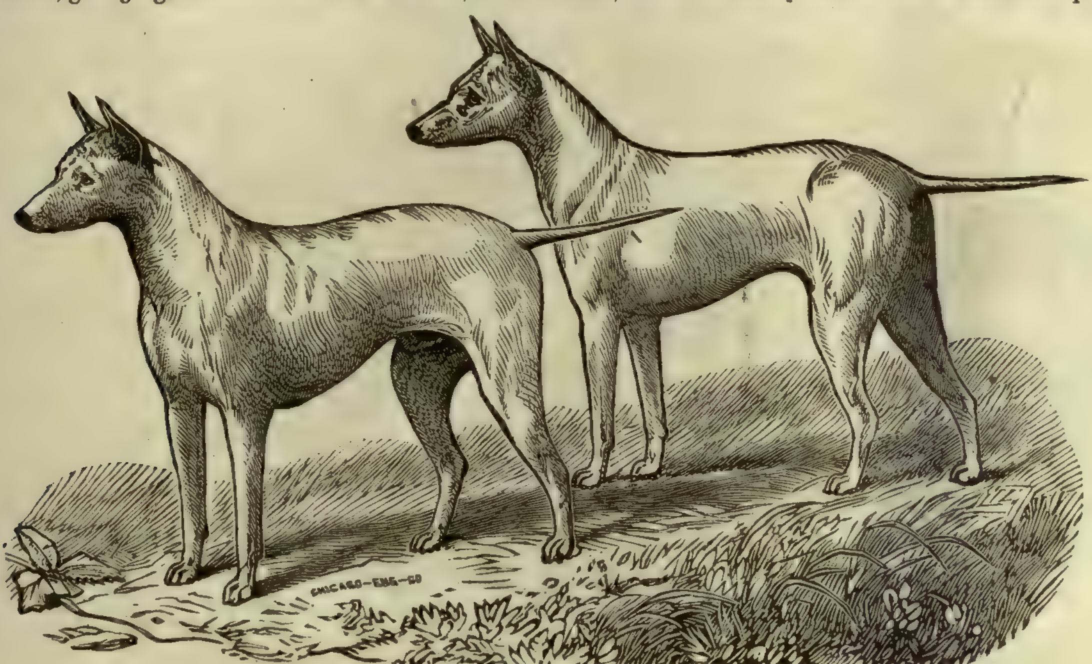


FIG. 21.—*White English Terriers.*

MANGE. This is a scabby disease of the skin, in

which the regular itch mite is often found. Sometimes the large blotches appear, from which the hair falls and leaves the skin bare and rough; sometimes the disease appears much like an attack of erysipelas, and sometimes there is considerable inflammation, and even ulceration. Treatment: Aperient and cooling medicines, and applications of subacetate of lead or spermaceti ointment. When other things fail, a weak infusion of tobacco may be carefully resorted to. Mercurial ointment may be used, taking care that the dog does not lick it; also, mild purgatives, especially Epsom salts, are often beneficial, and also mercurial alteratives, as Æthiops mineral with cream of tartar and nitre. Or, apply an ointment of soft soap worked up with ½ a table spoonful of powdered charcoal and 1 ounce of sulphur, one-third of this each day for 3 days, and then wash the dog thoroughly with Castile soap and warm water, and wipe dry. Internally, give daily ½ teaspoonful of equal parts of sulphur and cream of tartar, in honey; when the disease becomes obstinate, and large, scabby eruptions appear on various parts of the body, take pyroligneous acid, 2 ounces to 1 pint of water, and wash the parts daily. Keep the animal on a light diet.

PILES. These are generally produced by confinement, over-feeding, fine-flour bread and sweet cakes, etc. They are shown by a red, sore and protruded rectum. Treatment: Give a half teaspoonful of sulphur for 2 or 3 mornings, and wash the parts with an infusion of white-oak bark. If they are very painful, wash 2 or 3 times a day with an infusion of hops, and keep the animal on a light diet, or plenty of that food which is most natural to dogs.

SCALDS. When a dog is accidentally scalded by hot water, apply lime-water and linseed oil as soon as possible. Hygienic: Apply cold water, and in severe cases, when a malignant sore results, apply emoillent (softening) poultices.

SORE THROAT. A strong decoction of mullein leaves is said to cure almost without fail. Hygienic: Fomentations of the part, and in severe cases no food, but plenty of drink should be allowed, for a day or two.

WORMS. These proceed from debilitated digestive organs; hence tonics are indicated as preventives, which consist, according to ordinary health laws, of the strictest fresh food, rather scantily given for a few days, then with an increase of quantity and variety, but always short of cloying the animal; according to most other systems, bark bitters. For immediate expulsion of the worms, take oil of wormseed 1 teaspoonful and powdered asafœtida 30 grains, and give every morning before the patient has had his breakfast; two doses will generally suffice. Or, take of powdered mandrake ½ tablespoonful, of Virginia snakeroot 1 teaspoonful, and divide into 4 doses, giving 1 every night in honey; or give an occasional drink, followed by an injection, of an infusion of sweet fern; or, ½ tablespoonful of powdered golden seal rubbed up with an ounce of common brown soap, and made into pills the size of a hazelnut, 1 to be given every night.

FIG. 22.—*English Pointer.*

WOUNDS. When fresh, bind up with adhesive plaster and watch for inflammation, which reduce with warm water. In old wounds the decayed flesh should be eaten out with silver nitrate, and if the place is then raw, apply a poultice of linseed meal or Turlington's balsam. When a dog is bitten by one that is mad, give him a teaspoonful of lobelia in warm water, and bind some of the same upon the wound.

HOW TO GIVE MEDICINE. The administration of medicine is often a troublesome process with canine patients; the usually affectionate, obedient, and

harmless pet becomes (through fear and mental excitement) snappish and resistful, and a general complaint the veterinary attendant hears is, "It's no use, sir; we can't give him the medicine; the more we try, the more he struggles, fights and bites." This in the majority of cases is so, the reason for which is that, as a rule, strength versus system is the plan adopted. As with ourselves, so with the dog: there is a right and a wrong way in the taking or administering of medicine. The medicine is in the form of a pill or draught. The former may be given one or two ways; first by taking the animal in the lap, or rearing him up between the knees; the upper part of the mouth is then grasped with the hand, and the lips on either side thrust between the teeth. Security against the operator being bitten is gained by the dog being afraid of biting himself. The head is then elevated, the pill is dropped into the posterior part of the mouth, and the jaws immediately closed and held so; and if the animal refuse to swallow it, placing the fingers on compressing the nostrils will speedily compel him to do so. Pushing the pill down with the finger is injurious and unnecessary. The other and more advisable way, if it can be contrived, is by deception, that is, closing the pill in a little meat and throwing it to the animal to bolt. With regard to draughts, they should be administered as follows: The animal being placed in the same position as for the pill, the angle of the mouth is drawn down away from the teeth, and into the pouch thus formed the medicine may be poured; the same means as recommended in the former will, if he refuses, compel him to swallow it. Some forms of medicine, more or less tasteless from minuteness of the dose, may be given in a little milk or broth which the animal laps voluntarily.

FIG. 23.—*English Pointer.*

CARE AND MANAGEMENT OF DOGS. *Food.* How much evil accrues from the want of a proper system and, in many cases, knowledge of administering food and of the kind requisite, it is impossible to say. That many of the diseases to which the canine species are subject, and especially of the digestive organs, are due to ignorance and neglect of this subject, is no exaggeration.

The organization of the dog is peculiar; his digestive powers are undoubtedly great, but the process by which digestion is accomplished is slow. Hence, he does not require more than one, or, if in full exercise and work, not more than two meals per day. The food should be plain, wholesome, nutritious, and, as far as possible, compatible with the circumstances under which the animal exists.

Sugar, buttered bread, hot toast, muffin, preserves, fancy biscuits, tea, sweetmeats, and such like, are items never intended to enter a canine bill of fare. The animal, contrary to nature's laws, has been educated to mimic human beings; three or four meals a day, exclusive of kitchen-scraps, have taken the place of the prescribed one or two, and human delicacies substituted for the proper requirements of a carnivorous stomach.

Can it be wondered at if the whole digestive machinery is, in consequence, put out of gear; if the once glossy-coated pet of cleanly habits becomes the bloated, waddling, unsightly animal so often seen, with teeth loose, discolored, and decayed, breath foul, and excrements fœtid? And all the result of what? Ignorance and kindness.

A proper system of feeding is, therefore, one of the

great essentials of canine care and management.

Time of Feeding. The food should always be given, if convenient, at a stated time; where only one meal is allowed, at mid-day; in case of two, morning and evening. It should not be given immediately before exercise or work, or the process of digestion will be interrupted and the foundation laid for ill health; but as soon as the animal comes home, has had sufficient time to rest, and becomes cool, then food may be proffered and will be relished considerably more.

Quantity. This should be exactly in proportion to the appetite, that is, until the animal is satisfied. Some individuals condemn the practice of permitting dogs to fill, or, as they call it, to overgorge themselves; and where the dogs have been previously starved or have missed a meal or two, they are right, but otherwise not so. The cravings of the carnivorous stomach are not of the frequency found in herbivorous and omnivorous ones, owing to the slow process of digestion; and this being so, a larger stock of material is required to work on than when the intervals between the meals are shorter; otherwise long fasts would result, and eventually act prejudicially to the animal's health.

When the dog, after eating for some time, pauses, looks about, leaves the dish, returns to it and makes an attempt, as it were, to get a little more down, then it should be removed. Company will frequently induce the animal, from motives of jealousy, to take more than he really wants, and he will greedily devour, on the approach of another creature, that which a few moments before was rejected. This, of course, is hurtful; it may be likened unto the surplus oil on a machine, which cannot be utilized, and is therefore wasted, and does injury to other parts; so with the dog; the surplus food may pass into the intestinal canal undigested, and produce diarrhœa or constipation.

Kind of Food. Many and various are the opinions on this point; horse-flesh, mutton, paunch, entrails, liver, greaves and oatmeal are among the list of those advocated. Flesh is, undoubtedly, the dog's natural food, but, on the other hand, we must look to the circumstances under which he is placed. For instance, toy dogs or house pets, not used for sport, do not require flesh meat beyond an occasional bone and meat gravy; bread, or plain biscuit with milk, oatmeal porridge, plain rice pudding, or potatoes and gravy, with green vegetables once or twice a week, form the most suitable diet for this class of dogs.

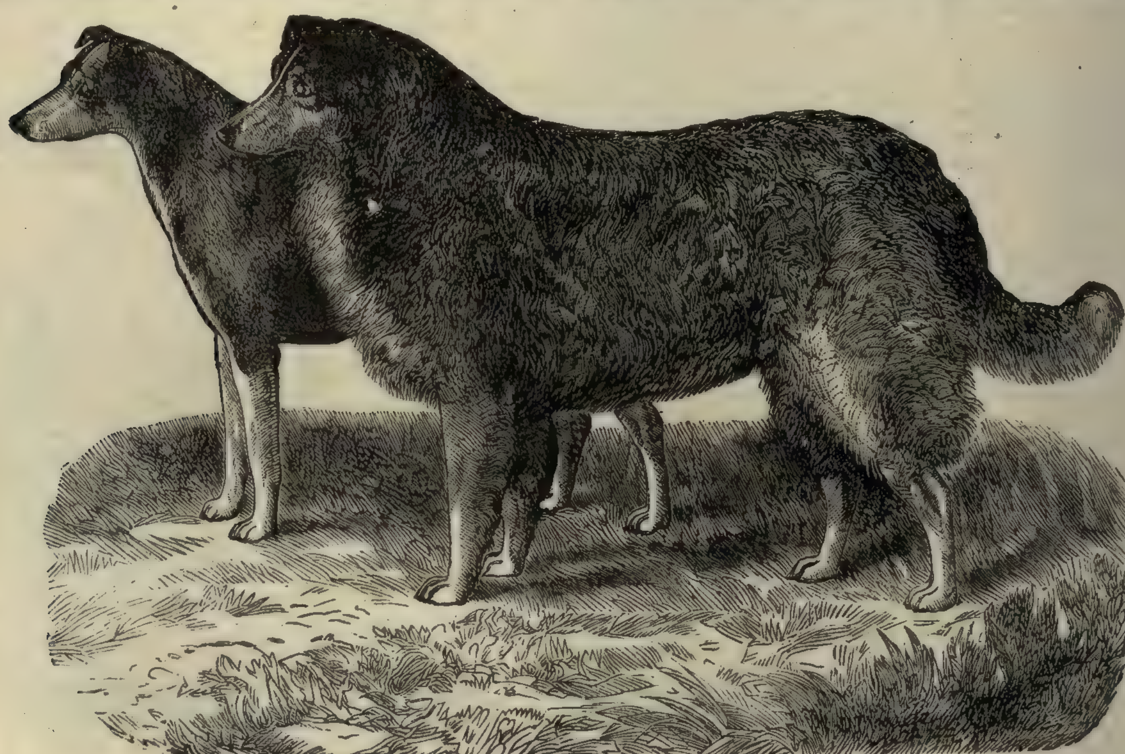


FIG. 24.—*Scotch Colleys, or Shepherd Dogs.*

For those used in sport or kept on the chain, especially the former, flesh meat, used with discretion, is suitable. Paunches or mutton are best adapted; the former should always be thoroughly washed, otherwise worms or their larvæ are likely to be swallowed, and develop in the dog into large tape-worms; horse-flesh is heating, causes the animal to smell strong, and is a great producer of worms. Liver cooked is like so

FIG. 28.—POMERANIAN OR SPITZ DOGS.

much leather, indigestible and innutritious, and from its liability to flukes, which in the dog develop into tæniæ proper, is also objectionable raw. Sheep-heads, trotters, and ox-noses form a highly nutritious and valuable food, especially for invalid dogs; boiled down, they form a glutinous jelly, of which dogs are particularly fond. Whatever kind of flesh meat is used, meal should form the basis, and none is better than the coarse Scotch oatmeal.

Bones are of great value to the dog. The dog has a natural fondness for bones, independently of which they are of great value to him. One should always be allowed at least once or twice a week. They assist in cleansing the teeth and aid digestion. The animal's instinct would appear to teach him this, for however good and savory the meal may be, if there be a bone in it, he will immediately pick it out, strip it of its meat, if there be any, and store it away for after use. It is best, however, to give bones after a meal; otherwise, when hungry, they are apt to eat as much of the bone as possible, to their own injury, as portions may get lodged in the œsophagus, and give rise to asphyxia, or from being to hard to digest, cause gastric or intestinal irritation. A dog should never be induced to eat against his will except in certain diseases. Beer, wine and spirits should never be allowed, except medicinally. Some dogs are particularly fond of the former.

Water. There are few animals to which the denial of water is felt to a greater degree than the dog. Whether in health or disease, water is requisite in assisting the natural functions of the body. With regard to the feeding of puppies, when weaning, milk is undoubtedly the most suitable diet, and to this, as time goes on, may be gradually added a little bread or oatmeal porridge. Animal food (except in an occasional bone), is not advisable in any breed of young dogs, until four or five months old, and it should then be gradually, not suddenly, introduced into diet.

Exercise is equally beneficial to canine as it is to human health. The mind is diverted not only in the performance of the act but also in the novelty of fresh scenes, new faces and objects, bright weather and pure and bracing air. To the young dog it is indispensable. Compare the animal, which from a puppy has had full freedom, with one cooped up until it has arrived at maturity: in the former nature has asserted her right, and, unchecked, given symmetry, full development and health; in the latter, crooked legs, deformed body, and stunted growth, is the picture she presents of an interference with her laws.

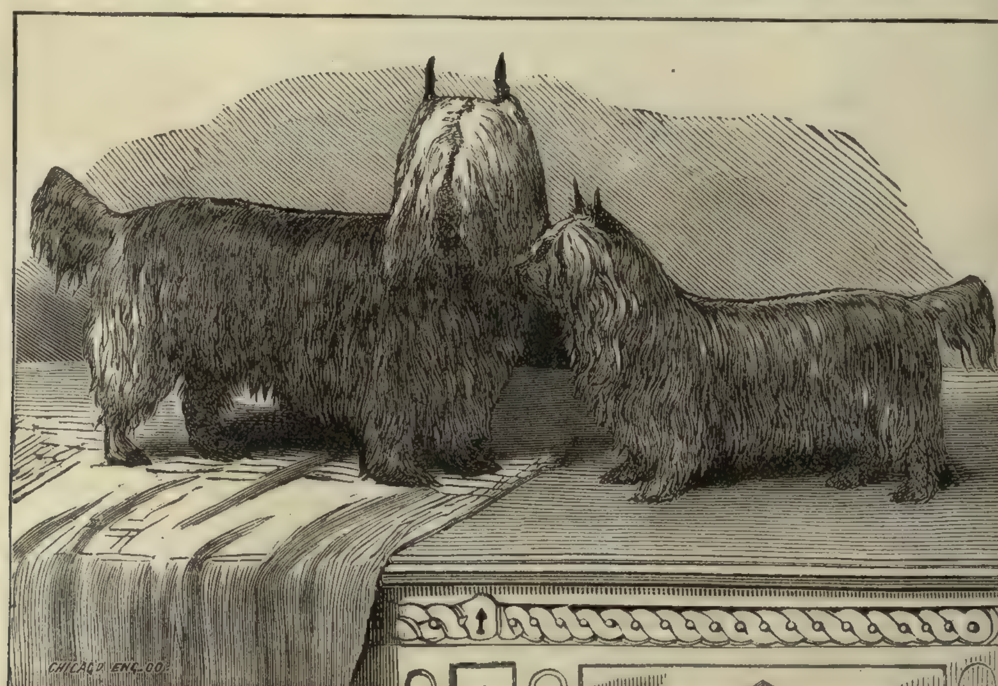


Fig. 26.—*Yorkshire Terriers.*

Exercise should not be allowed so as to produce undue fatigue, as in carriage-followers and sporting dogs; in the latter, we are aware, it is under certain circumstances unavoidable. It should also, if possible, take place before feeding, or if impracticable not until some hours afterwards. Running or long walks on a full stomach, is liable to produce fits of the worst kind, and many a dog have we seen so affected.

Washing in moderation adds greatly to the health and comfort of the dog. Long-haired dogs require ablution more than short-haired ones, and usually have a natural inclination for water. The frequency of washing will depend to some extent on the manner in

which the coat is kept; if regularly brushed and combed, once a month is quite sufficient; under any circumstances a weekly bath is more than ample. The water should be a little more than tepid, and soap used merely enough to create a lather, - as its alkaline properties, if used in excess, render it an irritant to the skin (where careful rinsing is adopted the caution is almost needless). This, however, is so frequently not carried out that the soap in the process of wiping is rubbed in, and gives rise to the irritation named. When, then, thoroughly cleansed the animal should be finally douched with cold water, rubbed dry before the fire, if the weather is raw, and immediately after allowed some brisk exercise. Out-door dogs will dry themselves after their own fashion, and a good bed of straw will be sufficient to complete the toilet. In those breeds which have an inclination for water, as Newfoundlands, retrievers and spaniels, the lake, river, or canal will afford the best means of ablution.


FIG. 27.—*Irish Terriers.*

Grooming is especially advisable in all dogs where fineness of coat, kindness of skin, cleanliness and health are desirable. Combing and brushing in long-haired dogs is absolutely necessary to prevent the hair matting, and to preserve its character. In large breeds, as the mastiff tribe, it is as requisite for good appearance as in the horse.

CROPPING. "This is an infliction of too much torture for the gratification of a nonsensical fancy," observes Youatt; "and, after all, in the opinion of many, and of those, too, who are fondest of dogs, the animal looks far better in his natural state than when we have exercised all our cruel art upon him." Fashion, however, unfortunately, in this as many other matters relating to the lower animals, steps in and countenances what is to all intents and purposes an act of wanton cruelty. One of the great functions of the external ear is the protection of the more delicately arranged internal structures. Again, the ears are full of expression. Alarm, excitement, joy, watchfulness, are each denoted by their different attitudes.

ROUNDING. This may be termed cropping in another form, and unless absolutely necessary, as in the extension of cartilaginous disease in canker, it is equally to be condemned with the former. That it is a prevention of canker is purely imaginary. Such an idea is on a par with cutting off a leg to prevent its being broken. True, the part that is removed cannot become diseased; but what is left can, and is very apt to after such unwise measures.

TAILING. This also is a dictate of fashion; shortening this appendage is not necessarily a cruel operation. It should always be performed, when intended, a few days after birth, while the parts are tender and easily severed without hæmorrhage. For dividing the tail and then drawing it, a pair of the ordinary flat-nosed, sharp-edged pincers are best adapted, and avoids the other filthy habit of biting the required length off and making a foul sore.

WORMING consists in removing one of the cords or tendons of the frænum, which, when removed and released from tension is in its movements said to resemble a dying worm. Ignorant people are thus imposed upon by pretenders of equal ignorance, with which barbarity is mingled. Two prevalent ideas regarding the operation are, that it is a preventive of rabies and mischievous disposition, both of which are equally absurd and erroneous.

CASTRATION. This operation is now rarely performed upon the dog except for certain conditions of the testicles which render their removal necessary. Emasculated dogs have a great tendency to become

obese, idle, and so far as sports are concerned, comparatively useless. The operation, which should be performed under chloroform, is a simple one. An incision is made through the scrotum on either side of the medium line. The testicles being protruded, a thread or silk ligature is placed around the spermatic cord about an inch from the testicle, and the latter is then removed a little below the ligature with a scalpel or scissors. An aperient and warm fomentations are generally all that is necessary in after-treatment.

In all animals a loss of energy, physical strength, and acuteness of the senses, generally result from castration. It has been claimed that animals, particularly dogs, in this state, are more affectionate and faithful. Disinclination to fraternize with their own species, and more especially those of the opposite sex, is a natural consequence of emasculation, and therefore the supposed home affection and faithfulness are but the result of their abnormal state.

FIG. 29.—*Newfoundland Dog*

VACCINATION is very largely adopted for the prevention of distemper. Whether beneficial or not, the operation is a harmless one; and as small-pox does occasionally attack the dog, it may sometimes be attended with good results. The places generally selected for vaccination of the dog are the back of the neck, the inside of the fore-arm, and the ears.

SPAYING, or removal of the ovaries of the bitch, is now seldom or never performed. It is both an inhuman and useless operation.

CHLOROFORM is of especial value in operations on the dog. An operation of any consequence on the larger breeds and those of a savage disposition could not be performed with any degree of safety and comfort without its use or some other anæsthetic. There are certain conditions in which its administration would be attended with risk, as in diseases of the heart and lungs. Chloroform demands the attention of those of a humane disposition, for with the knowledge that we are not inflicting pain is gained strength of nerve, confidence in ourselves, and a more successful operation.

REMOVAL OF THE DEW-CLAWS. The dew-claws or supplementary toes grow above the foot on the inside of the leg, and are apparently of but little use. Their presence, however, in sporting dogs is considered an eye-sore by some, and they are therefore often removed. This should be done when the animal is quite young. They are easily cut off at that time with a sharp pair of scissors, first dividing the skin, and the dew-claw being drawn to one side before it is detached, in order that the skin may after cover the wound.

THE KENNEL. With the exception of those varieties of dogs that are only designed for pets, no dog should be allowed in the house or around the stove if a due regard for his health and comfort is had; neither should he be exposed to the inclemency of the weather, any more than the more valuable domestic animals. A house or kennel should be constructed for his especial use which in style and cost may depend on the owner's fancy and pocket. The principal features of a good kennel are, warmth, airiness, cleanliness, and ample protection from wind and rain. It is a mistaken kindness to admit a dog to the house on a cold day, because he is fine-haired; the undue warmth of the house makes him tender, and renders him far more susceptible to injury from the cold when again exposed. Make his kennel warm and give him a good dry, fresh bed, and there is nothing to fear for him. The heat of a stove is injurious to the health of a dog, and a thin-haired pointer may be raised from puppyhood, in a good kennel, without either discomfort or injury from cold.

Dog Days. This name is applied to the period between July 24 and August 24, because the dog-star (Sirius) during this period rises with the sun. The heat which is usually most oppressive at this period was formerly ascribed to the conjunction of this star with the sun.

Domestic Economy, or household science, includes all the arts pertaining to the management of home affairs, intellectual, moral and material; but the terms are often restricted to kitchen, laundry and chamber work. A large portion of this encyclopedia is devoted to domestic economy, and therefore, to consult it concerning any point within the domain of the household, the reader should look for the particular topic in its alphabetical place. There are a few general principles, however, which come more appropriately under this head than elsewhere, and we therefore present them here.

PRESERVATION OF FOOD. Every housekeeper should know how to best preserve food. Not only should they know how to cure meats by salting, smoking, etc., but they should know how to preserve them fresh as long as possible. The temperature and dryness of the atmosphere are important considerations, and their effects should be understood in all attempts at retarding decomposition. A certain degree of heat will hasten decomposition, while a higher one will arrest it. Cold, according to its degree, must retard or utterly prevent decay. The good housekeeper never throws away even crumbs of bread, but saves them for puddings; she bakes all the dough mixed, leaving none to sour, and bakes when and as it should be, thus avoiding heavy bread and funereal pastry; in boiling her meat, she skims off the fat for cooking purposes; she saves every scrap of cooked meat for hash or soup; she never wastes flour in sifting; she uses vegetables

FIG. 30.—*Chesapeake Bay Dog.*

while they are fresh instead of first allowing them to wilt or spoil; she saves everything that can be warmed over for the next meal; she has appropriate dish cloths, and washing and wiping cloths for each class of articles; she has pot-scrapers, metallic and wooden, and griddle and pot holders, and uses them; she removes the bar of soap from the water after using it, and puts bits of soap into a dish to be changed into soft soap by a little boiling, when enough has accumulated; she washes the scrub-brush after using and hangs it up; she seldom spoils the stoves or stoveware by too hot a fire, nor allows her tinware, pots, kettles, knives, forks, etc., to rust by leaving them wet; she never uses good knives in cooking or scrap-

ing kettles, or good forks to toast bread with, but takes the old ones for toasting forks; she has a place for everything and everything in its place, hence no time is lost in hunting for an article; she knows that there is no use in saving anything for future use unless she saves it in a way she can lay her hands on it when she wants it; she is prompt to clean or make repairs before it is so late as to become a difficult or an impossible task.

"A wife can throw out with a spoon faster than a husband can put in with a shovel," is a trite old maxim, too often demonstrated to be doubted. Here is how it is done: Cream and milk are allowed to spoil the pans; crocks are not scalded and dried and milk sours; coffee is charred instead of browned; tea and spices are left open to lose their strength; flies get into the molasses, and wade through soft butter all day, because proper care is not taken; fruits are not sorted, and rot and spoil; vinegar stands in metallic vessels until both are spoiled, and sometimes made poisonous; sugar is fed to flies or wasted; sauces are made too sweet or too sour, and are thrown away or left to spoil; dried fruit gets full of worms or musty; potatoes sprout and grow or rot, for want of care, breeding malarial diseases in the family; meats spoil for want of salt or brine; hams become alive with worms, or strong; dried beef gets too hard or wet, and is spoiled; cheese gets "skippery," or molds, or mice destroy it; lard gets strong; butter becomes rancid, because improperly worked and not covered with brine; fuel is wasted and stoves are burnt out or cracked by needless fires; lamps are burned unnecessarily; clothing mildews, or is spoiled in washing, or is whipped out on the line; costly laces are ruined in starching, and brooms by careless use and not hanging up; carpets are scratched threadbare with stubby brooms, while dirty porches and brick walks are scrubbed with new ones; towels are burned out from being used as holders; good sheets are used to iron upon, and burned; sad-irons become rusty, and spoil clothes; table linen is eaten by mice, or put away damp to mold; fruit stains upon linen are left to become fixed colors, instead of being removed at once with boiling water; napkins and towels are used for dish-cloths; water is allowed to spoil the varnish on furniture, or the children to mar it; glassware is broken with hot water; tinware is spoiled with extreme heat; water freezes in pitchers, kettles, tubs, etc., rendering them useless; slops and ashes are thrown away instead of saving for pig-sty or for fertilizing the garden; eggs are allowed to spoil, instead of being marketed, used or properly packed; small fruits and berries, canned and preserved fruits are allowed to sour, and are thrown away, instead of being converted into vinegar; stoves are cracked by water or covered with unclean grease and grow rusty; bread is spoiled by a dirty, smoky stove, which a little exertion would make good; clothes become useless for want of a stitch or the brush; moths destroy furs, carpets, etc. A thousand and one other leaks occur in the careless household, representing so many dollars or cents, and in the course of years the loss is frightful—enough to keep an otherwise prosperous man poor for life. With a knack of system all these losses may be averted. But with all the above and a thousand other efforts to save useful things, one should have the good judgment not to spend more time on a thing trying to save it than it is worth.

While the farmer may produce the most toothsome vegetables, fruits and meats, few articles are eaten without preparation, and an army of errors and dangers intervene between their production and the stomach. The indulgence of gross passions drag men down to barbarism; but the cook is accountable for many of the ills, woes and tumults which are devitalizing human vigor on the earth. They are responsible for a large per cent. of the sickly lives and premature deaths in the United States. In far too many instances a woman who considers herself competent to manipulate the frying-pan, boil tea and coffee, make dried-apple pies with raw-hide covers, and wipe dishes with a greasy rag, calls herself a cook, and boldly takes into her reckless, ignorant hands the welfare of innocent people, who never tortured her in their lives. Every housekeeper should realize that ignorant or careless cooking may result in the loss of health, or life itself, to one or more members of the family for whom she cooks, herself included. This is no "warmed-over" truth. It is steaming hot, and the sooner it is realized by the cooks of America the better it will be for the nation. The wife and mother who will not learn to perform her part well makes her family unhappy, and destroys her title to respect and love. Her husband and children notice better kept houses, better cooking and happier faces in other homes, and are dissatisfied with their own. Fault-finding and suppressed condemnation follow; and the negligent wife and mother loses her queenly prestige.

"WHAT FOR DINNER?" "If I only knew what to get for dinner!" is the housekeeper's troubled cry. If she cannot do more, she can at least vary the old varieties by bringing them to the table in a different dress. Even this is more of an art than may be supposed. A reasonable variety of food is indispensable to bodily health and comfort; not necessarily a variety at each meal, but from day to day and week to week. There is hardly anything more delectable than broiled steak and mashed potatoes, if you are only hungry and have not partaken of them for a considerable time; but let them be set before you every day for months, unvaried in their manner of preparation, and you get to dislike them. Potatoes boiled with skins on are nice enough for anybody; but let potatoes so cooked be the order of every meal, and everything that bears resemblance to a potato peeling will soon become an object of disgust.

Fretfulness, scolding and anger are noxious weeds, which crowd out every good fruit and flower. Do not cultivate the weeds in the kitchen or elsewhere, but keep them down, that home virtues and graces may thrive like a "tree planted by the rivers of water." Do not exhibit the weeds to those who call, nor burden

them, unasked, with recitals of domestic perplexities. Every house has its skeleton; but every well regulated dwelling has a closet in which to hang it. No mortal lives but has his sorrows. To retail them about a neighborhood is evidence of weakness, from which one instinctively recoils. It is like exhibiting a hole in your dress or a sore in the flesh. Better hide them until a patch or cure makes your appearance better. Bad temper spoils children and servants as well as the heads of families. Cheerfulness is the well rigged ship gliding smoothly over a ruffled sea. A mind made wretched by every disappointment and rebuff is small indeed, and apt to be wrecked on the storm-tossed ocean of life. Knowledge averts trouble and disarms disappointment. Learn to cook well and you will not have spoiled bread, cakes, puddings and unsavory dishes with their manifold perplexities. Ignorance makes a poor mechanic or wife, and saddens life, unless the possessor is so great a fool as to be unconscious of the torture inflicted upon others, and of his own littleness. Culture improves the apple, peach, horse and ox. The analogy extends to the human race. The man or woman who does not strive daily for personal and mental improvement is on the road toward barbarism. Such will miss the happiness of a pleasant home, with respectful and obedient children. Spasmodic efforts, like cleaning a house but once a year, are of no avail. The moment one enters a house he sees an index to the character of the woman who keeps it. We are all known by our works. A fine painting points to a good artist, a good watch to a skilled mechanic, and a neat, cozy home to a good and cultivated wife.

Dominique (dom-in-eek′), a breed of fowls: see Fowls.

Door: see Residence.

Dorking, a breed of fowls: see Fowls, Domestic.

Dormer, or **Dormer Window,** a perpendicular window in an inclined roof. Between its top and the roof is a recess roofed over, Gothic fashion.

Dorset, a breed of sheep. See Sheep.

Double-Tree, or **Evener,** the central whiffle-tree of a two-horse set.

Doughnuts, or **Crullers:** Take 3 pounds of flour, 1 pound of butter, 1½ pounds of sugar; cut the butter fine into the flour; beat 6 eggs light, and put them in; add 2 wineglasses of yeast, 1 pint of milk, some cinnamon, mace and nutmeg; make it up into a light dough, and put it to rise; when it is light enough roll out the paste, cut it in small pieces and boil them in lard.

Another: Half a pint of sweet milk, half a cup of butter (scant), one cup of yeast; salt; flavor with nutmeg or cinnamon. Mix them at night. In the morning roll out and let them rise until very light, and drop in hot fat. They are very nice, after they are fried, to roll them in pulverized sugar.

Another: Three cups of sugar; 3 eggs; 1 cup of butter; 1 pint of buttermilk; 1 cup of cream; 1 nutmeg; saleratus sufficient for the buttermilk; mold with flour.

Pan Doddles. Make a sponge just as you do for bread over night. In the morning take from the bread dough small pieces about the size of a walnut, shape them rather long than round; fry in boiling hot lard a light brown; serve hot in a covered dish; pull them open and butter them. You will find them both simple and delicious for breakfast.

Dove-cote (duv′cot), a small building or box raised to a considerable height above the ground, in which domestic pigeons breed; any apartment or house for doves.

Dover's Powders. Ipecacuanha, in powder, one drachm; powdered opium, one drachm; powdered saltpetre, one ounce. All well mixed. Dose: From 8 to 20 grains. The chief effect is to promote insensible perspiration.

Dovetail, to unite two pieces by one or more tenons, which are in the form of a spread dove's tail.

Dowel (dow′el), a piece of wood driven into a wall so that other pieces may be nailed to it. A "dowel-pin" is a pin of wood or metal used for joining two pieces of material by tightly fitting a hole in each, as in a barrel-head.

Dower, or **Dowry,** is that portion of the real estate of a man which his widow enjoys during her life, or to which a woman is entitled after the death of her husband. In most of the States the widow is entitled to dower of personal as as well as real property. Estates of deceased persons are administered in courts of probate. Laws upon the subject of dower differ in the different States.

Draft, an order given by one bank upon another for the payment of a sum of money. This is the best, and generally the cheapest, way to transmit money in any large amounts.

Drainage, the withdrawal of superfluous or injurious moisture from land by means of artificial conduits. Twenty-five years ago it required a good deal of argument to convince the average farmer that under-draining was in many cases a necessity. All readily admitted the practicability of removing surface water from swamps, bottom lands and sloughs, and surface ditching, where a fall could be obtained, was an easily understood method. But the plan of "blind ditches" and under-drainage, especially with tile, was long looked upon with doubt. Now, however, no intelligent farmer is so silly as to deny the utility of under-drainage with tile. The fact that this kind of farm improvement is being largely prosecuted in Illinois and others of the Northwestern States, shows how completely the doctrine of drainage has won its place in American agriculture.

What Lands Require Drainage. All lands, of whatever kind, in which the spaces between the particles of soil are filled with water, within four feet of

the ground's surface, need drainage. It is not meant by this that the particles of the soil should be dry, for that would destroy their fertility. But water should not fill the spaces between the particles, or surround them, because that prevents the ingress of air, so necessary to the germination and growth of plants. The soil has been compared to a barrel of chips; it may be filled with water, when the chips will absorb a portion, but still the water will fill the spaces between the chips. But puncture the bottom of the barrel, and the water will drain off, leaving the chips, and admitting air to fill the space between them. A soil over-burdened with water is like a barrel of dirt on which water is poured. The dirt will continue to absorb the water till the particles are full. If water is continuously poured upon the dirt it will become sodden, the spaces between the particles becoming full. If the pouring is continued the water will at length run off the surface, the mass of dirt being no longer able to take up the moisture; this may be compared to surface water in swamps. If holes were bored in the barrel's bottom, the surplus water would run out, while the particles of soil inside the barrel would absorb the water in its passage through, and retain it for a long time. This exhibits the nature and principle of drainage. If we bore a hole in the side of the barrel at a certain distance above the bottom, the surplus water as poured in will run out. This represents a drain, and also the "water level" that exists in all soils.

Horace Greeley said that probably one-third of New England, one-half the Middle States and three-fourths of the Mississippi Valley may ultimately be drained with profit.

A careless survey of a field is sufficient to determine whether or not it needs drainage. If a plowed field, wholly or in part, shows constant dampness on the surface, indicating that as fast as water is dried out of the top soil it oozes up from the subsoil, and after rains it is much longer than other lands in becoming dry, that land needs drainage. This saturated condition of the soil can be tested by digging a hole, four feet deep, which, if the conditions just indicated exist, will partially fill with water, especially in a wet season, or after a rain. If water stands on the surface some time after a rain the land should be drained. If the soil is clayey, and after a rain and subsequent sun and drying winds, "wind cracks" come in the surface, it is a sign that the land needs drainage. Sometimes corn is observed to curl after a brief drought; this generally indicates too much water in the soil at some depth below the surface. Spring water, ooze, and a general "squeechiness" of the soil can always be remedied, and the land doubled in value by tile draining.

Why do Lands Need Drainage? Too much water in soils excludes air from the germinating seed and plant roots. Both should be filled with moisture, but not surrounded by water. A soil in a proper condition should be free from surplus water, so as to admit the air freely among the particles to the depth of four feet. Such will be the case if it is thoroughly underdrained. The particles of soil will hold moisture by attraction or absorption. Soils which require drainage are not in this condition. When they are not saturated with water they are generally dried into lumps and clods, that are almost as impenetrable to roots as so many stones. The saturation of the soil renders it unfit for a growing crop either in a wet or dry season. It is cold, unfriendly, and the harbor of noxious gases inimical to plant growth. It kills the vitality of the seed, and if the plant struggles out of its comfortless and sickly bed to the light of day, its roots take hold on infirmity in the start, and its growth is feeble and its end unfruitful. Manures applied to such soils are nearly thrown away. Now and then a season neither too wet nor too dry comes, and a tolerably good crop can be raised. But usually both labor and fertilizer are expended in vain on such soils. Lands which suffer most by drought are benefited most by drainage. When air is allowed to circulate among the lower and cooler (because more shaded) particles, they receive moisture by the process of condensation. So when the subsoil becomes loose by drainage, the air is admitted, condensation takes place and the resulting moisture is absorbed by the particles. The subsoil being also open and accessible, the moisture from below rises, is vitalized by the air and absorbed by the particles and the plants. The depth to which the soil is made friable admits the deeper influence of the sun, and also permits the plants to strike down into the subsoil, drawing therefrom moisture and nutrition. The chemical processes of plant growth are thus promoted. Land not drained is of necessity cold; it warms up late in the spring, and becomes cold early in the fall, favoring early and late frosts. For this reason undrained land cannot be cultivated early in the spring, which is a serious drawback. Neither will it admit of deep tillage, which is indispensable to good farming. A writer on agriculture sums up the benefits of drainage in the following comprehensive terms: With deep culture and drainage the surplus water is rapidy carried away, evaporation is moderate in the spring, the soil warms up, and vegetation starts with vigor. But the constant heats of summer do not exhaust the ground of all moisture, as the deeply worked subsoil can hold its normal supply by capillary and adhesive attraction—which experiment proves to be equal to nearly one half the measure of the soil itself—and a moderate evaporation is kept up, during the entire summer, which modifies the extreme heat, and supplies necessary moisture to plant growth, which goes on with all the vigor of healthy life. The great quantity of water necessary to sustain the exhalation of plants when in growth, has been ascertained by experiments in the case of many plants, as of wheat and clover, to be for the growing season, two hundred times the dry weight of the plants themselves. This for a good crop of clover would be about 400 tons to the acre, or two gallons per square foot, of water exhaled from the leaves while in growth. How appar-

ent, then, becomes the necessity of securing that condition of the soil which will absorb and hold a generous supply of water, to meet these immense drafts during the dry months of the year. We think we shall find in this system a remedy in great part for our leaf blights and mildews, etc.

Will it Pay? It is only necessary to point to the testimony of practical men who have tried drainage—especially underdrainage with tile—to answer this question in emphatic affirmation. From the time that John Johnson, in New York, began to "bury crockery" in his farm till this latter day, when Michigan and Illinois farmers are converting swamps and sloughs into grain-burdened, arable fields, a uniform "Yes; drainage pays," has been returned to every doubting query. By over a thousand circulars mailed by one gentleman to farmers all over the country, he received the common statement that underdrainage pays from 25 to 100 per cent. The common farmer will not average a yield of over 13 bushels of wheat and 35 bushels of corn to the acre on land that needs drainage. The cost of production, interest on capital, and capital itself will yield but little or no profit. The same land thoroughly drained, will average 25 of wheat and 60 of corn to the acre, a difference that will cover the cost of draining in two years. Gentlemen have informed the writer that their underdrained lands in Illinois would yield 100 per cent more crops than they did previous to drainage. It has been estimated by farmers who have practiced drainage for years that the increased product consequent on drainage, on a given area of land, would defray the expense of drainage an equal area. The foregoing statements being true, there can be no doubt about the profit of drainage.

Surface Drainage. This method, by open ditches, was undoubtedly the first for freeing land from surface water. Where the overflow is large, and the necessity, for health and profit, great that the water be drained off, ditches provide the readiest and cheapest means. But as a method for thorough drainage of large areas, they are objectionable; for they occupy too much land; they are a great inconvenience in cultivating adjoining lands; cause accident to stock, and are an obstruction to teaming; they produce weeds, which foul the farm; they cave in and need continued repair; they are never deep enough to properly drain surrounding land: they carry off the very richest part of the soil and manure, which is washed into them by the surface streams; and they induce disease by holding stagnant water in times of drouth. Open ditches are hence defective for thorough drainage.

The cultivation of land in ridges is another method by which a moderate degree of draining is practically effected. By plowing into narrow lands with wide, open furrows between, or by turning two furrows together from opposite directions and leaving a large, open space or water furrow between each two ridges, and planting directly upon the top of each ridge, some of the advantages of draining can be secured. But in such cases they must be obtained at the expense of extra work in preparing the soil and cultivating the crop.

Under-drains. The primitive method of under-draining was by boards and stones, so placed that a conduit for the passage of water in the bottom of the ditch would be formed. There were various plans for making under-drains before tile came into general use, but the latter has so superseded the old way that it is useless to treat any other at length. We will briefly illustrate here such cheap drains, as they are still needed in pioneer districts. They are of various devices, Figs. 1 to 4, and they serve very well until the country becomes more densely populated and wealthy, when tiling can be afforded. Fig. 1 shows the ends of the poles in the plan of the ditch or drain; Fig. 2 shows the stones, in a similar situation; Fig. 3 shows how a narrower ditch, at the bottom of the main one, is covered by a single board, and the earth filled in over it, as in the preceding methods; and Fig. 4 points out how three boards are placed. The last is the best plan of all four, as it better protects the drain from filling up with sediment.


Fig. 1.—*Pole Drain.*


Fig. 2.—*Stone Drain.*


Fig. 3.—*Single Board Drain.*


Fig. 4.—*Box Drain.*

In putting down these board drains, which in clay soils will last for five to ten years, dig the ditch and take two by four-inch hard-wood plank (oak and cedar are preferable) for side pieces. They may be of any length. Leave undisturbed elevated spots one foot long, three feet apart in the bottom for side pieces to rest upon. Place those down and cover with boards. Should the drain be narrow, one-inch boards will answer; but two-inch plank cut in pieces of one foot in length, or slabs with sides trimmed to fit closely, are better. Use no bottom board: water enters there. Fill the ditch with clay, placing surface soil at the top.

Tile Drains. These are the best and cheapest of all drains yet devised. Millions of dollars are now invested in their manufacture. Actual and universal good results have followed their general adoption. More than 20,000 tests in this country have demonstrated the value of under-draining, by this method, for the following reasons: Good tile drains, properly placed, last for all time, and do not fill up; it is the cheapest way known to accomplish the end; they are out of the reach of the plow, and therefore do not interfere with cultivation.

Tile for draining purposes are molded from brick clay by a machine for the purpose. They are 8 to 24

inches long, and in diameter from two to nine inches. Round tile with collars are generally preferred. They sell by the foot at about one cent an inch of diameter.

Probably, as to size, the following is as good a rule as can be had: For tiles taking only the rain fall on the land the tile should be two inches for four acres, three inches for nine acres, four inches for 16 acres, etc. A one-inch rain-fall per hour gives 22,633 gallons per hour for each acre, or 377 gallons per minute. These figures may assist in deciding the size of tile needed.

How to Lay Tile. The usual distance between drains is 25 feet for three feet depth, 40 feet for four feet depth, and 80 feet for five feet depth. If the drains are 20 feet apart about 2,000 tiles to the acre will be required; if 40 feet, about 1,000, and if 80 feet, about 500. Deep digging for tiles is thought to be more effective and saves money.

Tiles are planted at from two to five feet below the surface. The depth must depend partly on the surface of the land. If a sufficient outlet five feet below the level of the land can be obtained, then sink your drain to that depth. In any case it must be deep enough to be out of the way of the frost, to give sufficient room for plants to grow above the water-line. It must be beyond the reach of roots, and deep enough to prevent evaporation of the water rising in the soil from the force of capillary attraction.; 30 inches is a common depth, but is not as effective as though from 6 to 30 inches deeper. A tile less than three feet in depth is liable to disappoint. The deep drain acts quicker and with more effect than the shallow. The tile costs the same, therefore plant deep, and your farm will repay you the first year.

To find competent outlet for drains is often difficult, yet it cannot be dispensed with. Make it as low as circumstances will allow, in order to get as great a fall as possible. The outlet should be protected by either brick or stone work, and a grate over it to prevent obstructions from getting into the pipe. If the opening is into a running stream, it will do no harm if the water in the time of freshets rises and enters the mouth, though it is well to avoid this when practicable. If the water from the drain is to be conveyed away by an open ditch the channel should be so low as to prevent mud or other substances from clogging the flow of the pipe. There are several different gates for protecting the outlet of drains from vermin, etc. Outlets should, of course, be into under-drains as much as possible, and not into open ditches.

In planning a system of tile drainage there should be a main drain extending under the lowest portion of the land. These mains, of course, will have to be of larger tile than those of the lateral drains. The most important part of tile draining is fixing the grade of the system; an imperfect grade of a few feet may render the entire system worthless. As much care must be used in grading the ditches for the reception of tile as in building sewers under cities. There must be a continuous slope or fall to every foot of the pipe, from the utmost end of the laterals to the outlet of the main. Drains must not be laid at a uniform depth from the surface unless the surface is a perfect grade line, which is seldom or never the case.

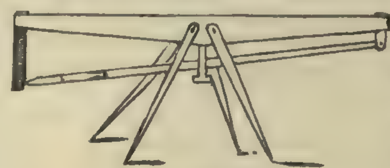


Fig. 5.—*Leveler.*

Figure 5 illustrates the principle on which a leveler can be made that will enable the most inexperienced to determine accurately the proper grade in ditching. The upper portion, or body of the instrument, is of wood, measuring exactly six feet three inches from the inner edge of the scale to the point directly above the hinge of the pointer. The scale, attached as shown, is made of heavy sheet iron, graduated to one-sixteenth of an inch to the foot. The zero point of the scale is at a distance from the upper edge of the instrument exactly equal to that of the center-point of the pointer-hinge from the same edge. The wood pointer has a spirit level attached to its side in the end near the scale. The level is so constructed that the bubble can be seen both from above and below. The pointer should be made either to work tightly, or should be furnished with a clamp. The machine should be mounted on four legs (fixed as shown in the cut), so attached as to be readily folded and strapped to the sides. A little ingenuity must be exercised in adjusting the legs, or the instrument will "wabble." The handle in the middle is only for convenience in carrying.

To Use the Level. Set it up on the highest point of the ground to be drained. At the point whose difference of level is to be ascertained, fix a stake at exactly the height of the center of the instrument when set. The use of the instrument is simplified by making this distance 100 feet, or even fractional parts, as 50, 33⅓ or 25 feet. Now let the operator place himself at the end of the instrument where the scale is attached, sight along the top of it and bring its upper edge on a line with the top of the stake. Be careful not to move the body of the level after it is adjusted. Now raise the pointer until it is horizontal, which is shown by the spirit or water level in the pointer. The number of sixteenths of an inch which the pointer designates, if the distance between the stake and instrument is an even 100 feet, will be the fall in feet to the one hundred feet. If the distance is one-half of one hundred feet, each sixteenth will represent six inches, or one-half of one foot, and the same proportion is true of one-third, one-fourth, etc. The result may be verified by taking a back sight—that is, changing places of the stake and instrument, and sighting from the opposite end of the machine back, or up hill. The readings should agree. A profile of the ground can be made by taking several bearings. In leveling long lines several stations are necessary. To use the level in grading the bottom of the ditch, bring the instrument on a line with the stake, as in the first case. Make the pointer horizontal and clamp it to the scale, fold the legs, reverse the ends of the machine, and, grasping it by the handle, lower it into the

ditch. If when the level is placed therein, the pointer is kept horizontal, as will be shown by the attached level, the upper edge, now resting on the ditch, will be parallel to its former position, and make an angle with the pointer equal to the required grade. The ditch being parallel of course to the edge, will have the proper slope.

If the bottom is ordinarily firm, begin laying at the lower end of the drain, putting in and covering it up as fast as the digging proceeds. This is different from the method formerly advocated by Waring himself, and formerly universally practiced—that of laying open the drain the entire length before beginning to lay the tile; but Mr. Waring now advises this manner of procedure. In beginning to dig, strike a line to mark one side of the ditch; remove the sod to a spade's depth (15 inches wide) for a length of two rods, and a ditch can then be dug 18 inches deep, with narrow bottom. A ditching spade, 20 inches long in the blade, six at the top and four at the point is then to be thrust in, whole length, and the dirt thrown out. The loose earth, escaped from the spade, can be thrown out with a scoop, four inches wide, the workman walking backward and drawing the scoop toward him. In this way he gets down three feet, and gets a smooth floor on which to stand. Beginning again at the end next the main, with a narrower, sharper spade of the same length, or a little less, he digs out another foot of earth, facing the main and working back, so that he always stands on the smooth surface, three feet below the surface of the ground. When he has dug for a length of two or three feet, he takes a snipe-bill scoop, and removes the loose earth. The round back of this scoop, which is always working a foot below the level on which the operator stands, and performs the office of a shovel, smooths and forms the bottom of the trench, making a much better bed for the tiles than it is possible to get if it has to be walked on, as is the case when the trench is opened from end to end. When the trench is dug and graded for a short distance the work of laying the tile can begin. First uncover the branch or junction piece of tile, and make the connection with the new drain. Then proceed, using a tile layer, the operator standing astride the ditch. The collar is placed on the end of the branch, on the upper end of the tile. The instrument lowers the tile (with its collar in place), and the other end is carefully inserted into the second collar, and so on till the drain is laid. Then throw carefully down the clayey part of the subsoil, and tramp it into place, all but the collar end of the tile being covered, and have the ditch filled at least half-full and pounded down, or well tramped. Another rod or two of the ditch can then be opened and dug out, laid, and filled up, as described—the amount at any one time not being enough to allow of a dangerous accumulation of water. At night the tile is left with a plug of grass or straw in the end to prevent dirt running in, in case of rain. Where a gang of men are to be employed in laying a single drain, they can follow each other in the successive gradations of the work, one opening the surface of the drain, another taking out the second spade-full of dirt, another the third, etc., and a man following with the tile-layer. Of course where the land is sandy, gravelly, or loose, the walls of the ditch may have to be kept in place by boards. Where the soil is full of large stones the work of opening the ditches will be much more laborious and difficult, and the regular order of the operation, as laid down above, will be somewhat broken. In laying, if the ends of the tile are jagged, trim them with a hatchet, so that they shall fit together perfectly, as much depends on this, and the skill with which the connections are made. Often in new drains small particles of dirt find their way into the channel. Sometimes it works into the drain while it is being laid. This deposit is carried along by the stream in the pipe, sometimes causing a complete obstruction. To remedy this, a "silt basin" is placed where the grade is slightest, or at the intersection of the mains. The handiest basin of this kind is made by sinking a tile two thirds its length in the bottom of the ditch, and making the tile above and below empty into it; or, rather, the drain passes through it. The bottom of the basin should rest on a flat stone, or solid piece of plank, and the top also be securely covered. The traveling particles tumble into the basin, and unless there are more than enough to fill it, can do no more harm. In filling the ditch it is well to have the basin uncovered for a few days, until the drain has thoroughly washed out, then fill. This will be a good point at which to search for trouble afterward; and its location should be marked. It is well to make a map, showing the exact location of every part of the drain, connections, silt basins, and all. This can be done before beginning work, while it is in progress, or when the system is completed. Mark in the map distances between connections, length of each stretch of pipe, etc., so that any trouble in the future can be sought out and remedied.

Further Suggestions. A very handy way to fix the grade of a ditch is, find the greatest aggregate fall to be obtained in the whole length of the drain, without placing the outlet so low as to cause its obstruction by backwater. Then find how much fall there is in 100 feet, or in a rod. For example, if the fall is found to be one inch in a rod, attach by screws to the lower edge of an ordinary level a straight piece of pine of the same thickness, eight feet three inches long (one-half a rod), and, say, two inches wide at one end and two and a half inches at the other, placing the level at the wider end for the convenience of handling. Then begin at the outlet, finishing the bottom of the ditch level, as indicated by this instrument, always keeping the wide end toward the outlet. When the bottom of the ditch is made soft or uneven by running water, or otherwise, the level should be tried on every two or three tiles laid to insure accuracy. When the bottom of the trench is too soft to support the tile in line, a few inches of gravel or hard earth will make it sufficiently solid. Plank should never be used, says one expert, for the reason that they will

finally decay, and allow the tile to settle and destroy the drain. The joints should be covered with gravel or tame grass sod, with the grass side next the pipe. Marsh hay, though it may be sometimes used, is not desirable. Marsh sods should never be used, for they will often cause the pipes to be filled with compact masses of fine water-grass many feet in length.

The following table will aid in calculating the size of pipe needed for any given tract of land, for a fall of six inches per 100 feet:

Size of Pipe in Inches.	Capacity of Pipe per Min. in Gal's.
4	75
6	213
9	576
12	1,220
15	2,108
18	3,306
20	4,320
22	5,498

Draught, Angle of, the angle made by the line of draught with the general direction of the body drawn.

Dredge, or **Dredging-Machine,** a machine for scooping up mud or earth from under water, for clearing the channels of canals, rivers and harbors. To dredge is to scoop up and remove mud from under water; also, in the culinary art, to sprinkle flour on, as roasted meat.

Drench, a medical drink administered to animals, principally to the horse. It is often preferred to a ball in flatulent colic and other cases in which the medicine requires to act with the utmost possible rapidity. A drench ought rarely, if ever, exceed a quart, and in all ordinary cases it may be administered by an expert operator with a strong, smooth-necked, wide-mouth bottle, or perhaps equally as well with a cow's horn. In administering a drench the head of the animal should be held firmly. A drench is in some degree more or less dangerous, for it is often bunglingly done, and consequently inefficient. Every such draught is in particular hazard of finding its way down the wind-pipe and exciting inflammation in the lungs. To make a drench to be used in case of colic take sulphuric ether, ½ ounce; laudanum 2 ounces; flaxseed oil, 1 pint; mix. Or, take spirits of turpentine, 1 ounce; tincture of aconite root, 25 drops; aloes, 1 ounce in solution; mix. Or, take warm ale, 2 pints; ground ginger, ½ an ounce; tincture of aconite root, 20 drops; mix. Used in flatulent colic, accompanied with swelling of the abdomen. Or, laudanum, 2 ounces; aloes in solution, 1 ounce; chloride of lime, ½ an ounce; mix. Or, take tincture of aconite root, 20 drops; aloes in solution, 1 ounce; sulphite of soda, 1 ounce; mix. Or, spirits of hartshorn, 3 drachms; aloes in solution, 1 ounce; water, 1 pint; mix.

Dressmaking. Notwithstanding the almost incessant changes of fashion, there are certain general rules in the art of dressmaking that never vary, and which it may be well to point out for the instruction of those who are desirous of making their own dresses. By adhering to these instructions the ladies of the country may be as capable of making their own dresses fit as neatly as could be furnished by the most accomplished modiste of the city. In purchasing a dress, always buy a little more goods than is required: this will come in usefully for repairing, altering and renewing the cuffs, etc., or perhaps it may be required for a new body. Also, if a dress is too scantily made, it will never look well, however expensive the material. In buying silk you can best ascertain its thickness by holding a part of it between your eyes and the light. If very stiff it is highly gummed, and therefore cannot wear well, as the gum will cause it to split and crack at the gathers. Soft, thick silks, with both sides alike, cut out the most advantageously and wear the best. Figured or flowered silks look beautiful for a short time, but in consequence of their flossiness the sprigs soon begin to wear rough and the spaces between them seem to appear shrivelled and contracted. This is the case with most silks which have figures embossed or thrown up on the outside. What are called watered silks look after a while as if they had been literally watered or wetted all over.

To Cut out the Body of a Dress. In commencing a dress the first thing is to cut out the bodice-lining, which should be always made of good linen, as lining that is thin and coarse will stretch out of shape when the material is put on it, and shrink very much if wanted to wash. For a white dress, or any one that is to be washed, the lining must be of linen that is perfectly white, otherwise the brownish tint, however pale, will show through. For a dark silk or merino dress the lining may be of brown goods. A yard of linen will make a bodice for a person of moderate size, and it must be quite smooth when you cut it. The person to be fitted should wear at the time one of her best fitting dresses. Over the fore-body of this let the linen be pinned, placing it bias, and putting several pins at the shoulders, waist and sides. Fold over at the bottom of the waist two very large pleats, slanting upward, and diminishing gradually to a point as they ascend to the bosom. If these pleats are small and narrow, the dress will be inevitably too tight across the front, compressing the bosom painfully, and making it look flat and contracted. This is a very common fault with dressmakers, who depend upon giving an artificial fullness to the bosom by means of wadding. The fore-body leaves off at the shoulder-seams, and after it is fitted the back should be done. The lining of the back must be cut straight way of the linen (not bias), and it must be pinned very smoothly on the back of the dress worn at the time by the person for whom it is intended, allowing sufficient everywhere for hemming in, and for outlet if the dress should afterwards be found too tight. The lining must be allowed longer in the waist than the model dress, as it takes up greatly in sewing on the skirt. For a person of hollow back and taper form, the side-seams should have a considerable

slope inwards from the arm-hole to the lower extremity of the waist, otherwise the dress will not set well into the lower part of the back, even when made very tight. Where the waist is thick, the slope inwards should be less; and some figures require little or no slope. If the back of the person is rather round, or the shoulders very prominent (as they frequently become from habitually compressing the waist to excessive tightness) the body should be cut considerably longer behind, so as to allow sufficient space for the projection of the shoulders. When the back is flat and straight the body need be no longer behind than at the sides. Be very careful not to cut the body-lining too short either behind or before, for to all figures a short waist is the most unbecoming. In cutting out the sleeve-holes notch them in front and allow them sufficiently easy, particularly just under the arms. Give the shoulders a considerable slope inwards towards the neck, otherwise the dress will set too loosely about the upper part. Next, with a piece of tape measure the length of skirt from the waist behind down to the heels, allowing sufficient for the hem and facings. After the lining has been fitted and cut out over the model dress, take it off and baste it together; also basting down the large pleats. Then let it be tried on and fitted a second time upon the corsets only. This is the time to remedy any faults in the cutting out or basting together. If it is found too loose about the upper part of the back, slope it in a little more toward the neck. If too tight, let it out sufficiently by opening the shoulder-seams. Should the lowest part of the back be too loose, take it in a little at the side-seams under the arms. If the waist is too tight, let it out at the side-seam of the fore-body; or it may be necessary to let it out at the back and the fore-body.

A dress, to fit well, should have no wrinkle whatever under the arms, or, indeed, in any place where it ought to be perfectly smooth. A body will frequently set badly not because it is too loose, but from the sleeve-hole being so small that the dress cannot be got on sufficiently, causing it to hang off and wrinkle down. When this is the fault, the remedy, of course, is to enlarge the sleeve-holes. When sleeve-holes are found too tight, cut them away just in front and under the arms, and then round them off nicely at the back. If left too tight when the lining is cut out, they will not be any looser when the dress is finished, as the ridge made by the seam in putting in the sleeve always fills up whatever space is allowed for the sewing. When the fitting of the lining is finished, do not, after stitching them down trim off the inside folds of the large pleats, but allow them to remain uncut, in case it should at any time be found necessary to let them out for the purpose of enlarging the body. They can be made to lie perfectly flat by felling down the folded edge on the inside.

In making the fore-body of a dress the silk or other material that constitutes the outside should always be cut precisely bias; otherwise neither the pleats nor gathers, nor, indeed, any part of the front can set well. To do this, fold one corner quite sharp, and make the middle of the fold lie exactly even. If the silk is not wide enough for a perfect bias, join it at the selvage to another selvage piece running just the same way. An imperfect bias causes the pleats to twist or warp and the whole to go wrong and unevenly. In cutting the outside of the fore-body, see that there is amply sufficient, both in length and breadth, for all the pleats or gathers, allowing it wider considerably at the top than at the bottom. If the dress is of the material that is to be washed, the upper part of the fullness should be gathered; as loose bias pleats cannot be ironed to look well, or even tolerably, the lower part of a gathered front may be stitched closely down. Wherever there are gathers in a dress, make them small, and stroke them neatly, as in making up linen. The pleats should be laid smooth and even, so that no part of them may rise or stand off even in the smallest degree. Baste or run them down to the lining, concealing the stitches of each pleat under the pleat that falls over it. If there is to be wadding at the bosom, you may insert it between the lining and the outside before you cord the neck. But the best way is to put it on after the body is finished. To do this, cut out two circular pieces of wadding of sufficient size, lay on each of them another round piece about an inch smaller in circumference, upon that put a third, and fourth, fifth, and sixth round pieces, each diminishing in size, till the last is not larger than a five-shilling piece. Baste each of these piles of wadding upon a circular piece of white glazed muslin, notching the edges of the muslin and turning them in. Then sew them to the lining of the body so as to have wadded pieces next the corset, and not between the lining and the outside. In stitching down the lower part of the pleats (where they diminish in width towards the waist) make a second row of stitching on the extreme edge of each.

A fore-body, to set off the figure, should fan very much, the pleats or gathers spreading full above so as to give breadth to the chest, and narrowing into a small compass at the bottom of the waist, where they meet in the centre. The space on each side of the pleats should sit quite smooth to the waist and be perfectly free from wrinkles. The outside of the stuff must be cut straightway of the stuff, like the lining. For a full back (they are sometimes in the fashion) the lining must be tight, but the outside must be cut large enough to allow of gathers at the lower part and shoulders. A full back gathered into the middle of the neck rarely sets well; the gathers should fan from the shoulders down to the waist. Great care must be taken in making a full back not to let it puff out in the middle—a most disfiguring fault, and one to which full-backed dresses are very liable. The gathers should be small and nicely stroked. If the back is gathered, the sleeves and skirt should be gathered also. It is now usual to have no seams in the backs of dresses, except under the arms; but some persons still prefer having the form or shape designated by

narrow bias folds, beginning just below the middle of the back part of the sleeve-hole, and descending to the waist, where at their termination the space between diminishes to about half a finger in width. These narrow bias folds are furnished with a cording. To put them on, baste them down on the back of the dress after it has been lined, giving them a slight curve, and then sew them on with the lining next to you, keeping the needle and thread on the lining side, and catching the under part of the bias fold as you take the stitches through. A cording must be let in at the shoulder where the fore-body is joined to the back. In putting whalebones into the body of a dress, use none that are not perfectly straight and even; if in the least crooked they will cause a drawing or puckering of the outside. It is usual to have whalebone up the middle of the front; one, or perhaps two, at each side of the fore-body, running in the same direction as the large pleats in the lining and extending up as far as the bosom, but not over it. Also a whalebone at each of the side seams and under the arms. It is not a good way to run in the whalebones between the lining and the outside of the dress, as their ends very soon wear through the outside. Make a case for each whalebone, by sewing a piece of strong twilled tape upon the body-lining, then slip in the whalebones, and secure them well at the ends. Finish the lower part of the body with a cording felled down on the inside, and finish the neck in the same manner. The covering for cord should be cut into long slips, all of them exactly crossways, otherwise they will pucker and not set smoothly when sewn on. In sewing on cording, hold the dress next to you, take the stitches very short and close, and quite through. In plaid dresses or dresses with patterns on them the checks must be correctly matched in the seams of the skirt and bodice. Wherever there is a joint it is better to cut off a portion from one piece or the other than to allow the checks to come wrong. A perpendicular stripe of a check should always go directly up the middle of the back, and the cross stripes should be made to match precisely. The same accuracy is to be observed in making a dress of a striped material. In sewing on hooks and eyes use very strong silk, and put the hooks on the right side and the eyes on the left. For the sleeves they should be of a smaller size. If instead of eyes you work loops in button-hole stitch, make them very strong, or they will soon wear out and break.

To Cut Out a Plain Skirt. A dress skirt will not look well unless it is very full and wide; it should be long enough just to touch the ground. For a person of moderate size, a yard and a quarter in length will allow something to turn up for the hem. A tall person may require a yard and a quarter and a half-quarter for a hem. A dress made of narrow silk, that measures but half a yard in width, will require eight in the skirt, but if the material is less than half a yard wide, the skirt should be nine breadths. Any material of three-quarters of a yard wide will take six breadths; if but half a yard and half a quarter in width, there must be seven. A tall person should wear a full skirt, measuring at least five yards round, if without flounces. A dress, if lined through, will look much fresher when turned than one that has not been lined. The lining should be very thin. After breadths of the outside are all run up, measure those of the lining so as to fit exactly, and run them up also. Put the lining inside, whip the two raw edges together at the top, and baste the lining and outside together at the bottom. For the slit behind at the top of the skirt, hem down the outside upon the lining, securing it well at the termination, and taking care to turn in the selvage edge. Be also very particular in running up the breadths, or forming the sleeves, to take sufficient hold, so as to prevent even a thread of the selvage edge from appearing on the outside of the dress, as is frequently the case when seams are put together carelessly. It is well to notch with your scissors the selvage all along; otherwise the tightness of the extreme edge will draw up the breadths, and cause them to pucker at the seams. In sewing together the pieces for a frill, or a flounce to a silk dress, cut off the selvage entirely, and whip over the seams; for if the white edge is left on it will show at every joint.

If the skirt is pleated at the top, turn down an inch or two all along, and fix all the pleats exactly even, securing them for the present with pins, and afterwards basting them; leave a space directly in front of the fore-breadths. Take care not to have a seam on any of the top pleats, but fold all the seams underneath. The middle of the fore-breadth must come exactly to the middle of the fore-body, and the central gathers of the back-breadth must go precisely to the back-body. As the gathers are to be caught up and not whipped with a drawing thread, they can not be made till after the body is sewn fast to the skirt, but enough must be left to make them very full. Having basted the body to the skirt, stitch or sew them very closely with a strong silk thread. In doing so stitch the body very tightly and hold the skirt rather easy. Then put on the gathers at the back of the skirt, catching them to the body as you go along, and securing each in its place with a seamed stitch taken over the first. When they are all in, take a large needle and a strong thread, with a large knot on its end, and run it through the hole of the gathers as they stand in a row on the inside, and draw the thread tightly. This will keep them compact, and make them set out well. If the skirt is not lined all through, put a stiffener in the upper part of the two back-breadths, and sew it on with the gathers when you are making them, whipping it first to the raw edge of the outside. This stiffener may be of a double piece of glazed muslin about a quarter and a half quarter in length when doubled, and in width the same as the two back-breadths. Unless they are extremely wide do not double it exactly in half, but leave one of the lower edges a little longer than the other. Scollop it all round with your scissors.

The Sleeve of the Dress. After you have fitted the body-lining, take the measurement for the sleeves

by means of a piece of tape from the armpit to the wrist, allowing a little extra length, as it will take up in sewing. If the sleeve is too short in the inside of the arm it will give a very awkward appearance to the wrist, exposing it bare whenever the arm is in the least extended, besides feeling most uncomfortable. We have seen sleeves in which this defect (shortness of the under side) was so great, that after the dress was on, it was impossible to raise the hand higher than the waist, the arms appearing as if skewered down to the sides. The remedy when the sleeve is too short is to put an addition to the cuff at the wrist, or else to take out the sleeve at the shoulder, rip it down the seams for about a half a yard, and then cut a piece from each side, which (though making the upper part of the sleeve narrower) will add something to its length under the arm when it is set in again. If the design of the sleeve will permit, it is perhaps better to increase its length by adding a cuff at the bottom, concealing the joint under a band. If you wish the sleeve to set off very much from the elbow, cut it very long on the top at the shoulder, and give it a great curve along the inside of the arm. On the contrary, if you desire that it should hang straight, give the inside but very little slope.

In cutting out the sleeves fold over the material into an exact bias; and if not wide enough at the top, cut a piece to join on, making both selvages to come together. This seam or joint had best go at the back of the sleeve. When the material is very narrow, it is necessary to join the upper part of the sleeves both at the back and front. That side of a bias sleeve where the threads run straightways must be put front or next the fore-body; the crossway side must go next the back—this is very important to the set of the sleeve. The top or shoulder part must be rounded at the back, and hollowed a little at the front, where it is seamed in at the sleeve-hole. The linings should be cut out with the sleeves, and exactly of the same form and size. Colored linings (unless of silk) are apt to rub off on the arm. White glaze linings are the best for the sleeves, if not for a washing dress; for a dress that may be washed, it is better that the linings should be separate from the sleeves, making them of cheap white cambric muslin, or any other cheap fabric. Gather these extra linings at the top into a band, and at the bottom into a wrist-band. They must not be so long as to appear at the outer lower slit of the outer sleeve. In setting on the sleeve, baste a cord all round the arm-hole, beginning and finishing at the side seam under the arm; then close-stitch the sleeve all round, leaving the cord to appear as a finish on the outside. Bands and their lining must be made crossway of the stuff. If intended to wash, it is best not to cord them at the edges, but to fell down the outside over a lining. Between the outside and the lining there should be a very stout stiffening of buckram. Cut all three perfectly even and baste them together till after the belt is finished. Line the flap or end that hooks over with a piece of the same material as the dress. If you cannot get a waist-band to match the dress exactly, get one that is rather of a lighter than a darker shade.

For particulars as to the styles of dress suited to persons and occasions and for harmony of color, see Etiquette.

Harmony of Dress. In this connection, regarding the proper development of that taste which pertains to the person and clothing, a few hints will not be out of place. Outline, symmetry, contrast, color and harmony are the principal elements in the problem, after considering the cost and durability of the materials. It would seem of primary importance to have a well-developed and well-formed body, first, to clothe. Woman's dress should make her shoulders appear narrow and sloping. Long dresses make short people appear tall, and short garments make long ones short. Horizontal stripes shorten, while perpendicular ones lengthen. Loose clothing makes thin people appear larger, and large people smaller, while close fitting garments have the opposite effect. Black, while it has many objections, is generally more universally worn than any one color. A lady's dress admits of greater ornamentation than a gentleman's. Contrasts of color are as necessary as harmony. Some bright colors give life to black or somber shades. The proper harmony of colors requires artistic taste.

There are two distinct types of complexion, the blonde and the brunette. There are intermediate shades of hair, eyes and complexion, belonging to each, and requiring a peculiar character of dress. A blonde may wear violet, lilac, and blue or green. If very ruddy the blue and green should be dark. White, of course, may be worn with or without any of these colors. The ruddy blonde may wear russets, slates, maroons, browns, grays, drabs, fawns and stones. Those having rich, brown hair may wear, as a contrast, blue, pale yellow, azure, lilac or black, trimmed with rose or pink.

A brunette may wear black, scarlet, orange, yellow, plum or green. If the complexion is sallow, green and yellow; dark green and red or yellow are appropriate. A red or yellow face is benefited by blue or orange. Red and blue are relieved by purple and blue and yellow by green. White and black are appropriate to pale faces, but blue and red become them better. These harmonies are particularly to be considered in the selection of bonnets. In selecting colors, do so with reference to day or night wear, as some look better by artificial light, and others by natural light. White, yellow, crimson, scarlet, orange, and light brown are beautiful at night, and white, purple, orange, rose, lilac, dark blue and green suit the day. The complexion will bear stronger colors at night than by day. Large people look best in black, while smaller ones may more appropriately wear colors. Black or dark clothing will wear the longest.

Dried Fruits and Vegetables: see Drying and the respective fruits and vegetables.

Drill, a furrow for the reception of seed, or a row of growing plants; also, a machine for sowing seed in rows.

Drills, for sowing seed. A good seed drill is a remarkable piece of labor-saving machinery; and not the least advantage in its use is the comparative perfection with which it does its work. The seed is all put *into* the ground, and *evenly.* Besides, plants in drills can be *cultivated;* from broadcast sowing they cannot be. By the study of the features of the drills here represented, the reader will be enabled to judge of the good points of seed drills when he desires to purchase. It is, however, a hard matter to tell just which drill is "the best." As with other leading farm machines, mowers, reapers, etc., there are so many that seem to be just what a grain drill should be, that to choose among those conceded to be in the first class, is a very difficult matter. The best are all so good that one can hardly go amiss, and it makes little difference if taste, or an acquaintance with a particular style, influences the selection. In making the purchase, however, other things being the same, it is best to select the drill that has its factory nearest at hand, or is represented by an agent close by. The best of machines will need repairs, and most frequently at just that time when a day makes a great difference; so the quicker the new part can be obtained the better. We wish to state in this connection that it is true economy to sow grain with a drill, except in those stony, or stumpy, newly-cleared fields, in which a drill would neither do its work well nor with safety.

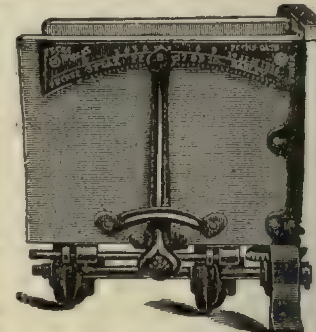


Fig. 3.—*Indicator.*


Fig. 1.—*Force-Feed Grain Drill.*

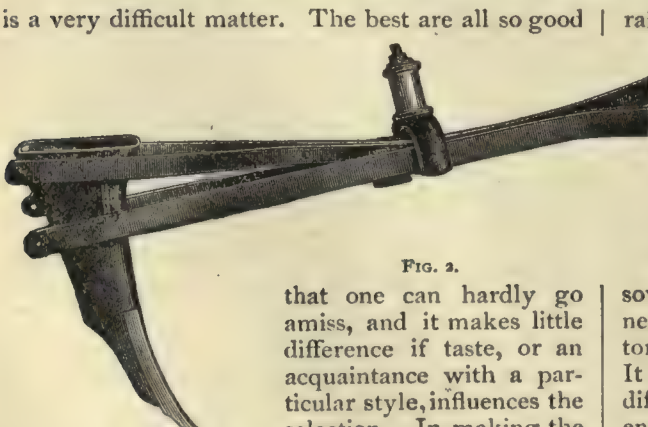


Fig. 2.

The engraving (Fig. 1) represents the new "Buckeye" force-feed grain drill, manufactured by P. P. Mast & Co., Springfielh, Ohio. It has India-rubber spring hoes (Fig. 2), with attachments for all the purposes of sowing and cultivating. It is also furnished with an entirely new arrangement for raising the hoes out of the ground. Instead of lifting up, a lever is arranged which pulls them from a perpendicular position downward. By this means the hoes are raised very much more easily and quickly than heretofore. A quadrant with notches is provided, so that the hoes may be raised only part way if so desired.

The scale for the quantity sown, with the indicator (Fig. 3) which operates the feed gauges, and shows how much seed has been sown, is placed on the rear of the grain hopper, near the right hand-end, thus enabling the operator to quickly change the quantity if he so desire. It is sometimes desirable to change the quantity for different parts of the same field, owing to differences in the soil. The indicator is so arranged that such changes can be quickly and easily made.

One of the great improvements that has been made during the last few years is in the accuracy and uniformity of the sowing. Instead of the old mode of allowing the seed to pass through the machine merely by its weight, the "force-feed" (Figs. 4 and 5) is used, which carries it through with precision. The force-feed used with this drill is the usual cup or case, in one side of which is placed what is called the feed wheel. It is a disk upon which is a ledge or rim, the outer edge of the disk being provided with teeth which assist in carrying the grain out. This feed wheel is made to revolve by a shaft, which shaft is of such shape as to prevent any lost motion. The device for varying the quantity sown without change of gears, consists of a feed-regulating gate, having one end inserted and arranged to slide through a slot in the side of the feed cup or case, the gate being made of such form and so arranged as to slide into and across the grain passage or channel at a point a short distance in advance of its mouth or delivery, in such manner as to diminish the size of the passage at that

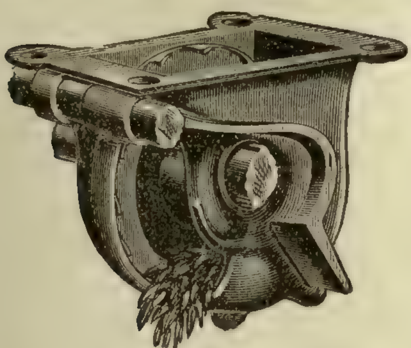


Fig. 4.

Fig. 6.—*One-Horse Drill.*

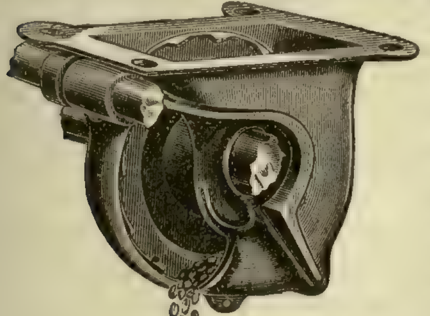


Fig. 5.

point, thereby limiting the outward flow of seed to a greater or less extent as occasion may require. All these feed-regulating gates are fastened to one and the same shaft. Obviously when this shaft is drawn endwise by the indicator all the gauges are drawn at once, so that all feeders sow exactly alike. The quantity sown can be varied as little or as much as may be desired, and when set to sow a certain quantity will always sow that quantity accurately. A reduced size of this force-feed is adapted to sowing grass seed. In the end of the hopper is an apparatus which indicates the amount of land which the machine has sown for that setting. The hopper is so arranged that all the seed will be fed out clean; and there is also a hopper for sowing fertilizers.

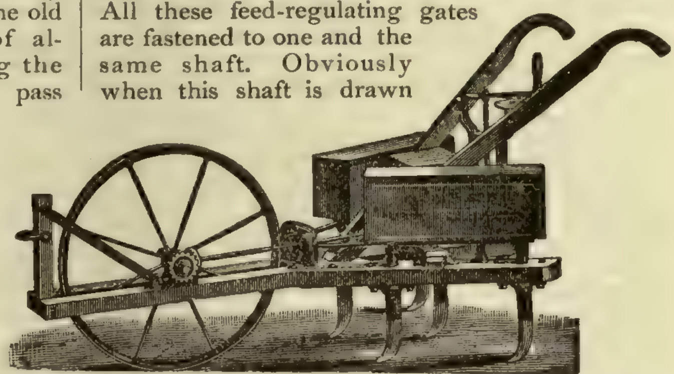


Fig. 7.—*One-Horse Drill.*

A one-horse drill (Fig. 6), made by Mast & Co., has three hoes, for drilling among standing corn; has also the force-feed. At least one-fourth more wheat can be grown on corn ground by seeding early with the drill, than by waiting until the corn is cut and out of the way. The usual rotation system, therefore, calls for a drill of this kind. Ewald Over, Indianapolis, Ind., also makes a fine drill (Fig. 7) for this purpose, with either three or five hoes. But it is

Fig. 8.—*Hand Drill,*

also good enough for sowing any kind of cereal grain.

For garden purposes the Matthews hand drill (Fig. 8) is as good as any. We know that a poor drill is worse than useless, and that many are so made as easily to get out of trim. Some men, too, are rough in the handling of tools, and will blame the manufacturer instead of himself; but alas! he scarcely ever knows that by so doing he injures himself more than any one else. The Matthews hand drill is supplied to the market by Messrs. Everett & Small, Boston, Mass. It opens the furrow, drops the seed evenly at the required depth, covers and rolls the soil; at the same time marking the next row parallel with the one planted. Among the seeds to which this drill is fitted are beet, carrot, pea, bean, corn, sorghum, onion, parsnip, turnip, etc. An indicator has the names of these different seeds, and it is necessary only to turn the hopper to the name. There are no cams, gears, springs or belts to get out of order, and yet the quantity of seed is accurately gauged.

Drinks. See the respective beverages. A list is given on page 77 under head of Beverages.

Driving, urging forward domestic animals, whether in travelling or working. This is often done in so bad a manner as to involve great cruelty to the animals and much loss to the owners. Cattle when brought out to be driven any considerable distance to market, ought to have very little undigested food upon their stomachs; and, when upon the road, they ought to travel leisurely, and never be driven into either fatigue or excitement, never seriously heated, never much urged, never beaten, never allowed to make any spontaneous run or hasty movement, never overgorged with food, and always, as nearly as possible, maintained in the same cool and easy condition as if they were moving about in their summer pastures.

Sheep, when about to be driven to market, should be selected, turned upon a piece of coarse dry pasture, examined in their hoofs, and ochre-marked on the shoulder, rump, or other parts of the body; when collected for the road, they should be in a medium state between repletion and hunger; and, when on their journey, they should be driven slowly and coolly, three or four miles the first day, and should be restrained and controlled by an experienced and cautious dog, and should enjoy, during the long travel, a daily rest in an ample and quiet piece of pasture.

The driving of pigs is difficult and very tedious. The utmost patience and good sense are required to drive them without injury.

How to Drive Horses. The art of driving horses properly is not thoroughly understood, even by those who constantly handle this noble animal. Farmers often fail to realize the great profit and pleasure from their horses simply on account of bad handling in the harness. The art of driving, whether for pleasure or work, demands a clear understanding of the requirements of each particular case, and attention to every motion of one's horse. Pleasure horses are required to travel actively, evenly, safely, and with as much style as possible; while work horses are required to throw their weight into the collar, and with a steady, even pull, without swerving to the right or to the left, and without fretting or noticing what is going on about them, to keep up a uniform motion of their load, at no time losing the assistance of its momentum, and never unnecessarily wasting their strength by a sudden, rapid pull. The ability of the horse to assume one or the other of these characters depends even less upon his own nature than on the manner in which he is driven.

In Pleasure Driving the seat should be rather high, so that one may easily see over the dash-board of the carriage, but low enough for a direct pull on the bit when it is necessary. The feet should be firmly planted (avoiding an ungraceful or studied attitude), in such a manner as to give strength to the pull, and security to the position, in case of a sudden jolt of the carriage. The legs and hips should be as firm and immovable, and the upper part of the body should be as free and flexible, as possible, the principle being borne in mind, as in the case of riding on horseback, that while the seat should be perfectly secure, this security should not imply the least support from the reins, nor the least inability to do whatever may be necessary with the head or arms.

The eyes of the driver should be always on his horses, yet always about him. While he should see every strap and buckle within eye-shot, every movement of the horses' ears, every toss or shake of their heads, and every step that they take, he should also see every vehicle coming toward him, every object by the roadside, or elsewhere, which can possibly frighten his team, and every stone or uneven place in the road on which they are likely to step, or which may come in the way of the wheels. To sit in this manner, and to be thus watchful while driving a pair of lively horses, and at the same time to appear perfectly at ease, is no small accomplishment; still it may be attained by practice, and is essential to elegance in driving.

Holding the Reins. The manner of holding the reins should depend on circumstances. They may be both held in the left hand in either of the following ways, the hand being held with the thumb upward:

First. Let the off rein pass over the fore-finger, and the near rein between the fore and middle fingers, the thumb pressing on the off rein to keep it in place, and both reins passing out between the ring and little fingers. In this way they can be held very securely.

Second. Let the near rein pass under the little finger, and the off rein between the ring-finger and little finger, both ends being brought out between the thumb and fore finger, falling over the knuckles, and being secured by the pressure of the thumb; this is a lighter hold than the former, and is better for driving perfectly trained horses which require only the least touch to bring their heads into the proper (perpendicular) position. It is more fatiguing than the first described, with horses which are at all hard on the bit.

When it is desirable to hold the reins in both hands, the off rein may be taken in the right hand, by passing the fore-finger under it, and allowing it to fall down through the hand, and out between the ring and little fingers; this will admit of the hand being opened to take the whip. The rein in the left hand may remain in the same position as before. If it be necessary to strike a severe blow with the whip, the rein should be passed into the left hand, and quickly regained after the blow has been struck; this manner of holding the reins will give the greatest possible power over the team. The whip should be taken from the socket only when there is occasion to use it, and it should be returned as soon as it has become unnecessary. While held quietly in the hand it should lie horizontally across the near rein, and pointing over the whiffle-tree on the near side.

Driving a Single Horse is not at all difficult, and it requires only a good hand, a good temper, and a watchful eye. The horse's mouth should be lightly felt, that he may be supported if he trip; and especially in going down hill, the driver should sit with his feet well braced and his hand ready to support the horse in a false step, which, if at all, is most likely to occur at this time. Driving a pair of horses requires much more skill and care.

In Driving a Pair, the great art consists in putting them together so as to draw equally, and to step together. To do this well, the horses must match in action and temper, two slugs being much better than a free-tempered horse with a slug; because, in this case, the whip applied to the one only makes the other more free, and as a consequence it is impossible to make them draw equally. In some cases where two horses are exactly equally matched, the coupling-reins must both be of equal length; but this is seldom the case; and when they do not do an equal amount of work, the coupling-rein of the free one must be taken up, and that of the idle horse let out. In watching the working of the two horses the pole-pieces should always be the guide; and if both are slack, with the end of the pole steady, and neither horse shouldering it, the driver may rest contented that his horses are each doing his share; if, however, the pole is shouldered by either, that horse is a rogue, and is making the other do more than his share, keeping the pole straight by the pressure of his shoulder, instead of pulling at the traces. On the other hand, if either horse is pulling away from the pole, and straining at the pole-piece, he is doing more than his share, and his coupling-rein must be taken in accordingly. Sometimes both shoulder the pole, or spread from it, which are equally unsightly habits, and may generally be cured by an alteration of the coupling-reins of both horses, letting them out for shouldering, and taking them in for its opposite bad habit. The reins are held in the same way for double-harness as for single. In driving a pair, it should always be remembered that there are two methods of driving round a curve, one by pulling the inside rein, and the other by hitting the outside horse, and these two should generally be combined, graduating the use of the whip by the thinness of the skin of the horse. In all cases the whip is required in double harness, if not to drive horses when thoroughly put together, yet to make them pull equally; and there are very few pairs which do not occasionally want a little reminding of their duties. A constant change from one side to the other is a prevention of those tricks and bad habits which horses get into if they are kept to one side only. The driver should, therefore, change them every now and then, and back again, so as to make what was a puller from the pole, rather bear toward it than otherwise when put on the other side.

There is a certain animation of manner on the part of the driver which, without being noisy or demonstrative, keeps a team lively and cheerful at work, while another driver would not be able to get them to nearly so good a pace with even more labor to himself, and more fatigue to them. To attain this correspondence with one's horse should be the object of every person who attempts to become a fine driver.

Horses with hard, dead mouths require the greatest skill and management to draw tolerably, and should not be curbed up tightly, as that will tend to increase the difficulty. To ride or drive horses with pleasure and advantage, you must have a light finger and play with their mouths with skill and humor. Some horses have a trick of getting the check of their bit into their mouths; this is very dangerous, and should be prevented by a washer or round piece of leather.

The most dangerous horse in a team is a stiff-necked one, which, in going down hill, instead of inclining his head toward his partner, and throwing out his quarters so as to hold back the coach, twists his head another way, looking over one shoulder, and with the other shouldering the pole or his partner. When you have one of this sort you can do nothing with him by pulling up, but must whip his mate up to him, and if that does not answer, cross the road quickly with the leaders, to prevent running off to the side to which he is pushing.

If your horses are nervous and fidgety, they will not bear being confined too tightly at first starting, but must be humored and allowed some length of chain, particularly if the road be rough and full of ruts. When there are no breechings the horse requires to be nearer to the pole, or in holding back, his collar will get too far forward, unless restrained by a false martingale. Some object to breechings as being troublesome to horses in hot weather, but they are almost indispensable in hilly countries, as they enable the horse to hold back with less strain on his back and legs, and add greatly to the security of both team and vehicle.

The draft of the leaders will be greatly equalized by crossing the inside traces, fastening that of the near horse to the whiffle-tree of the off side, and that of the off horse to the near whiffle-tree.

The great art in driving four-in-hand is to favor the peculiarities of the different horses of the team. It is not often that all four will draw equally at all times,

nor is it desirable that they should do so. By allowing first one and then another to slacken his pull, the team will be able to do more in a day than if all were always pulling. Some horses will naturally draw at their best on starting off, and will work with less energy after a few miles, while others will hang back at first, and come in to their work as they get warmed up. By consulting their inclinations, the driver may economize the strength, and preserve the temper of his team, so as to secure a greater amount of work with less effort than if he kept the sluggard up to the bit from the start, and restrained the early ardor of the more spirited animal.

In turning corners, draw the leaders around first and let the wheel horses follow as nearly as possible in their tracks—not turn at the same time.

On ascending ground, the leaders should do more than half of the work, to compensate the wheel-horses for their extra effort in holding back when going down hill.

Driving Working Horses differs from pleasure driving, as much as does its object. One of the prime objects in pleasure driving that must be borne in mind is a regard to style and to appearance, while teaming or business driving has for its main object the best economy of the strength of the team, and its application to the performance of labors. It is true that a teamster may have a just pride in the appearance and style of his team, but this should always be subordinate to their usefulness; and the main problem which he has to solve is, how to turn a certain amount of invested capital, and a certain amount of hay and grain to the best account, in performing the work in which he and his team are employed. To accomplish this, having the horses fed in a manner to give them the greatest possible strength and health, and so groomed that their systems are in the best condition for appropriating the nutriment of their food, he should keep the following rules always in view:

1. The load should be just what the horse or the team can move steadily alone, neither so light that they are occupying their time in going over the road with less than they can draw, nor so heavy that they must overtax their strength to draw it, or stop to take breath and to recover from the effects of too hard a strain; in short, they should do all that they can do comfortably,—never much less, and never any more.

2. Horses will work better if they are kept well up to the bit, not sufficiently to pull on it, but just enough to feel its effect and to receive its support in case of a false step, than when allowed to become negligent and and careless in their gait.

3. When there are two or more horses in a team they should be so harnessed as to draw exactly alike. This requires them to be of uniform dispositions, and in equally good training; any deviation from this will cause one horse to do more, and another less, than his share of the work.

4. Working horses should never be whipped while drawing, except it is absolutely necessary; and then they should not be simply tapped, but smartly punished in a manner that will cause them to understand and to recollect that their driver really means that they shall work, and work properly.

5. If necessary to stop to rest before going up a hill, let the halt be at a little distance from the foot of the hill, that they may not get in the habit of stopping just at the foot of every hill which they encounter. When they are fully rested and prepared to go on, let them move vigorously, but do not allow them to rush at the hill; they would in such a case lose more in wind than they would gain in impetus. If possible, go moderately up every hill without stopping, recollecting that it is much harder to start a load against a hill than it is to keep it in motion after it is started. At the top of every difficult hill, either stop the team or let them walk slowly for a few rods, until they have recovered from the effects of the extra exertion.

6. At all times, and especially in difficult places, or when first starting with a heavy load, the driver should carefully avoid exciting his team by crossness or impatience, but should hold them steadily by the bit, and talk to them in a quiet and determined manner, endeavoring to keep them cool and resolute, pulling evenly and steadily until they start their load, without making a sudden jump at it, as many nervous horses are inclined to do. Such a movement is very likely to disconcert the other horses, and it exhausts the strength more than ten times the effort properly expended.

7. In descending a hill, especially if there be no break or drag on the wheels, the team should be so held back that the wagon never gets an increasing speed, and the pole should be kept in an exact line with, and not diagonally across, the wagon.

8. The team should never be so hardly driven as to become blown (where it is possible to avoid it), nor should they ever be allowed to become indolent, or careless in their gait. They should always be active and willing, but never impatient to do more than is clearly within their powers.

A road team, well kept, and driven according to the above directions, will last longer, keep in better condition, and do more work than horses managed by the ordinary system, and in the hands of persons who are either not able or not willing to give any thought to the matter.

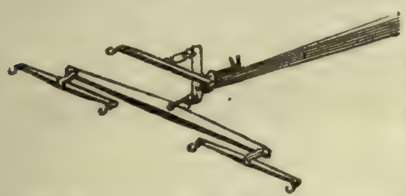
Plowing. Plowing on rough ground, with horses which are fit for anything else, is, at best, a painful necessity. There is occasionally to be found a stylish carriage team, or a pair of fast trotters, which will work like oxen at the plow; but generally horses of spirit will become impatient under the frequent interruption caused by stones, or by the frequent turning necessary in small fields, while the harness generally used for this work is neither comfortable nor complete. In large fields, free from obstructions, horses may very properly be used, as they are more pleasant to work with than oxen; but in rough work the latter are preferable, being by temper and structure much better adapted to such work than horses.

Horses are frequently driven to the plow with a sin-

gle line, or with a pair of lines fastened to the outer rings of each horse's bit, the inside rings being connected by a short line passing from one to the other. This will do very well for quiet, well-trained animals, in good ground; but with horses at all inclined to be unruly or impatient, or working in soft or stony ground, we should use the same sort of reins as in driving on the road, thus giving a fair hold of each horse's head.

Horses used for this work should be taught to stop instantly at the word, to start promptly and together, and to pull evenly. The team should be brought quickly around at the turns and headlands, and made to take their places as actively as possible for the new furrow; but they should not be started, if at all blown, until they are fully ready to go to the end of it without stopping, unless, indeed, it be a very long, or a very hard one.

We illustrate by the annexed engraving a good form of whiffle-tree for three horses plowing abreast.



Whiffle-tree for Plowing Three Abreast.

It is the opinion, apparently a good one, of the best farmers of the present day, that no two horses are strong enough to turn such a furrow as is necessary for the proper cultivation of the soil, and they recommend that three or four be used. Assuming this to be the case, it should be remembered that three horses working abreast will pull nearly as much on a plow as will four geared in the ordinary way—that is, the third horse, from being fastened within three or four feet of the plow, would have nearly as much power to draw it as would two horses drawing it from a distance of from 15 to 20 feet. See Plowing.

Driving-Wheel, in farm machinery, is the large wheel which runs on the ground and propels the machinery.

Drop to Wing. In hunting a dog is said to "drop to wing" when he suddenly crouches as the bird he points at takes to flight.

Dropsy, a morbid condition of the body which fills it up with a watery fluid. Diuretics, described under the head of Urine, are valuable in this disease. Keep the bowels open with some mild physic; give the lobelia emetic three times a week, together with a vapor or a Turkish bath. Place the patient in bed, and construct a frame so as to keep up the bed clothes. Produce a vapor by burning spirits, and conduct the vapor, by means of a tube, under the clothes. Let the patient remain in this vapor bath an hour; between giving the vapor and emetic, give an injection of pennyroyal tea: put in a teaspoonful of lobelia and as much cayenne. Cream of tartar dissolved in water, and taken every day, is very useful. Exercise is of the first importance; the patient should sleep on a hard bed and in a dry room. Let the body be rubbed morning and night with a coarse towel or flesh-brush; wear flannel next the body constantly; abstain as much as possible from drink, and let the food be light, and rather stimulating.

Drowning. Actual death by drowning is often preceded by apparent death, and it is possible, if this state has not continued too long, to resuscitate a person thus apparently drowned. The method of treatment for the recovery of a person in such a state is as follows: Avoid all rough usage. Do not hold the body up by the feet, nor roll it on a barrel or log to get the water out of him. There is no water there beyond the mouth. The life has been rolled out of many a poor victim over a barrel, under the misguided delusion of "getting the water out of him." Do not get a bellows and blow him full of wind. He does not need inflation. Begin the work of resuscitation by attempts to arouse the patient, who must not be removed unless there is danger of his freezing; but his face should be exposed to the fresh air, the mouth and nostrils wiped dry, the clothing quickly ripped open so as to expose the chest and waist, and two or three quick, smart slaps given upon the stomach and chest with the open hand. If the patient should not at once revive, a bit of wood or cork is placed between his teeth to keep the mouth open, and then turned upon his face, a large bundle of tightly rolled clothing placed beneath the stomach, and the operator should press heavily upon his back over the bundle for half a minute, or as long as fluid flows freely from his mouth. (See Fig. 1.) The mouth and throat should then be cleared of mucus by introducing into the throat the end of a handkerchief wrapped closely around the forefinger; the patient then turned upon his back, under which the roll of clothing is placed so as to raise the pit of the stomach above the level of any other part of the body. If an assistant is present, he should hold the tip of the patient's tongue, with a piece of dry cloth, out of one corner of the mouth, thus preventing the tongue from falling back and choking the entrance to the windpipe, and with the other hand he should grasp the patient's wrists and keep the arms stretched back over the head, which increases the prominence of the ribs and tends to enlarge the chest. The operator should then kneel astride the patient's hips and press both hands below the pit of the stomach, with the balls of the thumb resting on each side of it, and the fingers between the short ribs, so as to get a good grasp of the waist. (See Fig. 2.) He should then throw his weight forward on his hands, squeezing the waist between them with a strong pressure, count slowly one, two, three, and, with a final push, let go, which springs him back to his first kneeling position. This operation, which converts the chest of the patient into a bellows, is continued at a rate gradually increased from four to 15 times in a minute, and with the regularity observable in the natural motion of breathing which are thus imitated. If natural breathing is not restored in two or three minutes, the patient should be turned a second time upon the stomach in an opposite direction from that in which he was first turned, the object being to free the air-

passages from any remaining water. The artificial respiration should then be resumed and continued if necessary from one to four hours, or until the patient breathes; and when life appears the first short gasps are carefully aided by the same method. From the first, if assistants are present, the limbs of the patient should be rubbed, always in an upward direction toward the body, and with firmness and energy, the bare hands being used, or dry flannels or handkerchiefs, and the friction kept under dry blankets, or over dry clothing. The warmth of the body should be also promoted, whenever possible, by the application of hot flannels to the stomach and armpits, and bottles or bladders of hot water, or heated bricks, to the limbs or soles of the feet. As soon as breathing is established the patient should be stripped of all wet clothing, wrapped in blankets only, put to bed comfortably warm, but with a free circulation of fresh air, and left to perfect rest. For the first hour a little hot brandy-and-water, or other stimulant, is given every ten or fifteen minutes, and as often afterwards as may be expedient. After reaction is established the patient is in great danger of congestion of the lungs; and unless perfect rest is maintained for at least 48 hours he may be seized with difficulty of breathing, and death ensue if immediate relief is not afforded. In such cases a large mustard plaster is placed upon his chest, and, if he gasps for breath before the mustard takes effect his breathing is assisted by the careful repetition of the artificial respiration. It is necessary that everybody should know that death occurs in drowning because the water prevents the entrance of air into the lungs; the small quantity of water which gets into the lungs is of no consequence, and still less that which passes into the stomach, which occurs during life, or if the body be not drowned alive; consequently, the direction sometimes given in the old books, of holding the head down, in order to draw off the water, is not only useless, but positively hurtful; but if death occurs from want of air, it is obvious that the thing needful is to restore air to the lungs as fast as possible; and this is done by artificial inflation.

Fig. 1.—*The First Step Taken, by which the Chest is Emptied of Air and the Ejection of Fluids is Assisted.*

Another mode of resuscitating a drowned person is, as given by some, as follows: If the person has been drowned but a short time, or there is the least hope of restoring him, he should be placed immediately in such a position as will best allow the water to pass out, or will force it out of his lungs and throat; then wipe the body dry, wrap in warm blankets, and place in a warm, dry and well ventilated room; or, if the weather is warm and the sun shining, place the body in the sun, with his face turned toward it. The whole surface of the body should now be thoroughly rubbed with the dry hands, by stout, strong persons, perseveringly; if the patient is in bed, hot bricks, stones, or bottles of hot water should be applied about the body, legs and feet, and every means possible used to restore natural warmth to the body. At the same time, means must be used to inflate the lungs. Hold the nostrils tight and let some one blow strongly in the mouth of the patient, forcing air into the lungs; then press gently on the lower part of the breast, stomach and region of the lungs, to force out the air again; continue this as long as there is any hope or prospect of restoration.

Fig. 2.—*The Position and Action of the Operator in Producing Artificial Respiration.*

To Save a Drowning Person. The one point to especially guard against in attempting to save a person from a watery grave, is to prevent the victim from clutching you in such a way as to rob you of your power to swim. A drowning person will instinctively clutch at the nearest object with the greatest vigor, and often he will grasp his rescuer in such a way that both go down. So, be cautious in approaching a person to save him. Seize him from behind, if possible, and push him in front of you, or catch him in such a manner that you will be able to hold him at a distance. If the distance to the shore is great one should seize him by the foot and drag him, turning him on his back. Better use violence in making him defenseless, or wait until he becomes exhausted, rather than permit a strong man to grasp you; should he, however, succeed in fixing his grasp, the only remedy is to dive, when, finding himself under water, he will loosen his hold, thus permitting his rescuer to take a better position. Keep cool; act with firmness and decision.

Should a person accidentally fall into the water and be unable to swim, he should retain his presence of mind. In the moment of terror, a person thrown into the water almost instinctively stretches out his hands to grasp at some object. Now, the fact is that the human body is very little heavier than the volume of water it displaces; therefore, if the hands are kept under water and in slight motion, and the lungs filled with air, one may float securely in water for some time. Yet in most cases people who are not swimmers immediately raise their hands above their head and scream the moment they find themselves in deep water. The folly of such action can be impressively illustrated by means of a half empty bottle and a couple of nails, and the experiment should be repeated in every household until all the members—particularly the women and children—realize that the only safety in deep water lies in keeping the hands under and the mouth shut.

Any short-necked, square-shouldered bottle will answer, and the nails can be easily kept in place by a rubber band or a string. First, balance the bottle with sand, so that it will just float with the nails pointing downward, then by turning the nails upward the bottle will be either forced under water at once or will be tipped over so that the water will pour into the open mouth, and down it will go. To children the experiment is a very impressive one, and the moral of it is easily understood. The value of this precaution was strikingly illustrated near Accomac C. H., Virginia. A little girl, while bathing, was swept off into the ocean by a strong current and soon disappeared in the high breakers. As she could not swim her companions gave her up for lost. Two young fishermen who were employed some distance away thoughtfully set out with a small boat in search of her, and when a mile or more from shore, found her floating on the water. She had been drifting nearly an hour and was greatly exhausted, but soon recovered. Unable to swim she had pluckily floated, thereby making her rescue possible.

Cramps. Perhaps more good swimmers have lost their lives by cramps than anything else, and only those who have suffered from it can conceive its fatal power. The usual spot where the cramp is felt is in the calf of the leg just below the knee, and it sometimes comes with such violence that the muscles are gathered up in knots. There is only one method of proceeding under such circumstances: Turn on the back at once, kick out the leg in the air, disregarding the pain, and rub the spot smartly with one hand while the other is employed in paddling toward the shore. These directions are easy enough to give, but difficult to be obeyed. Cramp seems to deprive the sufferer of all reason for the time and to overpower him with mingled pain and terror. Still there is no other hope of reaching shore than that which is here given. The causes for cramp are generally two-fold. The principal cause lies in indigestion, for it is seldom that a person in really good health is attacked by this malady. The second is over-exertion of muscles that have been little used, and therefore too strong a leg-stroke should always be avoided. Should you see a swimmer struggling in the water, the chances are one hundred to one he has been attacked with cramp; therefore, go to his rescue without a moment's delay.

Drum, in machinery, a revolving cylinder around which belts or endless straps are passed to communicate motion.

Drunkenness, To Cure. A mixture made up as follows, and taken in quantities equal to an ordinary dram, as often as the desire for strong drink returns, is said to cure the worst case of drunkenness: Sulphate of iron, 5 grains; peppermint water, 11 drachms; spirits of nutmeg, 1 drachm. Another method is to let the patient eat or drink nothing that is not saturated somewhat with liquor until he is "sick" of all such victuals and drink. Some parties advertise that they will cure the disease or habit of drunkenness for a fee; and, as there are millions of ways in which the alcoholic appetite may be met and satisfied with vegetable drugs, the field for their operations is sufficiently large. They often succeed in effecting a cure, for the principal thing a drunkard needs is to become a slave to some friend who will force him through some course of treatment. The sober element of society generally would prescribe total abstinence and steady work.

Dry Earth-Closet: see Privy.

Drying. Preserving fruit by drying is a method as ancient as the growth of fruit. Until the modern way of canning was invented, there was no other method of converting fresh fruits into long-keeping goods, suitable for distant transportation and commerce throughout the world. By this means figs, dates, prunes, currrants, and raisins are prepared. Sun-drying is practiced largely in this country. In the Southern States, notably, drying fruit is quite an industry. The product is sold or bartered at country stores, shipped to eastern houses, and exported to

Europe. All over the Eastern, Middle and Western States, where fruit is raised, sun-drying is practiced, but by different methods. In New England, apples are pared, quartered, cored, strung with a needle, and

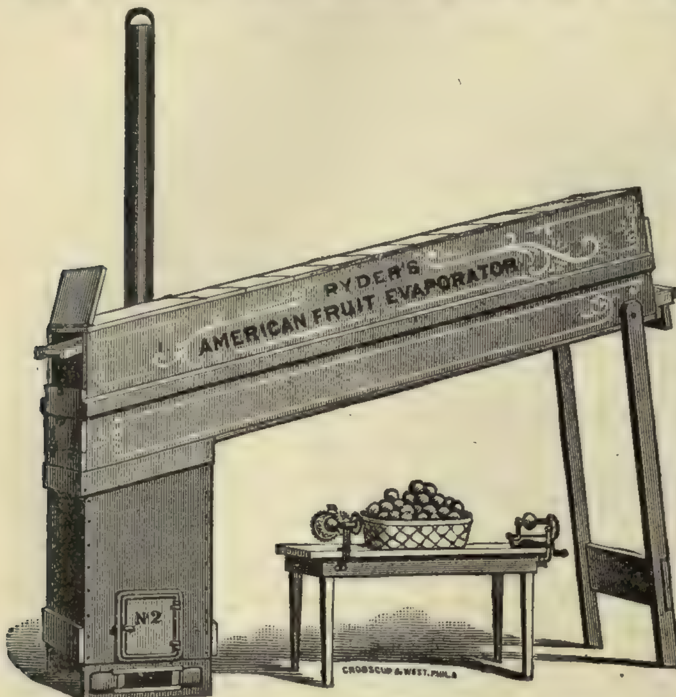


FIG. 1.—*Ryder's American Fruit Evaporator.*

hung out in the sun or around the kitchen stove to dry. This practice is somewhat common in the Middle and Western States, but in other sections, instead of strings, boards or dishes are more often used, and the apples are thinly sliced and spread on the surfaces. When a particularly fine article is desired, the fruit is placed in the sunlight, between muslin sheets, and dried. This keeps away insects, dust, etc., and gives a finer color.

An available method is to dry under glass, by which the hot-bed sash can be utilized. Make wooden boxes or frames to fit the bed, set them up on legs, one pair longer than the other, to get the proper shape. Cut holes at the top and bottom of the box to secure a current of air over the drying fruit. Place the fruit on trays, boards, or dishes in the box or frame, and put on the sash. Leave in the sun till the fruit is sufficiently dry to be packed in boxes, barrels, or sacks. This method keeps out all dirt or invasion by birds and insects, and requires less care than any other. Drying in stoves is attended by inconvenience and scorching, but can be practiced in cold weather for the saving of fruit liable to decay.

Artificial heat has now become the sole means for drying, in large establishments or by persons who dry for market. By this method only a few hours are necessary; birds, insects, dust, and storms are excluded, and the fruit retains color and taste.

An efficient and not costly home dryer is made in the following manner: Take a hogshead and saw a door in the side of it to admit the stove and fuel for feeding it; cut a hole in the rear top for the pipe, carrying the pipe above the drying-box on top. Saw an 18-inch square hole in the head of the hogshead. Take a box—any one large enough that is handy—knock one end out; nail cleats to the sides for perforated drawers or shelves to hold the fruit. Convert the top of the box into a door, with a button or strap to fasten it. Coal or wood may be used, and a very hot fire is not desirable. The door should be left open to provide air for the stove. With this arrangement the drying of apples, peaches, the small fruits, wild berries, plums, etc., is an easy task. The color and the flavor of the fruit will be improved by keeping a dish of water on the back of the stove, to furnish moisture for the heated air. The box need not be tight. There should be a few auger-holes in the top to induce a current of hot air through the fruit. Vegetables can be dried by this method as well as fruit.

An iron drying-machine on the above principle, costing about $75, is in use. It is portable, and may be used indoors and out. It will dry as much fruit in one day as a whole family can prepare in the same time.

The later method of pneumatic evaporation has become extensively adopted among large fruit-growers and dealers. Of the different varieties of this method, the first in use is the Alden process. The description of this will illustrate the principle of evaporating fruits and vegetables. The Alden process consists in exposing fruits and

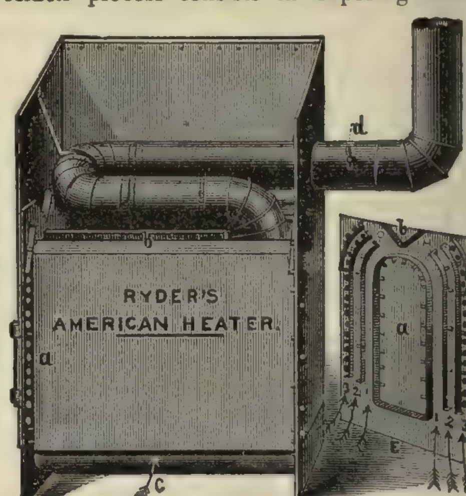


FIG. 2.—*Ryder's American Heater.*

vegetables to the action of rarefied, moist air. The heated air currents move in the same direction with the fruits, etc., which steadily advance into an atmos-

phere constantly becoming cooler and more damp, commencing with 200° to 240°. The effect of this increasing humidity and decreasing heat is to keep moist the surfaces of the articles under treatment, to open their minute pores and cells, and retain them in that condition until the water is evaporated and passes off in the form of warm vapor. This process occupies about two hours for apples.

The effects produced by evaporation are the opposites of the effect of drying. The latter begins by the formation of an external skin, which confines the internal moisture until the cellular structure of the fruit is broken down; it is a process of fermentation or cooking, and makes the fruit leathery and indigestible. Such is the value of evaporated fruit over dried, that, for five years after the process was adopted, the evaporated product sold for 100 to 500 per cent. more than the old-fashioned dried fruit. The cost by the new method is also considerably less than by the old, being about 20 to 25 cents a bushel.

We give an illustration of the American Fruit

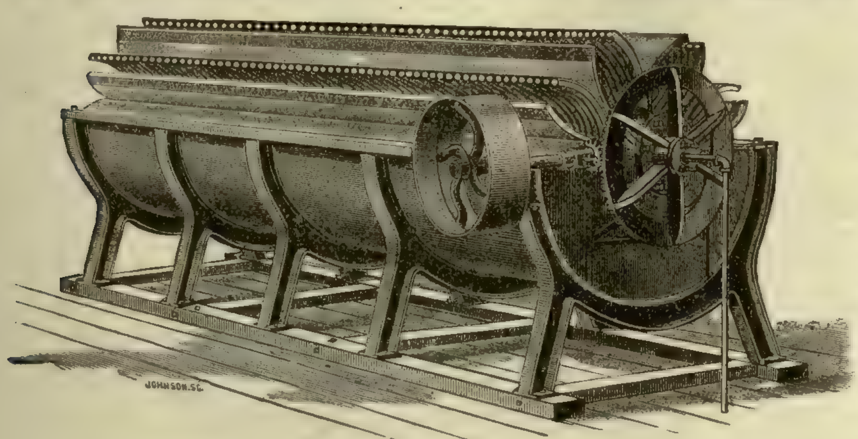


Fig. 3.—*Steam Drier.*

Evaporator, Fig. 1, made by the American Fruit-Drier Co., Chambersburg, Penn.

It is 28 inches wide, 9½ feet in length; 4 lines of tags; capacity 12 to 15 bushels per day.

To Dry Cherries. When they are pitted, put them into a porcelain kettle, add to them as much white sugar as will sweeten them nicely; let them come to a boil, then take out with a skimmer and lay on plates. Boil down the juice till it is almost thick, and pour over the cherries.

The smaller and more perishable fruits, such as currants, grapes, cherries, plums and the berries, may be dried in sugar, by preparing the fruit as for canning or preserving. Take five pounds of fruit to one pound of sugar; put in a kettle and boil, stirring at first. As the fruit rises to the top, skim it off; boil the syrup down till quite thick, pour over the fruit, then dry. In sun-drying, the dishes must be covered with musquito netting, to keep the flies off the fruit. In cooking for pies or sauce put in cold water and stew, adding sugar to suit the taste.

Fig. 3 is a cut of the latest improved dryer for grain and meal. It is made by the Nordyke & Marmon Company, of Indianapolis, Indiana.

Dry Rot, rapid decay of timber, by which its substance is converted into a dry powder, which issues from minute tubular cavities resembling the borings of worms: called also "sap rot" and "powder post."

Duck, a very extensive family of water-birds, which are found in all parts of the world.

The Mallard, or common wild duck, which is the original stock of domesticated ducks, appears to have been reclaimed at a very early period. The nest of the duck is usually placed in the most solitary recesses of a marsh or bog, among coarse grass, reeds and rushes, and generally contains from 12 to 16 eggs, of a dull greenish-white. The flesh of the wild duck is held in general estimation, and various methods are resorted to in order to obtain these birds in quantities.

The Muscovy duck is the largest of the duck kind, and approaches nearly to the size of the goose. It has obtained its name from a strong smell of musk, which exhales from its body and not because it comes from Russia, as has been supposed. The Muscovy ducks are damed in great quantities in the West Indies, and are found wild in Guiana, where they nestle on trunks of trees, close to the water's edge. They feed in the morning upon a plant called wild rice, and seldom permit the sportsman to approach within gunshot. The Canvass-back is peculiar to North America, and was known to the epicure long before it was discribed by the naturalist. The canvass-back ducks arrive in the United States from the north in October. When they first arrive they are very lean; but, from the abundance of their favorite food, they become fat about November. They are sometimes found in very great numbers. The Canvass-back is constantly attended by another species, the Widgeon, which manages to make a good subsistence from his labors. This bird is extremely fond of the tender roots of that particular species of plant on which the Canvass-back feeds. The Widgeon, which never dives, watches the moment the Canvass-back rises, and, before he has his eyes well opened, snatches the morsel from his mouth, and makes off. Among other varieties of the wild duck are the Sheldrakes, Shovellers, Summer Duck, Pintails, Gadwalls, Teals, Bluewings, etc.

Domestic Ducks. This species, in a wild state, always pairs, but in domestication it becomes polygamous, and the care of the young is left entirely to the female. It has been long common in the poultry-yard, being valued for its eggs and its flesh; and there are breeds, as the Aylesbury duck, etc., remarkable

for their great size and delicacy of flesh. In situations where they have ready access to a lake, pond, or stream, ducks are easily managed, and very profitable poultry. In other circumstances, they cannot be kept with advantage.

For the table every one is willing to admit the duck's excellence, though the want of cleanliness in its habits meets with everybody's reprobation. As a feeder, it has few equals, while its feathers in the market stand high above those of the hen or turkey and only second to those of its giant companion, the goose.

Ducks are easily hatched, and if properly managed they are easily raised—much more so than chickens or turkeys. Probably the worst thing for ducklings is the first thing they usually receive, and that is unlimited range and water to swim in. The little things are, in a measure, nude, and should be kept in pens with dry soil floors or stone pavement that can be washed down daily. No kind of poultry will succeed on bare boards. All the water they need is best furnished by burying an old pot in the ground and laying a round piece of board on the top of the water with room for the ducks to stick their heads in and fish out the corn that is put in the water. This amuses them and does no harm, while, if allowed to go off to ponds or streams, they are very liable to fall a prey to vermin in some shape, or to get their bodies wet and chilled from remaining too long in the water. Their pens must be kept clean if they are expected to thrive. The young of all ducks are great insect destroyers; hence in the garden or on the farm they will be found to amply pay for themselves. Ducks are also prolific layers, laying about 100 eggs a year. The period of incubation of the duck is from 28 to 36 days, depending upon the season, the variety, and the temperature of the air.

Tame ducks are well known to be greedy, and not nice feeders. They not only eat incessantly all day, but if it is a moonlight night they will up and at it again an hour or two before morning. They require a mixture of animal with vegetable food, being accustomed, in the natural state, to live on worms, which they are always seeking for in water. They will eat flesh and garbage of any kind; but water insects, vegetables, corn, and pulse are their proper nutriment. If fed much upon grain they fatten rapidly, and the flesh becomes delicate, but is apt to be insipid; and if fed too much upon animal food, their taste is strong and more like wild fowl. They require water, and that which is stagnant is best as affording more nourishment from weeds and insects. They are sometimes fattened in coops; but they become of a more delicate flavor, fatten equally well, and are more wholesome by having access to a pond with plenty of food. Their flesh is savory and stimulant, and is considered to be less gross than that of the goose as well as more easily digested.

The character of the duck is quite inoffensive and harmless, and is even distinguished by its social disposition. It is also valuable for its great fecundity, and the cheapness and ease with which it may be provided for, although voracious eaters, as they are.

How to Tell Ducks from Drakes. It is generally supposed that the only distinction between drakes and ducks is that the former have curls on their tails. This is not, by any means, an infallible sign, for some ducks have curls also, while some drakes have none at all. For instance, when a cross-bred Rouen and Mallard duck becomes seven or eight years old she looks exactly like a drake, curl and all. We have known a superannuated duck to be sold for a drake, just because she happened to have a curl on her tail, and had stopped laying, neither buyer nor seller being conscious of the mistake; and the poor duck would have any amount of scolding showered down upon her because she failed in her intended mission. The only true test is to judge by the sound of the voice. Ducks utter a sound very insulting to some medical men—quack, quack, but drakes only make a kind of a wheezing noise, as if suffering from a bad cold, and never say quack. This distinction can be noticed when very young, just as soon as the pinion feathers of the wing begin to grow.

Varieties. The most important varieties of domestic ducks are the Mallard, Aylesbury, Rouen, Musk, or Brazilian duck, called Muscovy and also Guinea duck, the Black East Indian, the Wood duck, the Mandarin, the Pekin and the Black Cayuga duck.

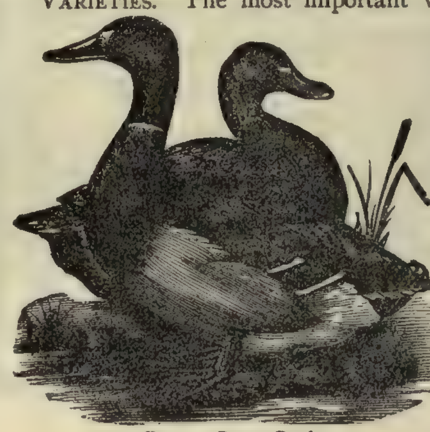


Fig. 1.—*Rouen Ducks.*

The Aylesbury is the largest, except the White Musk, and by far the best white duck. It is distinguished by its large size, its cream-white plumage, and its characteristic light yellow or cream-colored bill and orange legs. When well bred, adult Aylesbury ducks weigh from eight to ten pounds per pair, while the best specimens will reach twelve. It is the great favorite in England. The Aylesbury is a prolific layer, it being not unusual for the duck to lay more than 100 eggs, and in some instances 150, in a single season. The average weight of their eggs is about three ounces. Early-hatched birds sometimes lay in the fall. It is quiet and easily fattened, and fine for the table.

The Black East Indian or Buenos-Ayrean duck, a native of both sections that contribute to its name, is more remarkable for its beauty and excellent game flavor than for its size, being less in size than the Aylesbury. Metallic tints, varying with the light from green to a gilded purple. decorate their form of unform velvet black, their bills and feet

being of the same hue. The female has the same general color as her mate, and is nearly as beautiful, while her disposition is far more amiable. These ducks require but common feeding to be fit for the table, their flesh being prized for its high game flavor.

The Mallard duck is only interesting as being generally regarded as the progenitor of our common domestic duck.

It is small, hardy, prolific, dark gray, and is esteemed as a game bird.

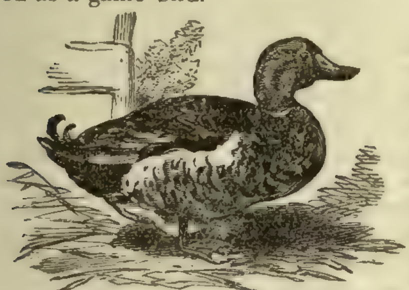


Fig. 2.—*The Common Barnyard Duck.*

The Musk duck is a native of Brazil, South America, where it is still found in large numbers in its wild state. It is occasionally called the Brazilian duck. In their wild state these ducks are very dark colored, while with us they are changed to various mixtures of brown, black, and white, and sometimes a blending of brown and drab. The adult drake weighs from nine to ten pounds, while the duck rarely exceeds half his weight. They have long bodies, short legs, and a very clumsy appearance upon the ground, which they much prefer to large bodies of water. They like to perch upon the branches of a low tree, a fence, or a low building, especially during the night. They do not rank high for the table, even when young; and the males are tyrants in the poultry yard. Time of incubation from 34 to 36 days.

The Rouen duck has for a long time been as distinguished in France as is the Aylesbury in England. It is the largest and, in some respects, the best duck of all our domestic varieties, though less beautiful in form than the Aylesbury. Its color is pleasing; closely resembling the wild Mallard. These ducks have broad, clumsily-built bodies, and when highly fattened they are very ungainly in their movements. They are remarkably quiet, easily fattened, and are most excellent layers of very large eggs, and have no equal for the table in the domestic family of ducks. The adult Rouen not unfrequently reaches from 18 to 21 pounds per pair.

The Wood duck, so called from its habit of building its nest in the hollows of trees, and also from its frequenting the edges of river groves in search of acorns—one of its principal foods in autumn—is one of the most beautiful of the duck tribe and easily domesticated, its small size making it unprofitable either for eggs or flesh.

The Bahama duck is very easily domesticated, and resembles a small Mallard with a pointed tail, but the bright red color on the base of its bill renders it a most beautiful object when swimming. Of these varieties the Mandarin duck is generally disseminated. They were originally imported to the United States in 1854. In its plumage it resembles the wood duck, but is more beautiful and elegant. It is chiefly valuable as an ornamental species.

Cayuga Black duck, one of the most superior, as it is among the largest of either American or foreign ducks, has been bred in the country so long that all trace of its origin is lost. Tradition says they are descended from a sort of wild ducks that stop in Cayuga lake and Seneca river, on their passage north and south, fall and spring. The Black Cayuga duck, in perfection, is black with a white collar on the neck, or white flecks on the neck and breast—rarely black without white; and as the white seems inclined to increase, we usually select them nearly or quite black for breeding. The duck has a faint green tint on the head, neck and wings. The drakes usually show more white markings than ducks, and the green tint on the head and neck is more strongly marked.

The Cayuga ducks are hardy, of good size, and for the table are superior to other ducks; the flesh quite dark and highly flavored. If well fed, they become very fat; can be readily made so fat that they cannot raise themselves from the ground by their wings; 12 to 14 pounds to the pair would be a good average weight.

They are very quiet in their habits; they are rarely able to rise from the ground—a fence one foot high will turn them; they are not disposed to wander from home; they commence laying about the last of March and lay 50 to 90 eggs, when they wish to sit, which they do well, but they are careless mothers; they cross readily with other ducks, and produce is certain.

The title Call-duck is given to two small varieties of the domestic duck, that bear the same relation to the full-sized birds that Bantams do to ordinary fowls. They are known as the Grey and the White Call; they both differ from ordinary breeds in their very small size; for show birds, the smaller the better. The shape of the head is also distinct; they are most esteemed when possessing a full, round forehead, with a broad, short bill. In color, the Grey Call should be an exact counterpart of the Rouen and wild breeds, not only in plumage, but also in legs, feet, and bill. The White Call should be clothed in feathers of pure and unsullied white; the bill, however, is not flesh-colored, as that of the Aylesbury, but a bright clear unspotted yellow, any other color being regarded as disqualifying the birds from success in a severe competition. Call-ducks, as their name implies, are remarkable for their loud and continuous quacking, in a shrill, high note, which can be heard at a great distance, and which renders them admirable as decoy ducks to allure the wild species to their destruction.

The Penguin duck is characterized by greater length of the femora, or upper bones of the legs, and of the bones of the feet, whilst the tibiæ remain unchanged. In consequence of this peculiarity of structure, the duck, in walking, is obliged to assume an erect attitude, like that of the Penguin. Beyond this quaint peculiarity, the Penguin duck has no specialty to call for particular observation, or to distinguish it from the

ordinary species, of which it is evidently only an accidental variation, perpetuated by the care of man. The colors of the Penguin duck are varied, and the bird breeds freely with any of the common varieties.

The Hook-billed duck is another accidental variation which has been propagated by man. It is characterized by the bill being turned downwards, instead of being straight, as in the other varieties. In color and size, they vary considerably.

The Tufted, or Crested duck is another variation which has been perpetuated and increased by the care and selection exercised by man. It is characterized by a large tuft of feathers on the top of the skull, very like that of a Polish hen. In some cases this globular crest attains a size of three inches in diameter, and renders the birds very remarkable objects.

The Pekin duck is one of the most popular breeds now raised in this country, although comparatively a modern bird for the United States, having been first imported in 1871. They are larger than the Aylesbury, but seldom weigh heavier.

Duck, To Cook. Ragout of Duck. Put the gizzards, livers, necks, etc., into a pint of good strong beef broth, or other well seasoned stock. Season the ducks inside with salt and mixed spices. Brown them on all sides in a frying pan, and then stew them till tender in strained stock. When nearly ready thicken the sauce with browned flour and butter.

Roast Duck. Prepare your duck for roasting and use the following dressing: Chop fine and throw into cold water three good-sized onions, one large spoonful of sage, two of bread crumbs, a piece of butter the size of a walnut, a little salt and pepper, and the onions drained. Mix well together, and stuff the duck. An hour is enough for an ordinary-sized duck. The gravy is made by straining the dripping; skim off the fat, then stir in a large spoonful of browned flour, a teaspoonful of mixed mustard, a wineglassful of claret. Simmer for ten minutes.

To Hash Duck. Nothing tastes better than a fat roast duck. Cut it into pieces as in carving at table, skin and soak these by the side of the fire in a little boiling gravy till thoroughly hot. Add a small glass of wine and a sufficient quantity of mixed spices to give the sauce a high relish.

Due-Bill, a brief written acknowledgment of a debt, not made payable to order, and not transferable by indorsement, like a promissory note. They are as binding as notes, and collectible by law.

Dumb Waiter, a movable frame by which dishes, etc., are passed from one room or story of a house to another.

Dumpling, a kind of pudding or mass of paste, in cookery; often a cover of paste inclosing an apple and boiled,—called also "apple dumpling." The latter may be prepared and cooked as follows: Take one pound of suet, one pound of flour, heaping teaspoonful of salt; chop the suet in a little of the flour to prevent its caking, chop very fine, then add flour and mix thoroughly; add cold water enough to make a paste; roll as thin as pie-crust; pare a dozen large apples, quarter and core them, keeping each apple by itself; place the quarters together again and cut the paste in a square to cover the apple; tie each dumpling in a square cloth, leaving a very little room to swell. Boil an hour, putting them into boiling water. Serve with hard sauce. Some cooks prefer to put the dumplings into cold water and boil until done, when they will be light. Another method is to put pared and quartered apples in a tin pan, with considerable water to cook them. Cover tight with soda-biscuit crust; leave no vent; cover close with another pan inverted over it; put on top of the stove and cook half an hour, or until the crust and apples are done.

Dun, a color partaking of brown and black. Large dun horses are generally well-tempered, good feeding animals, neither swift-footed nor very strong, but well adapted to the labors of the farm; but small duns, when somewhat lightly bred, suit excellently for the curricle or the phaeton, and when they have a dappling of a darker color upon their prevailing dun, they are thought to be decidedly beautiful.

Duress, an actual or threatened violence or restraint of a man's person, property or character, contrary to law, to compel him to enter into a contract or surrender property. The violence must be such as would naturally operate upon a person of ordinary firmness and inspire a just fear of great injury to the person's reputation or fortune. A contract obtained by such duress is void.

Dutch Cheese, a small, round, hard cheese, made from skim milk,—called also "cottage cheese." To make it, heat sour milk until the whey rises to the top; pour off the whey, put the curd in a bag and let it drip six hours, without squeezing it; chop it fine in a wooden bowl, salt to taste, and work to the consistency of soft putty, adding a little cream and butter as you proceed; then mold, with your hands, into round "pats" or balls, and keep in a cool place. It is best when fresh.

Dwelling: see Residence.

Dyeing. Formerly this process was very tedious and troublesome, requiring special attention and appliances, together with a degree of chemical knowledge not common. But with the dyes and drugs that may now be obtained at any drug store, a ribbon, a feather, a soiled or faded dress may be quickly, easily and cheaply dyed.

General Directions. See that everything is clean. Scour the goods in soap, then rinse thoroughly; sometimes they are steeped over night in soap dye. Before putting goods into the coloring matter, dip them into water, to guard against spotting. In coloring, soft water only is used, and sufficient to cover the goods. In the recipes that follow, this is always understood where the quantity of water to be used is not mentioned. When the fabrics are dyed they should be first aired, then rinsed well, then hung up to dry.

Never wring silk or fine materials of any kind, either in scouring or dyeing. If a light color is to be given cotton goods, they should be bleached before coloring.

TO DYE COTTON GOODS. BLACK. For each 5 pounds of goods boil half an hour in a decoction of 3 pounds of sumac, and steep in the same 12 hours; then dip in lime-water for half an hour; remove and let them drip 1 hour; then run through the lime-water again for 15 minutes. Now make a new dye of 2½ pounds of logwood, boiled 1 hour, and dip again for 3 hours; then add 2 ounces bichromate of potash to the logwood dye, and dip another hour. Wash in clean, cold water; dry in the shade, and you have a permanent black,—one that will stand anything.

For coloring black that will not crock: Extract logwood, 3 ounces; copperas, 1 ounce. Dissolve copperas in an iron kettle; dip goods in copperas water; after wetting thoroughly wring out, air a few minutes, then dip in logwood dye, bring to a boil, keep in dye about 1 hour, occasionally airing; color in iron kettle, wash and rinse; when dry, is ready for use. The secret consists in keeping the dye apart.

RED. Take muriate of tin two-thirds of a cupful, add sufficient water to cover the goods, and raise to a boiling heat; boil an hour, stirring often; then remove the goods, empty the kettle, fill with clear water, and add 1 pound of nicwood. Steep half an hour at blood-heat, then put in the goods and increase the heat to almost boiling for one hour. Now air the goods and dip for an hour, then wash without using soap.

SKY BLUE. For each 3 pounds of goods take 4 ounces of blue vitriol, and water to cover; boil a few minutes, then dip for 3 hours, and pass the goods through strong lime-water.

OTHER SHADES OF BLUE. For 5 pounds of cotton cloth dissolve 5 ounces of copperas, drain off, boil in the copperas water 1 hour; then dissolve 5 ounces of prussic potash in clear water; put in your goods, and scald well, frequently turning them; then lift from the dye, drain them, and air them one-half hour; then add 2 ounces of oil of vitriol; dip again, rinse well in clear water, and dry them. Be sure to have your goods thoroughly wet before dyeing them any color, or they will be spotted. Two shades of any color may be obtained by leaving some rags in the dye longer than others. Woolen goods always take the dye most readily.

BROWN. A beautiful brown may be obtained by putting the goods through a solution of prussiate of potash after having colored them blue by the last recipe.

Or, for 5 pounds of goods dissolve 1⅛ pounds of catechu in sufficient water to dip the goods; in another vessel dissolve 4 ounces of bichromate of potash in a like amount of water. Have both liquids hot; dip the goods first in the catechu liquid, then in the solution of potash alternately, until the color is of the right shade; wash in cold water. Bichromate of potash is the proper mordant for catechu.

YELLOW. Use 7 ounces sugar of lead for 5 pounds of goods; dip for two hours, then make a new dye with 4 ounces bichromate of potash and dip until the color suits. Wring out and dry, repeating if not yellow enough.

ORANGE. For 5 pounds of goods use 4 ounces sugar of lead for the first dye; boil a few minutes and after cooling a little, put in the goods. Dip for two hours and wring. Make a new dye with 2 ounces madder and 8 ounces bichromate of potash, and dip until color suits. If the color is too red dip a sample into lime-water and take your choice.

Or, prepare a lime-water, as for whitewash, the stronger the deeper the color. Let the lime settle; drain off the clear water and boil; while boiling put in the goods which have been colored yellow; rinse well in cold water.

GREEN. Dip the goods in home-made blue dye until blue, then dry and rinse a little. Take fustic, 3 pounds, and 3 ounces logwood to each pound of goods, and make a dye by boiling one hour. When sufficiently cool to bear the hand, put in the goods, move briskly about for a few minutes, and then let them lie an hour, after which remove and thoroughly drain. Then dissolve and add to the dye half an ounce of blue vitriol for each pound of goods, and dip another hour, then wring and dry in the shade. Any shade of color may be obtained by adding or diminishing the logwood and fustic.

TO DYE WOOLEN GOODS. BLACK. Use 6 ounces of blue vitriol for each 5 pounds of goods. After boiling a few minutes, dip the goods for ¾ hour, airing often; then remove and make a new dye by boiling 3 pounds logwood for half an hour. Now dip the goods ¾ hour and air, and then for ¾ hour more, and wash in strong suds. It is said exposure to the sun will not fade this color.

BLUE. For each 2 pounds of goods make a dye of alum, 5 ounces, cream tartar 3 ounces, in which boil the goods one hour, then put them into warm water containing more or less extract of indigo, according to color desired; boil until the shade suits, adding more blue if necessary.

SCARLET. For each 2 pounds of goods make a dye of 1 ounce cream tartar; pulverized cochineal, 1 ounce; muriate of tin, 5 ounces. Put in the goods while dye is boiling hot, stir briskly for 15 minutes, then boil 1½ hours, stirring slowly. Wash in clear water; dry in shade. Said to be very fine.

PINK. For each 3 pounds of goods take 3 ounces of alum; boil and dip an hour, then add to the dye 4 ounces cream tartar, pulverized cochineal 1 ounce. Boil well and dip goods while boiling until the desired shade is obtained.

MADDER RED. For each pound of goods, use alum, 5 ounces; cream tartar, 1 ounce. Put in the goods and bring to a boil for ½ hour, then rinse and boil ½ hour longer; empty, and fill the kettle with clean water, into which put one 1 peck of bran; raise to milk heat; let it stand until the bran rises, then skim it off, and put in madder ½ pound. Put in

goods, and heat slowly to a boil. Use strong soap-suds in washing.

DARK SNUFF BROWN. For each 5 pounds of goods use 1 pound of camwood, boiling 15 minutes, and then dipping 3/4 hour. Remove goods and put 2 1/2 pounds of fustic into the dye; boil 15 minutes; dip goods again for 3/4 hour, then add blue vitriol, 1 ounce, copperas, 4 ounces, and dip for 1/2 hour. More copperas will darken the shade.

PURPLE. For each 3 pounds of goods use 6 ounces cudbear. Rinse the goods well in soap-suds, then dissolve the cudbear in hot suds (not quite boiling) and soak goods until the desired shade is obtained. Brighten by rinsing in alum water.

CRIMSON. Work for 1 hour in a bath made of 1 pound of cochineal, 1 pound cream tartar, 1 pint protochloride of tin. Wash out and dry.

To dye yarn for STRIPED stockings, when your dye is ready, dip only 1/2 the skein into it, leaving the other white. If you wish to dye in two colors, the first color must be dried before attempting to dye the other half.

TO DYE SILKS. BLACK. Use the formula for dyeing woolen goods black, except that it should be weaker. Work the goods in the bichromate of potash, a little below boiling heat; then dip in the logwood. If colored in the blue vitriol dye use about the same heat.

PURPLE. Dye a light blue first by dipping in the home-made dye, then dry. Now, for each pound of goods take 4 ounces of alum, water to cover, and dip in the goods while the alum is warm.

CRIMSON. For each 2 pounds of goods use 6 ounces of alum; dip at hand-heat for one hour, then take out and drain while you make a new dye of cochineal, 6 ounces; bruised nut-galls, 4 ounces; cream of tartar, 1/2 ounce, in 6 gallons of water; boil the mixture ten minutes, and when a little cool, begin to dip, gently raising to the boiling point; dip for one hour, and then wash dry.

SKY BLUE. (Either silk or cotton.) Take 2 ounces of blue vitriol and dissolve in 1 gallon of water. Dip the goods in this for 15 minutes and then run through lime water. Said to be beautiful and durable.

BROWN. (For silk or cotton.) After dyeing sky blue by last recipe, run the goods through a solution of 1 ounce of prussiate of potash dissolved in 1 gallon of water. Simple and cheap.

GREEN. Take 1/2 pound of yellow-oak bark for each pound of goods; boil 1/2 hour, and then turn off the liquor and dissolve it in 6 ounces of alum; let it stand until cold. While making this give the goods a light blue in the dye-tub; then dry and wash them, after which dip in the alum and bark dye. If the goods do not take color well, warm the dye a little.

OLD-GOLD. To dye silk or satin a beautiful old-gold color, take green horse-radish leaves, steep them in water, make a strong dye; after dipping the silk or satin into the dye thoroughly, wash in soft-soap suds; iron while damp, laying a cloth over the silk. This should always be done when ironing silk or ribbon, even if it has not been washed, but simply sponged.

To color LINEN, make a strong solution of black tea, and mix it with the starch after washing the goods. Then dip the goods in this starch and dry quickly. Boiling linen in a decoction of common green grass or good hay will make it look new.

To color OLD DRESSES, either cotton or worsted, any shade of drab or slate color. To color 14 yards get 1 pound cheapest black tea, probably any kind of cheap tea will do; boil thoroughly with old rusty nails, or any kind of rusty iron in the tea; get the shade you want by the amount of water used. It makes a very pretty color to color over light dresses.

To color a FADED SHAWL, take 5 cents' worth (more will do no harm) of extract of logwood, and copperas the size of a nutmeg; put into an iron boiler or kettle, with water sufficient to well cover the goods. Scald and stir well from the bottom until dissolved; then put in the goods and scald half an hour; take out and drain, after which scald in skimmed sweet milk. You need not have your hands stained in the processs if you avoid handling the goods before scalding in the milk. Wash thoroughly after scalding. If the shawl is all wool, it will hide the stripes, but cotton will not take a perfect black.

To color KID GLOVES BLACK, take 4 ounces of alcohol and a handful of logwood chips; dissolve the chips in the alcohol, put the gloves on your hands, and put the liquid on with a sponge.

To color GRASS, take 1 pound of alum to 5 quarts of water, dissolved on the stove in a tin pan; when a little cool, put the grasses in, and let stand until formed. Gum-arabic water is the best to stick flour or dry paints on grasses. Get 5 cents' worth of chrome yellow, chrome green, ultramarine blue, Vandyke brown, and carmine,—all dry paints. The mucilage should be shook off the grass, so that little remain. Then whip them in the dry paint, tipping brown with blue, etc. Enough of the dry paint sticks on to color them beautifully. These mixed with the crystallized grasses make pretty winter bouquets.

ANALINE DYES. These are put up in packages which may be obtained at drug stores. They embrace almost every conceivable tint, and are not expensive. Full directions accompany each package. They save much trouble, and as a general thing are not apt to disappoint.

Dye-Stains, HOW TO REMOVE FROM THE HANDS: Wash them in cold water that is made about as sour as lemon-juice with sulphuric acid (oil of vitriol); wash them thoroughly in pure water immediately afterward.

Dynamometer (di-na-mom'e-ter), an instrument for measuring the force or power of a machine or plow, the amount of draft, etc.

Dysentery, inflammation of the mucous membrane of the large intestine, attended with bloody evacuations and pains. It is very liable to be mistaken by ignorant observers for the far milder disease

of diarrhœa. It begins with a griping pain, and a desire to void the alimentary contents. In general, little is voided at a time. The matter discharged is composed chiefly of mucus mixed with blood. A dose of castor oil with 2 teaspoonfuls of paregoric, mixed, taken once a day, will relieve dysentery. No solid food should be eaten, and the drink ought to be flaxseed tea, or some other demulcent. Laudanum is also efficacious to check the discharge. Take 20 or 30 drops for an adult. Or, mix 1 drachm each of powdered rhubarb, saleratus, and pulverized peppermint, and ½ pint each of the decoction of anise seed and hot water; strain, sweeten, and add 3 tablespoonfuls of brandy, and take a tablespoonful every hour. *Hygienic*: Same as for diarrhœa. As soon as one suspects he may have dysentery, he should call his favorite physician.

Dyspepsia. A person is, in common language, said to be dyspeptic when the appetite is impaired or lost; when there is a load and weight at the stomach after taking food, with eructations of gas, and sometimes of an acid fluid into the mouth; accompanying these symptoms is nausea, an occasional sickness, with a tense headache at the back of the head, or localized over the eyes; very often, also, there are dark specks before the eyes, and the eyes themselves look heavy, yellow, with a dark circle beneath. The tongue is red; the papillæ small, but elongated, and the organ itself enlarged, indented by the teeth, or pale and enlarged in the same way, or covered with a white or yellow fur; the bowels are costive, the water high colored, and with a red, or more rarely, a whitish sediment. Such are a few of the more prominent symptoms of the different kinds.

The principal causes of dyspepsia, and the whole train of distressing complaints resulting therefrom, are produced from the present fashionable habits of luxury and intemperance, both in eating and drinking, such as spirituous liquors, high-seasoned meats, excessive use of tea and coffee, hot bread, spices, pastry, tobacco in every form, irregular evacuations, excessive venery, swallowing the food without chewing it sufficiently, overloading the stomach, derangements of the liver and spleen, want of exercise, and pure air, the depressing passions, or great anxiety of the mind, and whatever has a tendency to debilitate the lining of the stomach, so as to prevent it from the healthy performance of its functions.

People in cities, whose minds are distracted with the pressure of business, and who are forced to great irregularity in sleep and eating, are peculiarly liable to dyspepsia. Farmers and their wives and children, who live in the country, who labor daily, never hurry, sleep sound at night, and eat wholesome articles of food, and who drink cold water, or very weak tea and coffee, are seldom affected with it. In the country, milk is the drink of children, instead of tea and coffee, which, no doubt, contributes greatly to strengthen and fortify the stomach against disease. In the beginning of dyspepsia strengthening medicines should not be given. First, remove the load or oppression, then improve and strengthen the digestive organs. This may be done by a gentle dose of ipecacuanha, from 5 to 10 or even 20 grains, and when the operation is over and the stomach has become quiet, give a gentle purgative, as Seidlitz powder. For children, a drachm of rhubarb, and the same quantity of calcined magnesia, divided into four equal parts, one stirred up in syrup and given night and morning, will relieve the digestive organs from sourness and wind colics, with which young persons are so much tormented. We recommend all dyspeptics to apply for competent aid, if they find their complaints to resist their own treatment for two or three weeks. A proper diet is one of the best remedies.

E

EAR, an animal's organ of hearing. Its internal structure is somewhat similar in man and in the numerous species of the higher order of quadrupeds; and it possesses, in all, a very complex and yet simple organization, exquisitely adapted to its functional uses, beautifully combining utility with protection, and admirably illustrating the wisdom and beneficence of the Creator. Its external structure, in the several animals, varies in adaptation to their respective habits and constitution, and affords, both in its general form and in its wide variations, high and striking evidences of minute and most benevolent designs. Though any description of either the internal or the external structure would be out of our province, yet one great differential feature may be noticed, that the outward ear of timid and graminivorous animals usually lies backward, to enable them to detect sounds of danger or pursuit, while that of the predacious and carnivorous animals usually lies forward to enable them to catch every intelligence of prey.

The outward ear of the horse is a truncated, obliquely severed and very elegant cone, so admirably constructed as to receive a vast volume of vibration in the air, and so exquisitely mounted on organic mechanism as to wheel and circle and oscillate with the utmost power and freedom of motion. The ears of a horse, especially of a spirited one, are in continual play, and are so often and easily stretched in directions opposite to each other as to serve the purpose of a double organ, and possesses such power and play of nerve as to afford expressive indications of temper and intention. "The ears," remarks Mr. Blaine, "we usually suppose criterions of the spirit of the animal," and we have seldom seen a horse that carried one ear forward and the other backward during his exercise, especially if on a journey, but what was lasting and good. The reason appears a plain one; a horse of spirit, strong, and not easily fatigued, is attentive to everything around him, and directs one ear forward and one backward to collect sounds from every quarter. We need not mention that the ears are an indication of the temper of the animal, and that he is seldom either playful or vicious but the ears are laid flat on the neck. It was kind in Providence to give us such a warning in an animal who does not want craft to surprise us, nor strength to render his resentment terrible. The twitching of a horse's ear in the way of discipline or punishment may occasionally be necessary in a case of obstinacy, and in order to prevent a severe application of the whip to other parts of the body; but generally it is both unnecessary and cruel, and sometimes it inflicts very painful wounds and contusions. When a wound in the ear is merely a laceration of the cartilage, it readily heals; but when it is an ulceration of the integument and the cellular substance, it will probably be healed by no gentler means than powerful caustics or the application of the cautery.

The ears of cattle have a very different form and size in some breeds than in others; and they constitute one of the minute or secondary points by which the character and the comparative value of breeds are judged. They are usually of well proportioned size and freely movable in the polled breeds, and are comparatively small, inconspicuous and stiff in most of the horned breeds.

The ears of some breeds of swine are peculiarly and amazingly subject, in the back part of their great lops, to troublesome cracks and sores. A good cure in these cases, as in that of scurf in the ears of cattle, is calamine and rosin ointment. If there is any disposition to mange in swine, it is most evident about the ears, and the mischief is sadly aggravated when brutes in human shape set their dogs on them, the favorite hold of which is the ear.

Ear-wax assists the hearing and is so bitter and offensive to all insects, that the fear of ear-wigs, etc., entering the ears is to a great extent unnecessary. Instances of insects entering the ear, are, however, not altogether unknown, although it is difficult to account for their doing so.

Ear-wigs in the Ear. If one of these insects should crawl within the ear, and a piece of apple is applied to the ear the insect will crawl upon it, it being fond of apples; or some drops of sweet oil, oil of almonds, or olive oil may be dropped into the ear, which will instantly kill this or any kind of insect. Insects are deterred from attempting to penetrate the ear by the offensive bitterness of the wax it contains, but they sometimes get in, and are unable, although desperately anxious, to get out.

Ear, a spike or head of corn, oats, barley, wheat or other cereal grass. Ears of grain, though an almost universal popular phrase, is a somewhat indefinite one, and cannot be used in botanical or minute description.

Earache. This troublesome complaint is sometimes occasioned by some foreign substance getting into the ear, or by exposure to cold, or by the forming of an abscess. Dip a piece of wool into a little sweet

oil, and place it into the ear. The progress of this painful complaint may often be checked by means of a large poultice of bread and milk, with a little fine oil added. This should be applied as warm as possible and renewed every three or four hours. At the same time an aperient medicine should be taken. A little warm oil of laudanum dropped into the ear sometimes gives relief, and may be used before the application of a poultice. When suppuration appears, a little warm milk and water should be used for its removal, with a syringe, several times a day, care being taken not to use too much force. The following remedies are recommended: Boil a fig for five minutes, wrap it in a piece of rag and put it into the ear, binding it on with a handkerchief round the head. When the earache is very severe and of long continuance, put a small blister behind the ear in addition to one of the above remedies, or a leech may be applied to the same part; or put 4 drops of best kerosene oil and the same quantity of laudanum into a teaspoon; put in a little bit of cotton batting, about enough to absorb the mixture; hold the spoon and contents over a lighted candle until it begins to hiss with the heat; turn the cotton over, apply spoon and contents once more to the heat, then pinch out the cotton; put it hot in the ear; tie a bandage over the ear to keep the heat in, and relief is immediate. If you are subject to earache, keep a small bottle with each or the articles named, and you can get relief at all hours of night or day in a few minutes.

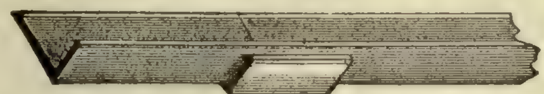
Place in the ear cotton wool moistened with sweet oil and laudanum. A flannel bag of salt, or chamomile flowers, made very hot and applied to the ear at bed-time, will often give relief. Or, a roasted onion, and hartshorn and oil, are household remedies. If it arises from heat, frequently apply wet cloths. If from cold, boil rue, or rosemary, and steam the ear through a funnel. Or, rub the ear hard for a quarter of an hour. Tried. Or, be electrified. Or, soak the feet in warm water; roast an onion and put the heart of it into the ear as warm as can be borne; heat a brick, wrap it up, and apply to the side of the head. When the feet are taken from the water, bind roasted onions on them. Lard or sweet oil, dropped into the ear, as warm as it can be borne, is good. Or, drop in juice of onions. Or, take equal parts of the best strained honey, balsam copaiva, and brandy; put in a bottle, and, when wanted, warm and shake it thoroughly, and put two drops in the ear three times a day, until relieved. It will cure deafness when caused by cold. A little piece of raw cotton will keep the oil in the ear.

Hardened wax in the ear may be softened with oil and then syringed out. Insects and other foreign bodies may be carefully swabbed out or syringed out. Do not introduce sticks, tweezers or other hard substances into the ear for taking out these things, as there is great danger of injuring some delicate organ permanently.

Ear-Mark, a notching, clipping, slitting, or other artificial mark, made on the ears of cattle, sheep, dogs or other tame animals, with the design of distinguishing them from other individuals or flocks of their own species. In counties where stock is permitted to run at large these marks are recorded generally in the county clerk's office and then they become legal means of identifying stock.

Earnest, any portion of price or wages, paid or given as ratification of contract. The smallest portion, even a penny, is sufficient; but in order to make it binding on either party to the terms of the agreement, it must be expressly stated to be earnest.

Eave-Trough. This economical attachment to



Eave-Trough.

every building is made either of wood or tin, the former being generally preferable. The styles of each are somewhat various, the greatest difference being in the degree of substantialness with which they are constructed. Probably the best kind is the literal trough, consisting of single pieces of guttered wood, joined at the ends only, if joined at all; but the cheapest and quickest made is that which consists simply of two boards nailed together, as illustrated in the annexed cut, with the seems filled with putty, pitch or other like substance. The joints should be embraced by a bracket, as seen in the engraving. See Residence.

Eccentric (ek-sen'tric), out of center. An eccentric wheel or disc performs the office of a crank.

Eclectic, selecting; taking points from many or all systems; as, the "eclectic" system of medicine; an "eclectic" philosopher, etc.

Economy, management of domestic affairs; system of rules by which anything is managed; wise management; prevention of waste. We have "domestic," "political," "social," etc., economy. See Domestic Economy. Political economy is the science of wealth,—the accumulation and distribution of wealth; and in national affairs questions of currency, tariff, finance, etc., are involved in political economy. Changing the volume of currency is generally considered bad policy, as the mysterious fluctuations of prices which it occasions gives unprincipled speculators the advantage of the laboring classes. In comparing prices, one should consider both what he buys and what he sells. For example, labor at $1 a day when wheat is $1 a bushel is the same to a man as when labor is $2 a day and wheat $2 a bushel.

Education, that discipline and knowledge which one obtains by systematic study. In the broadest sense, everything that we see, hear, touch, taste, smell and think of has a tendency to "educate" us in some direction or another; in the more restricted sense, "education" signifies that knowledge and mental discipline which we obtain at school. By "mental discipline" is meant such a culture of the mental powers

and systematizing of the data of knowledge or facts, as enable one to make use of his knowledge when he needs it. There is the same difference between knowledge and discipline as between tools and the having of them at hand in good trim, with ability to use them properly.

There is no topic of more vital importance to the farmers of America than that of education, and none should receive from them more zealous attention. We will divide this article into two departments; in the one we will speak of the common schools, and the education obtained therefrom, the other we will confine to agricultural education.

While we have a very elaborate and excellent system of education, yet it is evident that the schools of the rural districts are not doing the good they should and might do, as they do not sufficiently allow for the peculiar talents of each pupil, and their courses of study are too far behind the demands of this utilitarian age. We wish to show why and how it is that almost the entire force of our common schools tend to throw our young men away from the shop and the farm, and to drive them into the scholastic professions; or pile them up in huge stacks of agents, clerks, and office-seekers. A committee of the Massachusetts Legislature, where the whole system originated, and where it has been carried to greater perfection than perhaps in any other State, report that "the results of their system of schools is not satisfactory;" and that "the public school system of New England fails to meet the demands of modern civilization."

The great uprising of the industrial classes, and their new attempts at founding schools all over the republic, whatever may be said or thought of their work, shows the same fact. Along side of the efforts to confine children, through all their young and growing years, to school-rooms, and the abstract studies in books, the nervous system has become either excessively developed or diseased; insanity has greatly increased; a whole crop of brain and nervous diseases are said to have sprung up, some of which are not developed till late in life; females in particular become inert, weak, and nervously diseased, indisposed and incapacitated for the real duties of the wife and the mother, insomuch that the most highly educated races are perpetually running out, and giving place to races of less so-called culture, but of greater stalwart vigor; all of which tends to show that we may be making them over into angels a little too fast for the good of earth and time; or, if not, it betokens widespread distrust and doubt, not of our present system as such, but of our present mode of running it. The general complaint that children are kept in school so continuously that they become dull and listless, and although immense sums of money are expended upon the schools, that they do not after all leave them as well fitted for the real duties of life as they used to do in half the time, and at less than half the expense, shows the same general fact of uneasiness under our present administration.

However great these evils may be, or may not be, one great vital and all-important end of the school system is, after all, being perpetually realized and attained, whatever else may fail; the children of our nation are learning those habits of self-government and self-restraint in public, in crowds, and acquiring a sort of homogeneity in manners, tastes and feelings, which could never be learned at home; and which perhaps tends to conserve and perpetuate the freedom of the republic more than all else combined.

But we wish to more particularly point out some of the evils that have grown up under our system, that affect the farmers and the industrial classes in the rural districts.

The first is the curse of "thoroughness" so-called, which is really not genuine, but a sham thoroughness. In a philosophical point of view, a child cannot go thoroughly into any subject whatever, and it is utterly absurd to attempt to make him do it. It would not be more absurd to attempt to glue tassels and ripe ears upon a corn-stalk as soon as it is out of the ground, in order to make a sort of dumb show of an early harvest, and seem to outstrip the old-fogy pace of your neighbors. A child's thoroughness, in any such sense, is all a mere sham. More than that, it is a curse that may and will weight him down in all after life. Nature requires, everywhere, that things should slowly grow into all organisms, physical, mental and moral; they can neither be pounded into them, nor glued or tied on to them. It is as absurd to attempt to teach a child what a man ought to know, as it would be to attempt to make him lift or eat what a man does. He cannot safely even begin those forms and modes of knowledge that are peculiar to riper years; or if he does he begins at the peril of his physical or intellectual well-being, or both. He may, indeed, seem to be a prodigy when he is young, but he will be dead, or a fool, before he grows old. Long continued, wearisome and exhaustive attention to any subject whatever, is unsuitable for a child, under pretense of giving him something to do. Something to do!! Who ever saw a young child idle? Something to do!! Why, has he not got all the flies of the house, and all the butterflies of the field to catch and examine; his top, and whip, and skates, to mend and to spin, and ten thousand other things to do, that no mortal else ever thought of? Has he not got to stand on his head, knock his hat-crown in, and wear holes in his shoe-toes, knees and elbows? Look into a boy's drawer, where he keeps his own peculiar "school apparatus," and you will find out that he has got enough planned out to do for a life-time. Has he not got to eat tons of green apples and other coarse vegetable and animal products, and before he is a dozen years old, to transform all this rough garbage into at least one hundred pounds of good, solid, human bones, muscles and nerves, so firmly, and yet so delicately elaborated, that they are fit for an angel's use? All these things which he now contrives to do for himself, help him forward in this first, greatest, and most important part of all his life-work on earth. When will it get through our stupid, scholastic heads that the

first duty of every born man and woman on earth, both to God and man, is to eat, to drink, to rollic, and to grow? And if they are simply shielded from harm, and kept out of unendurable mischief, and allowed to do it, much in their own way, it is the best thing we can do for them, or with them, for well nigh the first ten years of their life. Some little general shaping of their course, some power of reading, some "kindergarten" care, either in school or out, and better out all the time than in, more with reference to varying their tastes and employments, and improving their moral feelings, than in hope of making them savans in anything, is about all we can safely do for them.

In a world where no man thoroughly knows how a candle burns or a blade of grass grows, or his own eyes see, what consummate folly to attempt to make a mere child thorough in anything. Nature and Nature's God give a child a sort of bird's-eye view of a vast variety of things in their most natural and simple relations without protracted or profound views of anything.

It is evident that those who would be anything, or become anything, must elect some very small part, to start with; and one of the chief uses of our schools (after confirming them all in the great *moral* American *habit of self-government*) is to enable them, by giving them tastes and snatches of as wide a range of subjects as possible, connected with the real arts and interests of common and social life, more intelligently to make this proper selection for themselves.

We should not assume that they are to become teachers, or experts in any one thing whatever, that can be got out of books; for not one in a thousand of them ever will, or ever ought to, do so.

Take for example our four fundamental branches: reading, spelling, writing and arithmetic. These are the keys that unlock the gateways of knowledge to all other branches, and open the doors to all other forms of human intercourse, human thought, and human knowledge. Of course, some knowledge of these is an indispensable necessity, as a first step, to every child alike. But how much? that is the question. To become an expert at any single one of these most simple and elementary of all the forms of learning, a man must devote his whole life to the task; and then probably not one in a hundred would really succeed. Amid all our schools and schoolings, a real expert at reading, writing, or arithmetic, is about the rarest of all men found. The fact is, that even in these most common and indispensable of all branches of human learning, there is no more sense in keeping our children drumming and thumbing over them in the schools, year after year, as though we expected to make them experts in one, or all of them, than there would be in trying to fit them out with a pair of wax wings, to fly to the moon with. A child should be taught to read, write and cipher, well enough for a child—not for a man; an expert; a writing master; a stage player; an United States senator; and there the whole subject should be dropped, giving him pen, ink, and paper, and interesting books to read; and in his regular school drill he should pass on to something else, of more interest and importance for him.

Who ever thinks of reading, writing, or ciphering, as our teachers tried to drill us to do when we were boys? To be sure, we use the same alphabet, and that is about all of it. With good books, eloquent speakers, interest tables, and lightning calculators lying all about us, we soon make out methods of our own, for our own peculiar use, shorter and better than any school-drill in childhood can possibly give us, and have no need to fill our heads, to start with, so full of dry, abstract, memorized rules, that there is no room for brains in them.

In all this we are fully aware of the popular monomania for spelling, or of the pedant's unpardonable sin of not knowing how to spell; and of the common impression, that if a child is not drilled for years in the spelling book he never will learn to spell. Well, suppose it is so; it may be better still not to know how to spell or write all the totally absurd words in the English language, than it is to know nothing else. The man who can make a plow, or invent a plow, or hold a plow, is a vastly greater man, all other things being equal, than one who can only spell it, however many silent letters he may hitch on to it.

Reading naturally divides itself into two branches: reading for personal information, or silent reading, and loud reading for the benefit or amusement of others, or elocution. The first is of vastly the most consequence to all children in our common schools. The sole thing for the child here is, that he should learn to associate every printed word with its common conversational, natural pronunciation or sound, and its exact idea. A better way to teach him exactly how not to do it could not be devised than to set him to declaiming, in an unnatural orotund voice, high flights of oratory, or poetry, of which he cannot possibly have an adequate and proper conception, no more than he can of the man in the moon. One of the greatest curses that can befall any man, and especially any child, is to form the habit of using words which he feels he does not know the meaning of.

In writing, a child ought, first, to learn to write his name in the simplest and clearest form of letters possible, with no flourish of great, sprawling capitals or shadings about it. He should approach this one most useful thing to be achieved, equally necessary to all alike, by the simplest and best analysis of all the parts of the letters of the alphabet, but with no flourish of trumpets or pens whatever, under pretence of giving him a free hand, or making him an expert at mere writing. When he can write a passable letter to his young friends, he should be let alone, and left to practice by himself, and to feel that something is really accomplished, actually done with for the present, and that he is not to be put on a life tramp over a never-ending sea of flourishes.

Children are drilled and trained and schooled in geography till they are well nigh schooled out of the world, instead of being made acquainted with what is in it. They start with a wheelbarrow full of books,

in endless series and progressions; of all imaginable shapes, forms, sizes and editions; with the last improved edition in their satchel as a specimen. A school boy of eight or ten years really needs a dray-cart to get his books to school with, and back again; and he is drilled in this matter af geography as though it was expected that his future life-work was to be world-making, and that he was in great danger of getting some island of two acres in the South Seas or some village in Kamtschatka misplaced, or of making some river in Africa to run up hill. But most probably the poor child will never make a world in all his life; though he may get his head so full of mere memorized names and localities that there is room for nothing else in it.

Then comes grammar, with another host of memorized rules, which every sensible man takes special pains to forget as soon as he possibly can, in order to make room, in his head, for matters of more importance.

The boy who has learned not to swear when he pounds his fingers with a hammer, and the girl who has not learned to exclaim, "Oh, dear!" or "Awful," when she breaks a teacup or bespatters her dress, has already learned the most important rules in the use of the English language. For the remainder, if in some very brief book, or on the blackboard, those errors or vulgarisms most common in each location were simply pointed out to the pupil for practical correction, whenever he speaks or writes, without any wearisome memorizing of abstract rules whatever, it would do more and better for him, as a child, than all that Lindley Murray and his whole succession of grammatical saints have written from his day to ours. When a boy has decided to become an expert, or a teacher of language or of literature, then he should commence the metaphysical study of grammar, and not before. We all learn language and use language only by habit and by imitation; and never by rule. No man, from Adam's day to ours, ever yet learned a spoken language by rule, or ever will so learn it; and those few, who even think of any of their rules while speaking or writing, always advertise you of the fact. Their thoughtful, stiff, precise, "school-marm" mode of utterance always seems to say to you: "I am a pedant or a pedagogue. I have been clean through the grammars. I know a thing or two that you don't."

Then there is airthmetic. Suppose you should take a boy and tie upon his back all imaginable sorts of tin cups, and gill-cups, and quart and gallon cups; tight lace him with all sorts of tape-lines, strings, sticks, chains, and measures; fill his pockets with all sorts of old coin and spring steelyards; put all sorts of peck measures, baskets, and bushels over his head, already filled brimfull with all imaginable sorts of fractions and rules of fractions, and send him thus equipped out into life because he may happen to want to weigh or measure something, you don't know exactly what, in after years, and you wish to have his apparatus always with him, right at hand. He needs his measures ever at hand, as much as he does his memorized rules and tables. He can do nothing without the one any more than the other: why not have both always at hand in all after life? If a man is going to sea, or into the army or navy, where sudden emergencies may arrest him, with no possibility of consulting anew either tables or books of any sort, he should, of course, have the most essential parts of his library reprinted on his brain; for there alone it becomes practically available. And so, too, he must keep all his other apparatus on board, or along with him. But how, if in five minutes at any time, he can go into his pantry or library, and find whatever of these things he may need to use for the next six months, need he try to pack them round with him all his lifetime? As a plain matter of fact, not one in a thousand ever did do it or ever will do it. Men of action and enterprise will not burden or bother their heads with retaining such scholastic trifles. They will soon throw them all overboard, to make room for something vastly better and more important.

Of course, all of these studies are both elemental and fundamental, the indispensable tools of all other forms of knowledge. But how much time shall we spend on these mere elemental tools, before we begin to look out toward their application to real life as it is and must be? Shall we pause over these mere elements of tools for the whole common-school period of life, before we begin to cast an eye out to the big world as it actually is, and as God himself made it, solely for our education? or, shall we go through the thirty-nine years' course of Harvard, in still studying these mere tools and elements of all human knowledge? Where shall we stop? and why? That is the prime question, especially for all our workingmen on farms and in shops. If we wanted to make a practical mechanic, would we require that he should first acquire a thorough knowledge of the theoretical use of all the implements and tools and machines of the globe, or even of any one of them, before he attempted to strike a blow, under the pretext of disciplining him for his trade, or of giving him a broad culture? Who, that really knows anything about it, does not know that such sort of discipline, is dicipline to the death, for all the great ends of practical industrial life, however good it may be for mere teachers and experts; and that such broad culture, even in their case, often becomes at last as broad as vacuity itself? It is true they get, as they say, a "rounded development,"—as round as a stove-pipe, and just as hollow. The whole scheme is pedantic, scholastic, artificial, and unnatural. God made the actual, practical world of honest labor as it actually is, for the sole purpose of properly disciplining, developing, broadening, and rounding out all the faculties of man; rounded, not like a stove-pipe, full of wind, but like a cannon-ball, full of solid metal, sure of its aim and resistless in its force; and the man or the boy that is taken out of this great common school of our Heavenly Father, the actual service and hard work of the shop or the field, for more than half his growing years, is actually robbed of the best and

most important part of all possible education for any industrial art or service whatever.

One of the chief evils of this school system is that the book-makers and publishers have assumed about as absolute control of the schools as the "politicians" have of the post-offices; neither teachers nor parents nor committees have any real control over their absolute practical direction. Publishers often pay fabulous amounts to have their books introduced. They will send oily-tongued agents into the country to show the superior merit of their series of books over those in use. He will offer to make exchange—book for book—for all the old books then used in the school. This is simply done to get the pupils to using their line of books, knowing that when once introduced they will then be forced to pay the exorbitant prices at which they are sold ever afterwards, or at least until some other man comes along and takes them up and replaces by others. An agent for a school-book publishing house told us that during one season he took up about 80,000 volumes of school books from the State of Wisconsin. This enormous expense of frequent changing and salaries and expenses of agents have to be paid by the farmers. Books are, of course, generally made by experts. Every expert desires duly to magnify his office and his department: a mathematician naturally thinks that God and nature are nothing but an unsolved problem in mathematics; a chemist thinks they are all in the bottom of his crucible; a linguist or an elocutionist thinks they are all "voice and nothing more;" while a spelling-book maker thinks they are all spelling, and, in English at least, all spelled wrong. Each one wants to make a book on his department: he wants every child to be "thorough," at least in that. He soon finds that it will take a series of books to go over even the elements needful to an expert, and that if you were to begin with a child as soon as he is born, and drill him till he is older than the archangels, he could not become perfect, even in that single department. But he intends to make a thorough beginning, so he crams into his new series of books all the little unimaginable rules and trifles that the human race in twenty centuries have ever thought upon the subject. The first dose is homeopathic; one grain of science diluted by a world full of wind, for very young children; each dose becomes a little more allopathic and stiff and formal, than the preceding: but the trouble is, you never get through with it: you are never done with it; never ready to throw it aside and pass on to something else. A new term brings you flat back against a new series on the same subject: you don't get one dose fairly down before another is ready. All the doses are composed mainly of the three R's, "readin'," "'ritin'," and "'rithmertic." You never seem to get out of that charmed circle.

The book-maker likes all this: the more series there are, the more printing and binding and sales and profits in all respects,—especially as it is morally certain that no two children or pupils of any sort will continue to use the same books in succession; and a totally new series, full of most wonderful improvements, even on the dead classics, is sure to be born at least once a year, and to out-rival everything that preceded it.

A man with much of a family needs to build an out-house for the storing of his old cast-off school-books. He cannot manage, economically, to burn them up for kindling wood as fast as the book-makers want him to buy them. But the main trouble is, they are all made by experts; and they usually, either like commentaries on the Bible, explain everything except the precise point that needs explanation, or adjust their explanation to the wants of a preconceived expert, rather than to those of a common child. What would we say of a child's book on human teeth or eyes, which attempted to embody in it all the little rules and minute facts essential to the expert oculist, or dentist? What of a child's book on the plow, with all the miners', and forgers', and wood-workers', and painters', and holders', and teamsters' and farmers' rules for making, and handling, and using it, embodied in an everlasting series of most thorough and important rules, to be committed to memory by the tyro learner about the plow, in order to make him thorough in his knowledge of it, well-disciplined, and well rounded out? Or what should we say if it was a rule of the school, that every child alike, who took up singing, should advance precisely so far in it before he was allowed to take up anything else, wholly irrespective of his natural taste and aptitude for music? Some might sing till the stars fall, and do nothing else, and still never be singers. Precisely so: some children never would make good spellers, or elocutionists, or grammarians, or arithmeticians, if they were drilled on them to all eternity; while they might all easily excel in some one of these things, or in other things outside of them. The teacher has little chance to get hold of this matter: like the postmaster, he must use the materials actually furnished him, simply because he can get no others; or, if he could, it is doubtful if the community would tolerate him in the change.

We hope these observations may have the desired result of aiding the reformation of the present school system. As it is, we can justly boast of its superiority over that afforded by any other nation. There are needed reforms, however, as the above full description of very much of the present plan clearly indicates. With a few remarks in reference to the teachers, the school and the proper discipline of the school, we will pass to a treatise of agricultural education.

The exercise of the supreme power in a school is generally vested in the teacher, subject to the supervision of those from whom he receives his appointment. We call to mind that in our system of civil government there are three departments—the legislative, judicial, and executive. These in the school are usually united in the person of the teacher, making his duties sometimes trying, and always responsible. He frames the rules of action for the pupils while they are intrusted to his care; he is master to direct, friend to advise, teacher to instruct, and executive to

enforce his rules. It is his duty to look after the health, secure the comfort, protect the rights, and preserve the morals of his pupils.

As he assumes to be a teacher, there are those who expect him to be learned, wise, careful, prudent, amiable, gentle, sociable, forbearing, long-suffering, impartial, charitable, diligent, attentive, studious, energetic, polite, commanding, healthy, omniscient, and omnipresent. Such expectations are never realized, and consequently it will not be surprising that he does not give full satisfaction to all his pupils and their parents. Still, it may safely be asserted that as a class teachers do possess at least the desire to do right.

The teacher has rights, it must be remembered, and which are due to his position, his age, and his superior acquirements. He also has feelings as tender, sensibilities as delicate, pride as sensitive, and self-love as strong as any of his pupils, and no pupil has a right to impose upon him in violation of the golden rule. It is not to be expected that he shall be overcome by passion, prejudice, or pride, unless under very strong provocations; but what moral right has any one to exercise his patience by provocation? Teacher and pupils are under the same obligatlons to each other to be kind, patient, charitable, and forgiving. It may safely be said, however, that whenever the pupils of a school endeavor to do right, no fear need be entertained that any teacher will attempt to provoke them to act differently.

It is the interest of the teacher to make every reasonable exertion to secure the friendship of his pupils. Those who meet him in a spirit of friendliness, and show a disposition to please him will, of course, be more esteemed than those who are indifferent to his feelings and comfort. The teacher will necessarily be more attracted to those who are kind, polite and attentive and who manifest a disposition to make themselves agreeable. To do otherwise would be unnatural. His favorites are those to whom his sympathies are drawn by acts of kindness and respect. But while he may admire and love some pupils for their agreeable qualities, it does not follow that he shall dislike or hate those who have not tried to win his favor. He may be kind, attentive, and faithful to every one in school, and yet he may and must be partial to such as try to do their duty.

The term partiality is often used to indicate a want of fairness on the part of the teacher. If investigated thoroughly, the charge will frequently be found to originate with such pupils as are conscious of their own neglect of duty, and their indisposition to make an effort to merit the teacher's friendship. The teacher is in honor bound to do justice to all his pupils; but that he should be expected to possess an equal regard for all is absurd. Jealousy and ill nature are generally the causes that originate the charge of unfair partiality in school.

Common sense forbids the idea that any teacher should exercise injustice toward a pupil without a cause, and in opposition to self-interest; and yet, when the impression of partiality takes hold of some minds, it is almost impossible by any reasoning to remove it. It is so mingled with passion, prejudice, and pride that its correction seems an almost hopeless task. The sooner such a habit of mind is overcome by the exercise of reason and charity, the happier will all parties be in school.

School Habits. A good education is but little more than the formation of good habits. To insure a systematic training in all that is necessary to fit a young man or woman for good society, time, patience, and industry are required. Good habits must be formed. There are certain rules which experience has proven to be necessary in the management of every good school. These are not merely arbitrary regulations; they are founded in reason, and cannot be dispensed with, if the school shall be made to accomplish the design of its organization. Their observance will insure habits of attention, punctuality, regularity, and self-control, that are an essential part of a good education, while their neglect will certainly entail a life of mortification, annoyance, and failure.

The welfare of the school, the progress of each pupil, and the comfort and success of the teacher depend largely upon the unfailing attendance of every member. There is a moral obligation resting upon each person at school that he shall do nothing to interfere with the rights of his neighbors. It is his duty, therefore, to be present each day, unless prevented by some unavoidable occurrence. The waste of time, the hindrance in study, and the annoyance to teacher and pupils occasioned by unnecessary absence, has ruined many a school; and the habits of carelessness, indifference, and irregularity, arising from the same cause, have blasted the prospect of many a pupil. Self-respect, self-interest, and the love of the right should compel every pupil to spare no effort to secure a constant attendance.

Agricultural Education. Not an art is practiced by man which includes a greater variety of operations or involves a greater amount of scientific principles than farming; and yet almost every other art is popularly regarded as far more technical and intricate, and as requiring far higher qualifications, and a far more systematic and prolonged course of preparation for its successful performance. Popular opinion justly imposes a long apprenticeship upon every candidate for any department of mere handicraft, a long course of preparatory study upon every candidate for scientific or intellectual employment, and both an apprenticeship and a course of preparatory study upon every candidate for several of such professions as combine art and science; and yet, with marvelous inconsistency, it, in most instances, imposes no apprenticeship and no special study whatever upon the candidate for an employment far more noble and intricate than any handicraft, and eminently combining the influence of at least two-thirds of all the physical sciences with the most varied manipulations of complex art. How monstrous is it that, while one man is apprenticed two or three years in order to make a shoe, another is not apprenticed at all in order to manage a farm! that

while one is required for many years to be both an apprentice and a student in order to make the contents of a statute book bear upon a case of litigation, another is not required to be either apprentice or student in order to make the experience of all countries and ages of the civilized world, and the principles and discoveries of some of the most prominent and complex of human sciences, bear upon the diversified and multitudinous practices of agriculture! One year as a shoemaker's apprentice, and three years as a young lawyer, ought to be every particle as effective as seven years as a candidate for farming; and with not more than one or two exceptions, not an artificer, an artist, or a professional exists, who requires more special training or a larger amount of technical knowledge than a farmer, or who possesses equal facilities to turn a liberal and munificent education to practical account. Were the next generation of farmers all over the civilized world to be educated comparatively with other men in something like the proportions of their callings, human society would at one move experience almost as great a transition as when it passed from the degradation of the feudal ages to the dignity of the nineteenth century. Even an old Roman author, amid the material condition of a proud, vicious, and heathenish empire, had the sagacity to see the paramount importance of agricultural education, and the honesty to utter his astonishment at its neglect. "Nothing equals my surprise" says he, "when I consider that while those who desire to learn to speak well, select an author whose eloquence may serve them as a model; while those who are anxious to dance, or become good musicians, employ a dancing or a music master; in short, that while every one looks for the best master, in order to make the best progress under his instructions, the most important science, next to that of wisdom, has neither pupils nor teachers. We have seen schools established for teaching rhetoric, geometry, music, dancing, etc., and have never yet seen a master to teach agriculture, or a pupil to learn it.

Actual farmers who have had no special training, in multitudes of instances, improve their knowledge and their general qualifications by free intercourse with persons better informed than themselves, by accepting the advantages of example and instruction afforded on the home or model farms of many well conducted estates, by watching the proceedings and receiving the assistance of the agricultural societies of their county or district, by attending any occasional or serial agricultural lectures which professional or scientific gentlemen may deliver in their vicinity, and by making a diligent and discriminating use of one or more of the best books on agriculture. Thousands of the worst instructed class of farmers might by the use of several of these means, or even of any one of them, speedily acquire such knowledge as would enable them to draw 20 or 30 per cent. of additional produce from their farms.

All descriptions of young persons training to be farmers require to spend a large portion of their time upon a farm, to observe with all possible frequency the practices of the farm and the field, to take full and daily part in the operations of every season, and to learn, in a practical manner, the nature and conditions of every piece of labor, from the coarsest drudgery to the nicest and most artistic performance. Mere looking on, mere reading, mere listening, mere occasional acting, or all of these four combined, will far less enable a man to conduct a farm than even teach him to make a shoe or construct a steam engine. Pupil farmers do not require, indeed, to become adepts in every agricultural practice; they do not need to be the best workmen on the farm, the ablest plowmen, the most skillful sowers, the most expert manipulators of the stable and the barn; yet they certainly must acquire sufficient proficiency in every art and process, or at least sufficient practical acquaintance with the tact and method of performing it, and to judge when it is well and expertly done. They must fully obey, and they must know how to command; they must take part in everything, that they may learn to make judicious applications of the grand economical principle of the division of labor; they ought, in fact, to require the same comprehensive views of the operations of the farm as the farmer himself.

Yet mere practical learning, as we have already hinted, will as completely fail to make a man a wise farmer as a mere theory. The pupil, by carefully imitating all around him, may become a very expert monkey; but, unless he learn a reason for every operation, he will never farm like a rational being. His business, in preparing to become a farmer, is to learn the science of agriculture as well as the art, the principles of it as well as the practices. He ought therefore, during the whole course of his practical instruction on the farm, to be receiving explanations of the phenomena which he witnesses and the practices in which he shares, to be soliciting information respecting every matter which he does not clearly understand, and to be exercising his judgment as to the fittest mode of performing operations, the likeliest mode of overcoming difficulties, and the most feasible mode of attempting improvements. When he is under the care of a father or a kind master who farms intelligently, and possesses a fair share of science, he ought to acquire from him a large amount of requisite intellectual instruction; yet even in this case, and unspeakably more, if he be under the care of a mere imitative farmer, he requires the aid of such stores of knowledge as can be obtained only from other sources and by separate study. He needs, in fact, to be scientifically trained with books and by a schoolmaster, not less than to be practically trained with implements and by the farmer.

Whatever any ordinary school can furnish, in the departments of English education, writing, arithmetic, book-keeping, and elementary mathematics, ought, as a matter of course, to be acquired by every son of a farmer, and by every other boy who is likely to become an agriculturist.

The old view that anybody could be a farmer is

passing away. Farmers are "looking over the fence" more than ever before; they observe, and imitate when it seems desirable. This awakening of thought has developed into the establishment of various agricultural schools, many of which have been unsuccessful, and for various reasons. Too much was expected of them; the teachers were not trained to their work, and the pupils, in many cases, have been educated away from the farm. The love for farming and farm life must be developed in the child. The home teachings mainly shape the farmer boy's future. Object lessons, instead of book lessons, must interest and instruct the young—and the farm with all its plants and animals offers the very best opportunities for this training of the powers of observation. Study nature and refer to books, and not study books and afterwards refer to nature.

The great lack in the farmer's education is system and balance. In no occupation is there geater demand for independent thought and accurate judgment. To obtain these he must read the best agricultural papers, establish and attend farmers' clubs, take part in the annual exhibitions, and in every way possible meet his fellow farmers, that by so doing he may increase his knowledge.

There is much work for agriculture to be done in the common school. The apparatus required is simple and cheap, and plants, etc., are always at hand. A text-book of the rudiments of farming could be put into every common school with great advantage to every child. Scientific methods should he cultivated in youth; the method is as valuable as the facts. The only reason for this lack of agricultural instruction is the indifference of the people. Every teacher of a district or common school should know enough of budding and grafting to teach the scholars by practical lessons. The leading principles of vegetable physiology, as taught in Gray's First Lessons, may be understood by any intelligent teacher in the course of a few days, in connection with a little voluntary field practice. Young students may understand a great deal about germination by planting beans, peas, corn, wheat, etc., and examining the progress of the young shoots every day. They can try the effect of planting at different depths at the same time. They can trace the length of roots from young trees. A few ligatures about the limbs of trees will show them much in relation to circulation, in the course of the summer. Every teacher should show his pupils how to bud and graft, and to raise plants from cuttings and layers. He should explain the principles to them on which success depends. These things should be well understood by both girls and boys; they will not only prove attractive and interesting, but be useful all their days. Young men spend years in the study of Latin and algebra, which are useful; but one-tenth of this time given to the fascinating and useful arts connected with vegetable growth, would be more valuable for the time devoted. Young ladies study French and crayon work for years, but if they could cut off a few fragments of this time, and give them to some of the arts connected with horticulture, it would be better for their health, their minds, and add much to their usefulness.

As a stimulus and an aid in bringing about this system in agricultural education, schools of a few months' duration, in the winter season it may be, might be held at various points in the State. The nation is safest only when the youth are educated thoroughly; and agriculture is on a sound and permanent basis only when the boys, and girls too, are instructed in the elements of farming.

E. E., "Errors Excepted." These initial letters are written upon bills of purchase or statements of account to keep them open for future correction.

Eels afford light nourishing food, but they are generally considered better from this point of view when fried than when boiled. They should be well seasoned. They are sometimes salted, in which condition they are very wholesome eating. Wash them clean, and cut them in pieces, season them with pepper and salt, flour them, and fry them in butter. Let the sauce be a plain melted butter, with a piece of lemon, or a little fish sauce may be added.

EEL PIE. Make a rich pie-crust, and gut, clean and wash enough eels to fill the dish; season with salt, pepper, mace, etc., to your taste; put in as much water as the dish will hold and cover with the paste.

Eggs. The constitution of an egg exhibits very many and most striking evidences of the design and beneficence of the Creator, in the form of perfect and wonderful adaptations jointly to its immediate purpose of developing, feeding, and maturing an embryo bird, and to its incidental and secondary though scarcely less important purpose of affording food to man and to other animals. Yet so very numerous are both the chemical and the vital processes involved in the transmutation of its minute embryo into a perfect bird, that the exact provisions for some of the more recondite of them have hitherto eluded the scrutiny of the keenest human observation. A certain degree of porosity in the shell permits a comparatively free interchange of the gases of the atmosphere with the evolving gases of the interior; the detachment of a portion of the membrana putaminis at the great end of the egg permits a small and increasing volume of atmospheric air to be stored up there, as in a cell, for the ready use of the developing embryo; the membranous envelopments of respectively the white and the yolk together with their two connecting ligaments, admirably preserve them from intermixture, while both the thinness of these envelopments and the ready permeability of their own interior just as admirably permit an interchange of influences or a mutual reaction of chemical power; and the peculiar composition of the shell most beautifully combines the properties of a strong shield, a porous sheath, a smooth coat, and a frangible or facile doorway; while the chemical elements of both the white and the yolk, besides possessing mighty mutual adaptation for developing the bird, are singularly eminent in nutrition, and

exert almost the highest possible power as food both in the embryo bird and upon the digestive system of a human being.

Great chemical changes necessarily take place upon all the contents of an egg during the process of incubation, and if they could be examined and tested one by one, or stage by stage, they would unquestionably unfold a manifold and most instructive display of the subordination of chemical behavior to vital action. When incubation is complete, all the interior has lost its dead matter, and is occupied with a perfectly formed animal, whose organization is as complex, intricate, and wonderful as that of an elephant or of man; the inert mass with its mainly chemical influences has almost wholly disappeared, and a perfect bird, with its mainly vital powers and its multitudinous organic functions, is present.

Eggs of the hen are hatched by being kept at a temperature of 104° for three weeks. Their vitality has been retained after being exposed to a temperature of 10° Fahr., and it is a remarkable fact that the freezing point of new-laid eggs is much lower than that of the water and albumen of which they principally consist, and both of which congeal at about the same temperature. Eggs, too, that have been once frozen, or have been long kept, freeze at the point their constituents would seem to require. The specific gravity of new-laid eggs is from 1.08 to 1.09. By keeping they diminish in weight from evaporation of water, and the substitution of air through the pores of the shell. This diminution has been observed to continue for two years, an egg weighing originally 907½ grains being reduced to 363.2 grains. When they have lost so much weight as to float upon water, they are generally unsound. The preventing of this evaporation by covering their surface with a coating of varnish, wax, gum arabic, or lard, checks their putrefaction. It is said that if every new-laid egg was at once rubbed over with sweet butter it would be a rare thing to see one unsound. Hens' eggs vary so much in gravity that it is a wonder they continue to be sold by numbers instead of weight. A dozen of the largest have been found to weigh 24 ounces, while the same number of smaller ones of the same stock weighed only 14½ ounces. The fair average weight is said to be about 22½ ounces to the dozen. About one-third of the entire weight may be regarded as nitrogenous and nutritious matter, a greater portion than that of meat, which is rated at only from 20 to 28 per cent., while the nutritive portion of the oyster is only about 12 per cent.

Eggs as Food. Raw eggs are gently laxative, and are found to be serviceable in jaundice and obstructions of the liver. Eggs have the peculiar quality of singularly affecting some stomachs, while on others they do not produce the slightest sensation. The white of an egg closely resembles the lymph of the blood; the yolk is an animal mucilage. Eggs yield a mild demulcent and strengthening food; but they are mostly digestible when boiled so long as is necessary to slightly coagulate the greater part of the white without depriving the yolk of its fluidity. Raw eggs are more wholesome than boiled, or even than those lightly poached, which are very digestible. The white of an egg, from its tendency to coagulate into a hard and indigestible substance, is likely to disagree with the stomach of invalids, when the yolk may prove perfectly harmless. Eggs become more difficult of digestion by being kept.

To Preserve Eggs. How to preserve eggs for winter use has long been a matter of great solicitude. Among the processes in use by dealers and others is "liming." This is done by taking slacked lime and salt, a half pound each to a bucket of water. Some dealers use no salt, but instead add to the lime a small quantity of nitre, say a quarter of a pound to half a barrel of pickle. The eggs to be preserved in this solution must be thoroughly tested to be certain that they are fresh. This is generally done by "sunning" them through a roll of paper. The liquid must fully cover the eggs. If they are kept in a cool place they will remain good for several months. Long storage, however, in this way, is apt to make the shells brittle, and impart a limy taste to their contents. "Limed eggs" generally sell several cents lower in the market than fresh ones. The effect of the lime may in some measure be avoided by anointing the eggs all over with lard before putting them in the pickle, though this would be too expensive for large dealers; this plan can be practiced by housewives, and thus they can preserve eggs for six months or more, when stored in a cool celler.

The following is said to be a better method of storing eggs: Select perfectly fresh eggs, put a dozen or more in a small willow basket, and immerse this for five seconds in boiling water, containing about five pounds of brown sugar per gallon of water. Place the eggs immediately after on trays, to dry. The scalding water causes the formation of a thin skin of hard albumen next the inner surface of the shell, the sugar effectually closing all the pores of the latter. The cool eggs, when packed, small end down in fresh salt, or in a mixture of one measure of finely powdered charcoal, and two measures of bran, keep nicely, being found perfectly fresh after having been thus stored for six months.

A French authority gives the following: Melt four ounces of beeswax, and stir in eight ounces of olive oil. Let the mixture cool somewhat, then dip the fresh eggs into it, so as to coat every part of the shell. Wipe off with a cloth. The absorption of the oil by the shell, and the sealing of the pores by the wax, make the treatment perfect. It is claimed that eggs thus treated, then packed in charcoal, and stored in a cool place, have been known to keep perfectly fresh for two years.

Dry salt was the old means for preserving eggs for the household, but experience has proved that it is little better than bran.

A mixture of eight measures of bran, with one of powdered quicklime, makes an excellent packing for eggs for transportation.

A very popular method is to grease or oil the eggs, with fresh grease or oil, place them in salt, ashes, slacked lime, oats, sawdust or bran, and keep them in a dry, cool place, but where they will not freeze. Simple scalding, by dipping in boiling water quickly three times and out, and packing in oats, etc., is also recommended.

If eggs are not stored when perfectly fresh they will not keep under any circumstances. A broken egg stored with sound ones will sometimes endanger the whole lot. In packing, the small end should be placed downward; if in charcoal or other powder they must be packed so that they do not touch one another, the intertsices being filled with the powder. Under all circumstances stored eggs should be kept in as cool a place as possible not to freeze them. Frequent change of temperature must also be avoided.

A modern method, practiced by a few dealers, is to prepare an egg-preserving house, so that it can be kept at a uniform temperature through all kinds of weather. This temperature must be as cool as possible, and not reach the freezing point. The eggs are placed point downwards, in cases, or racks, each egg in a separate receptacle. It is said that this plan works to perfection, and dealers have grown wealthy in its practice.

For domestic use, when it is desired to use the liming process, take freshly slacked lime, put into four gallons of boiling water, strain through a coarse sieve, and add ten ounces of salt and three of cream tartar, mixed thoroughly. It is better if allowed to stand two weeks before using. Pack the eggs in stone jars as closely as possible, taking care not to break any of them, and pour the pickle over them. Float a board on the surface to keep them all under. Set in a cool place. It is claimed that, thus treated, eggs will keep for one to four years.

Boil four or six dozen eggs in a capacious sauce-pan until they become quite hard. After carefully removing the shells, lay them in large-mouthed jars, and pour over them scalding vinegar, well seasoned with whole pepper, allspice, a little ginger, a few cloves and garlic. When cold, bung down closely; in a month they are fit for use.

Eggs, when stored in charcoal, bran, or salt, or in holes in boards, or in pasteboard cases, should always be placed the small end downward, as the more recent experiments have demonstrated this to be the safer method.

Eggs, to be transported for a long distance, should either be packed in the regular pasteboard cases, or in boxes or barrels, between layers of finely-cut, dry, sweet straw or hay, care being taken that they do not touch the sides of the package or each other. Oats may be used for packing, and the grain disposed of at a price after the eggs are removed.

To tell good from bad eggs: Put them in water enough to cover them; all that lie flat are good; the large end will rise of those that are bad. Good eggs, also, when held up toward the light, seem more translucent than spoiled ones. The large end of a fresh egg is said to feel a little warm to the tongue, when touched with it.

An egg-tester may be made by fitting a looking-glass in the bottom of a cigar box, and cutting round holes in the cover, just large enough for the eggs to fit, and not drop through. Set in, large end downward. Make a slit near the end of the cover 1 by 2 inches to look through. With the egg in place, and the box held in a strong light, a peep in the glass will show the fertile eggs to be dark and opaque, and the unfertile ones transparent.

To determine the age of eggs, dissolve 4 ounces of salt in 1 quart of water, and immerse the egg. If it is only one day old it will sink; if three days, it will just begin to float in the liquid; if more than five days, it will come to the top and project above it in proportion to its increased age.

To determine the sex of eggs, it is said that those producing males are wrinkled at the small end, at least more than those which would produce females.

To Boil Eggs. Three minutes will boil them very soft; five minutes will cook hard, all but the yolk, and eight minutes will cook them hard all through.

A good plan is to put the eggs on in cold water, and as soon as the latter boils the eggs are soft-done, with the white portion less hardened, in proportion to the yolk, than by putting them in boiling hot water at first. Besides, by this method, one does not need to watch a time-piece. To prevent the contents of cracked eggs from oozing out when boiling, rub them with moistened salt.

Poached Eggs. Have boiling water in a shallow pan, break the eggs separately in a saucer, and slip gently into the boiling water; when all are in the water, place the pan over the fire until the white of each is perfectly set; remove with a slicer, and lay on buttered toast or broiled ham.

Scrambled Eggs. Have a spider hot and buttered; break the eggs into a dish, being careful not to break the yolks; slip them into the spider, add a very little salt, with butter the size of a nutmeg for half a dozen eggs, or three tablespoonfuls of rich cream. When the eggs begin to whiten, stir carefully from the bottom until cooked to suit.

Egg-Balls, for made dishes or soup. Pound the hard-boiled yolks of eight eggs in a mortar until very smooth; then mix with them the yolks of four raw eggs, a little salt, and a dust or so of flour to make them bind. Roll them into small balls, boil them in water, and add them to any made dishes or soups for which they may be required.

Frozen Eggs can be used for all ordinary cooking by thawing them in cold water. Do not use for cake, as they will invariably make it heavy.

Egg-Nogg. Take one tablespoonful of fine sugar, dissolve with water; 1 egg; 1 wineglass, more or less, of brandy, rum, whisky, or other spirit, in proportion desired, or according to the strength of the liquor. Fill the tumbler one-fourth full with shaved ice; shake the ingredients till they are thoroughly mixed, and grate a little nutmeg on top.

Egg Plant. This is an interesting vegetable to cultivate, being ornamental as well as eatable. The seeds may be sown in a hot-bed in March and the young plants potted when an inch or two high; then transplant in open ground in rows two feet apart each way; manage, however, so as not to transplant before warm weather is established.

Large Purple Egg Plant.

VARIETIES. *Long White China.* Delicate and beautiful; late.

Very Early Dwarf. A new French variety of long purple.

Round Purple. Medium size; well known.

Large Round Purple. Very popular.

Long Purple. Earlier and more productive, but smaller than the Round Purple.

Black Pekin. A new variety of Round Purple with blackish violet leaves and very large fruit.

New York Improved. Extra large and choice.

Scarlet China Guadaloupe. Striped and white are ornamental varieties.

TO COOK EGG PLANT. Choose the medium-sized fruit, cut it in slices a little more than a quarter of an inch thick and remove the skin. Sprinkle salt on each piece, put it in a dish and cover with water, placing a plate on top to keep it under. Leave it in this water for an hour or two to draw out the bitter taste; then wipe each slice dry, dip it in beaten egg; put in fine cracker crumb; season with a little pepper, and fry in equal parts of hot butter and lard until it is done to a light brown. The lard should be heated in the frying pan, and the butter added just before putting the egg plant in. Do not cover while cooking, as the steam would prevent that crispness which is a feature of nicely cooked egg-plant.

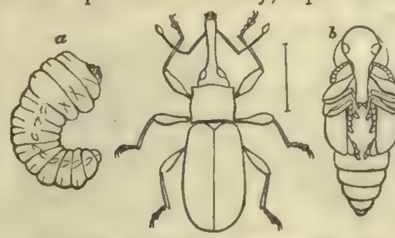


FIG. 5.—*Elm-Tree Curculio.* (Magdalinus Olyra.)

EGG PLANT AU GRATIN. Peel and cut them in slices lengthwise, arrange them in layers on a well-buttered tin, previously rubbed with garlic. Put between the layers a sprinkling of fine bread crumbs, chopped parsley, sweet herbs; add some melted butter; and a sprinkling of grated cheese and a few baked bread crumbs; bake in the oven and brown with a salamander.

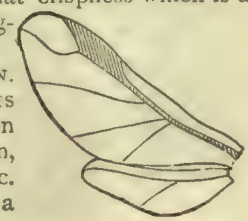


FIG. 4.—*Wing of Elm-Tree Louse.* (Tetraneura ulmi.)

FIG. 1.—*Camperdown Weeping Elm.*

Elder, a well-known shrub with a pith in the stem. All parts of the plant have been used medicinally, to aid in sweats, etc., but the flowers and fruit are the principal parts used. The berries are sometimes cooked and eaten, especially in pies. To make elder wine, see Wine.

Elecampane (el-e-cam-pane′), a plant having a flower like a small sunflower. The roots have been much used in herbal medicinal practice as diuretics and expectorants, but they have lost much of their medicinal celebrity and are now esteemed of but little value by many.

Electricity: see Lightning, Lightning-rods and Hygiene.

Elevator, a belt mounted with cups for elevating grain; also, the building in which grain is thus elevated or stored.

Elm, a well known forest tree, highly prized as an ornamental and shade tree. The white elm is by far the most abundant; the red, or slippery, elm is rare, and the corky elm is also rare.

The greatest objection to the elm as an ornamental tree is its liability to be infested by insects, the principal of which we figure in the annexed cuts, giving magnified views of eggs, larvæ, wings, legs, antennæ, etc., as well as the appearance of their work on the leaves.

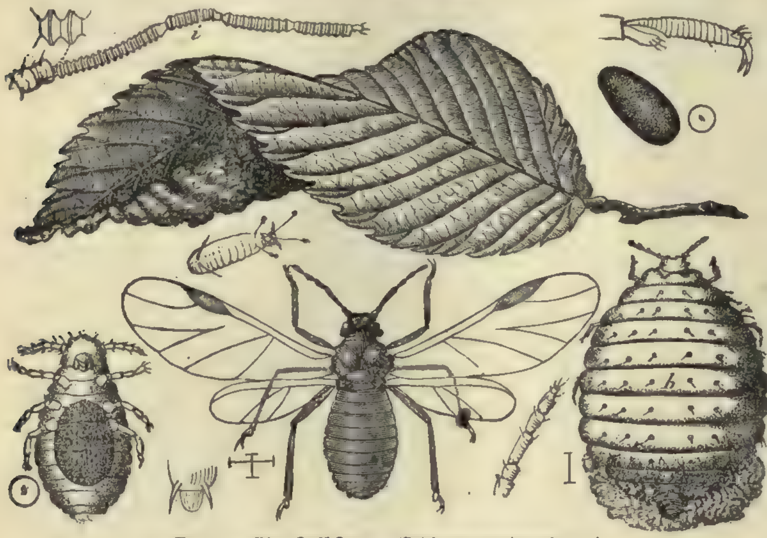


FIG. 4.—*Elm Gall Louse.* (Schizoneura Americana.)

The Camperdown weeping elm is a variety grafted from the Scotch or Wych elm. It is of rank growth, the shoots often making a zigzag growth outward and downward of several feet in a single season. The leaves are large, dark green and glossy, and the tree forms one of the most picturesque objects on the lawn. See Fig. 1.

Elm Bark, SLIPPERY, when scalded with hot water makes a useful poultice for irritable wounds, sores and ulcers. A decoction of the bark will answer every purpose for which flaxseed, or linseed, is used or recommended, as in diseases of the kidneys and bladder, produced by the use of Spanish fly, and from over-dosing with rosin and other diuretics. In diarrhœa, in all animals, slippery-elm tea or decoction will serve a good purpose, by sheathing the bowels, which are so apt to become irritated and inflamed in violent super-purgation.

Emaciation (e-ma-she-a'shun), wasting away of the flesh on account of disease.

Embroidery, fancy needle work.

Embrocation, oil or medicated liquid which is rubbed upon a diseased part; also, the act of rubbing a diseased part with a liquid.

Emery, a granular mineral mixed with oxide of iron, often pasted upon the circumference of wheels for grinding and polishing metals.

Emery Wheel, HOW TO MAKE: Provide a solid wheel, made of soft wood, and of the size you wish. Turn the wheel true and then turn rounds or hollows in its face to suit the tools which you wish to grind. Then prepare some of the best glue, and while hot and thin, put it upon the face of the wheel with a brush. The first coat should be a light one, and when it is dry, another should be applied, and as quickly as possible sift as much emery on it as the glue will hold. When this is dry another coat of glue and emery should be applied. We do not know of any process to make the powder solid.

Emetic, a substance which, introduced into the stomach, produces vomiting. The cleanest and simplest is warm water; next, salt and warm water. The most popular medicinal emetics are the following: No. 1.—Ipecacuanha wine, ½ ounce; water, 1 ounce; simple syrup, ½ ounce. Mix. For a child, 20 drops, or more, every quarter of an hour until vomiting ensues. An adult may take from ½ to 1 ounce. No. 2.—Lobelia, 4 ounces; spirits, a pint; infuse for a week or ten days and it is fit for use. This tincture is an efficient and gentle emetic. No. 3.—Give tincture of lobelia, ½ teaspoonful every half hour until vomiting is produced.

As horses, cattle and sheep cannot vomit whilst the stomach remains entire, emetics are of no use in veterinary practice. In case of rupture of that viscus, however, vomiting is occasionally seen. Emetics are useful in diseases of the dog and swine. Tartar emetic or sulphate of zinc, given in from two to five grain doses, will cause dogs and swine to vomit.

FIG. 5.—*Elm-Leaf Cockscomb Gall.* (Glyphina ulmicola.)

Engine, a machine for applying power; more specifically, the machinery by which *steam* power is communicated to other machinery or apparatus; in a still more restricted sense, it is, in contradistinction to the boilers, fly-wheel, etc., the cylinder and piston-rod, with their immediate attachments.

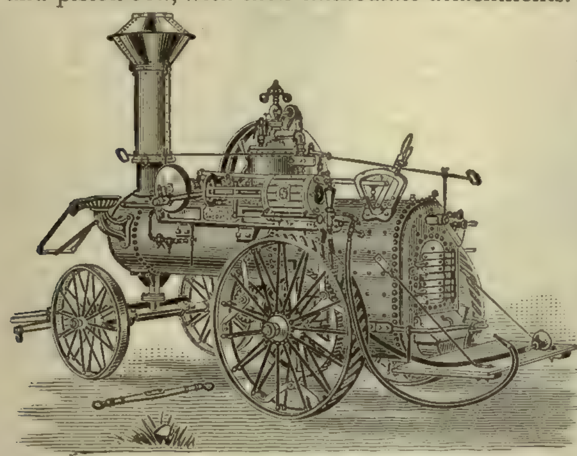


FIG. 1.—*Traction Engine.*

A "portable" engine is one which is fixed upon wheels, to be easily moved from place to place.

A "locomotive" engine is one that is propelled by its own power from one place to another. A locomotive for farm work must plow or draw loads, in which case it becomes a "traction" engine. ("Traction" signifies drawing.)

A "stationary" engine is fixed to one place, with more or less masonry, and is therefore difficult to be moved to another locality. This is the most economical form where great power is required, in one place.

Fig. 1 gives a correct view of one of the best farm engines in the market. It has a complete water front and water bottom, a heavy wrought-iron axle extending completely under the fire-box, double wrought-iron doors, strong stay bolts around fire-box, a splendid pump made entirely of brass, a surface blow-off, strong and elegant iron drive wheels, with eight-inch corrugated tires, a patent-lever throttle valve, controlled from either end of the boiler; extra large fire-box, double thick flue-sheet, copper thimbles on every flue, perfect safety from fire or explosion, great durability, elegant workmanship, beautiful finish, and superior material.

Some manufacturers frequently advertise an engine weighing several hundred pounds less than another, and at a proportionate decrease in price. On a superficial view, this light weight may seem to be an advantage; but it is found, on examination, that in every case this decrease in weight (and consequent cost to the manufacturers) is effected entirely in the boiler, which is cheapened in every possible way, such as using a thinner and inferior quality of iron in the shell, and "setting up" or swaging the seam to make it look thick; by using light, punched flue-sheets, which spring and warp with every change in the temperature and pressure of the boiler; by using cheap flues (without copper thimbles), which soon corrode and leak; by making a small fire-box with insufficient fire room, which necessitates constant "forcing" to make steam enough, and consequent burning and straining of the crown-sheet and other parts; and by using cheap cast-iron fronts, doors, dome, etc., which add no strength, but, on the contrary, seriously detract from the efficiency. Yet one of these "Cheap John" boilers will look well and often pass muster among the inexperienced buyers of farm engines. It takes a few months' use to disclose its weakness and defects. It is perfectly easy for the manufacturers of these cheap engines to warrant them to do certain things or perform a certain amount of work, such as driving a separator, etc. They send their experts, who understand exactly how to manage them to the best advantage and get the highest results, and they can thus make them work long enough to capture the purchaser's money or notes, and that is all they care for.

The engine represented by Fig 2 is one of the best for threshing, running a light saw-mill, etc., and is made with the same care as Fig. 1, and by a well known responsible firm.

All owners of large farms find it a great economy to possess a portable engine, and generally one of the "traction" kind. "Small" farmers, too, often find it a convenience to obtain from their more

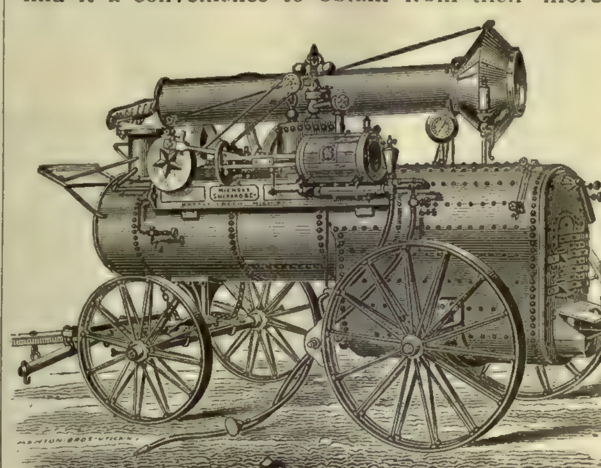


FIG. 2.—*13-Horse-Power Traction Engine.*

fortunate neighbors the temporary use of such power. Sometimes more power is wanted than can be well afforded by a portable engine, and in nearly all such cases the need is so local that a stationary engine fully supplies it, as in running

large mills for sawing, grinding, etc. Fig. 3 is a cut of a good stationary engine, furnished, with boiler (Fig 4), by Messrs. Willard & Co., Chicago. These boilers are tubular and set in brick work. Each boiler is complete, with full fire front, grates, skeleton arch, safety valve and blow-off cock, water column with syphon, steam gauge, water glass, and compression gauge cocks, hand holes and hand hole plates and crabs, holes for pipes cut and threaded. Boilers are so constructed as to be set as "return flue," by which the heat passes once along the boiler on its under side, and returning through the flues passes out of the smoke stack at the front end right over the fire. This is well known to be the most economical of fuel of all methods of setting a boiler.

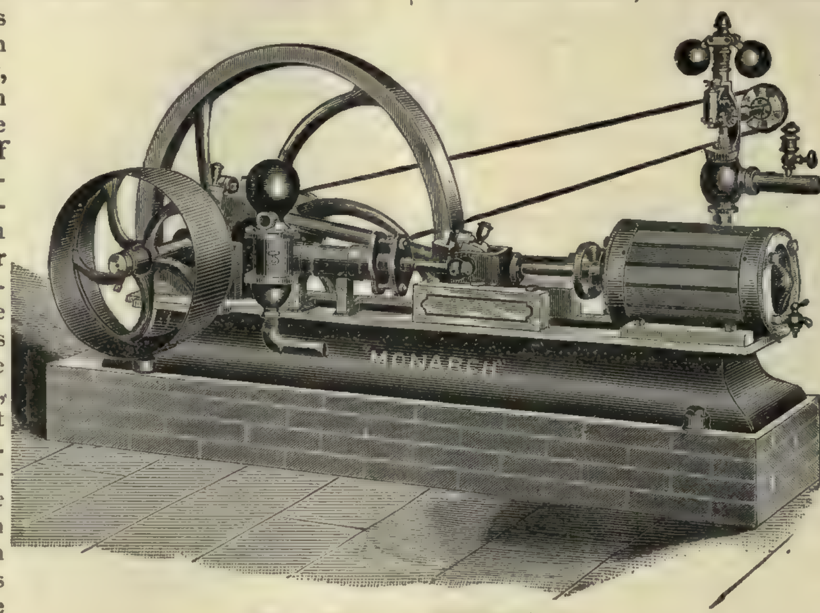


FIG. 3.—"*Monarch*" *Horizontal Engine.*

The boilers are made of first-class charcoal hammered No. 1 iron, with flange iron heads and the best lap-welded wrought iron flues, and are hand-riveted in the most approved manner. All these boilers are tested by hydrostatic pressure before leaving the shop, under pressure much greater than any steam pressure they are ever expected to carry, and every precaution is taken to ensure them against explosion in case of neglect. The engraving shows brick torn away to indicate manner of setting grate; also skeleton arch in the rear.

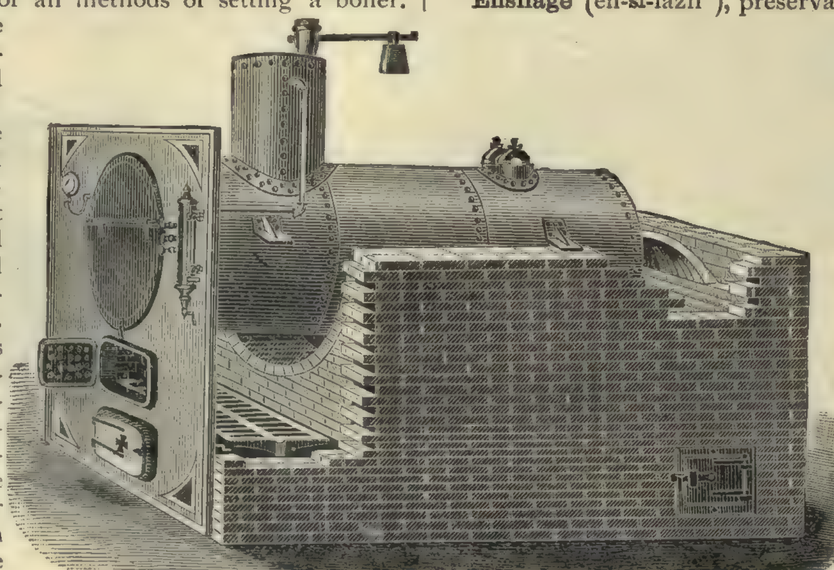


FIG. 4.—*Horizontal Tubular Boiler.*

Ennui (ong-nwe′), mental satiety and weariness; lack of disposition to entertain or to be entertained. In an extreme case, the patient is tempted to commit suicide, or at least wishes he were dead. This is really a morbid condition, brought on either by too much mental labor, or by some form of intemperance. It is a disease, and instead of repelling it with intoxicating beverages or other drugs, one should apply all the resources of general hygiene, the most important of which, in such cases, are, perhaps, a plenty of sleep, and a journey.

Engrail (en-grail′), to variegate or spot, as with hail; to indent or make ragged at the edges, as if broken with hail.

Ensilage (en-si-lazh′), preservation of fodder in its green and juicy state through the winter, in caves or out-houses called "silos." These are of two kinds—those in the ground without masonry, and those made of masonry or concrete, either in pits or above ground. The earth silo has been used successfully in this country, but masonry is preferable, and should always be used by beginners in the practice of ensilage.

In using the simple earth silo, the sides are lined with straw, standing so that the fodder will slide down as it settles. The bottom is floored with

plank. The green fodder is thrown in and trodden down. When the pit is full, round up the top, and cover it with a thin layer of long straw. On this, place a covering of tarred roofing felt, and pile on earth till it is about two feet thick. An earth trench can also be lined with boards.

WOODEN SILOS. There is no difficulty about making wooden silos; they require, however, more compression to prevent air from entering through the joints. The bays in the barn can be boarded up and down with matched flooring. The moist ensilage will keep the joints tight and it will keep well. The cover must be loose, and weighted so as to make a continuous pressure. But this silo requires an elevation of the cut fodder, and should the barn burn the winter supply is lost. Wherever it is possible, the cellar under the barn should be utilized if the barn be large enough to serve for a cover, and for the working place for cutting up the fodder. In the Southern States wooden silos are often built in the fields with double thickness of boards and a coat of tar between. The weight used may be cord wood, which becomes more valuable as it dries. These silos have doors through which the ensilage is excavated from below. The best silos, however, are built specially of masonry or concrete.

CONCRETE SILOS. For a silo 12 feet by 20 feet (or longer) and 14 feet deep, which would hold 72 tons, or sufficient for ten cows six months with full rations, the concrete walls should be 14 inches thick at the bottom and ten inches thick at the top of the side walls, with the bevel on the outside of the wall, and the end walls 12 inches thick top and bottom, the inside being perpendicular and smooth, so that the plank covering may settle with the ensilage. The concrete wall is stronger than an ordinary stone wall, and for this short silo, 14 inches at bottom is thick enough. It is not best to go any deeper in the earth than can be well drained, and a trench should be cut on the outside of the wall, six to ten inches deep, all around, to carry off all water that may reach this depth. If the land around the silos is nearly level, it is best to go only so deep that the bottom of the wall will be below frost.

Having excavated the earth as deep as the wall is to go, 15 feet wide and 23 feet long, then set the standards for the boxes to form the concrete walls in. It will require 20 standards three by six inches, 15 feet long (if the walls are to be 14 feet high), of straight-grained timber. Those standards intended for the inside of the wall should be joined straight on one edge, so that the wall may be made very straight and plumb on the inside. There will be three standards upon each long side—one at each corner and one in the middle. The other edges of these inside standdards will be 11 feet 9 inches apart; and as the boxing plank are one and a half inches thick, this will bring the walls just 12 feet apart. The outside standards will be opposite the inside ones, and just three inches farther apart than the wall is thick, so that when the plank are placed inside it forms a box 14 inches wide at the bottom, and the bevel or slant on the outside of the wall is made by bringing the outside standard four inches nearer the inside standard at the top. The end standards will be parallel with each other, and 15 inches apart. These standards are held together by nailing a lath under the bottom ends and a bracket across the top ends, holding the side standards 17 inches apart at the bottom and 13 inches at top. Then, when the standards are set up, and the inside standard plumbed very carefully, and both stay-lathed to hold them firmly in position, and the standards placed all around the proposed silo, it is all ready for fitting in the boxing plank. These boxing plank should be straight-grained hemlock or pine, 13 inches wide, and a half inch thick, and may be the whole length of each side and end, or, if more convenient, the sides may be two planks long, and the outside end plank will require to be 14½ feet long, but they may run by the ends of the side planks. The outside of the ends must be plumb, so that the outside plank of the long sides can be raised, but the end walls being shorter, 12 inches thick is enough of strength, and has the same material per foot of surface. When these boxing planks are placed, there will be a continuous box, 14 inches on the sides and 12 inches on the ends, around the silo.

Water lime concrete is the only concrete suitable for silos, as it requires a strong, air-tight, smooth wall and one that will stand moisture to some extent. This kind of wall is easily made air-tight, and is built cheaper than an ordinary stone wall. It is only necessary to use water lime or cement enough to completely coat the particles of sand, so as to cement them together, and this becomes a cement to fill in spaces among large gravel or between stones. The cement is made by mixing one part of water lime with four of fine sand, while dry, so that the lime and sand can be evenly mixed. Then work it into mortar, and if you have coarse gravel and no stone you may put in five or six parts of gravel, and this will be sufficient to cement all together. The gravel is best mixed in the mortar bed, but it must be used at once, as such mortar sets in a few minutes after wetting. But if you have rough stones of any kind, cobble or flat stones, they can be worked into the wall to good advantage, and save cement. When stones are to be worked in, put one or two inches of thin mortar in the wall box, then bed into this mortar a layer of stones, keeping them back a half inch from the boxing plank, so that the cement may be tamped all around the stone, leaving a smooth surface on both sides of the wall. This cement is a poorer conductor of heat, cold and moisture than stone. A properly built concrete wall never shows frost on the inside. In many parts of the country, thin, flat, irregular stones are found in abundance, and these are well adapted to concrete walls, it requiring only a thin layer of concrete mortar between them, and the walls become solid in a few days. But with these flat stones, it is better not to bring them quite to the boxing plank, but to let the concrete come over the edges so as to form a smooth surface.

When the concrete wall is laid with stone, sand and lime, as stated, so large a proportion of stone may be worked in that the water lime will be only one-tenth of the wall, and the same when the wall is made of sand and coarse gravel; so that, to find the amount of water lime required, count one barrel to 40 cubic feet of wall to be built. If water lime is very expensive, and you have flat stones, no matter how irregular, you may use quicklime after you get one foot higher than the earth will come against it. One of quicklime to five of sand will make excellent mortar to lay these stones in, doing the work in all respects as above stated. The concrete should be well tamped into the boxes, filling all crevices between the stones, and solid against the planks. Water lime will set hard enough so that these boxing planks can be raised 12 inches every day. That is, if you fill the box all around the silo in one day, the next morning you may raise the boxing planks where you began the day before; and as you fill, raise section after section of planks till you get around again. This may be repeated each day till the wall is completed, provided the mortar sets in the usual time. But if quicklime is used, this sets slower, and will take two or three days to become strong enough to raise the plank. It will be noted that the planks are to be 14 inches wide, but are raised only 12 inches, which leaves a lap of two inches on the wall below, keeping the sides of the wall smooth and even. The proposed silo will have 952 cubic feet in it, and requires 22 barrels of cemen , of the Akron or Rosendale brand. This cement in many places will cost from $1 to $1.25 per bushel.

About the only other cost of the wall is the labor, which can be done by common laborers. The standards can be set by any one who can use a level and plumb. When the walls are completed, take a seasoned board as wide as the wall is thick, tar one side, and turn the tarred side down upon the wall. This will prevent the moisture from rotting the plate rim placed on top of the wall.

The roof placed over the silo must be elevated some three feet above the plates so as to give head-room for filling the silo full. This may be done by framing short posts into the timber on top of the wall, and placing light plates on these, upon which the roof is to stand. It will be seen that this silo can be built, by many farmers, with only a small expenditure for cement, shingles and nails, all the rest of the materials being from their own farms. The bottom of the silo is usually cemented, to prevent moisture from rising.

The drainage so as to avoid pressure of water is very important, as the slightest in-road of water will cause the mass to mould as far as it penetrates. The contents of a silo will be about 50 pounds of compact ensilage to the cubic foot. In the prairies the natural ravines with stone bluffs will serve with little expense for silos, and the cattle carried over the drought and winter seasons.

The cover of the silo should be laid directly upon the ensilage without any straw between, and care should be taken that the pressure should be uniform. Make the cover of two-inch plank, matched and battered in sections of three feet, the battens put on with screws and projecting, which will keep them level. The ensilage will settle about one quarter, and if the walls are smooth and free from any projections it will not require any trampling. The less trampling the better, for when the juice is out, the air enters. For this reason it is important to cut the maize when in full juice, while the pollen is falling from the tassel. The screws and levers suggested by some inexperienced people are entirely unnecessary.

The ensilage should be piled up in curbs or sides above the silo, about one-third the depth of the silo; these sides should be firm, but movable; the cut fodder should be leveled with care, and the cover adjusted; so that it will be sure to press with uniformity, continuously, and not leave any garrets under it for the air to lodge in. Upon this cover will be found a convenient place for piling sacks of grain meal, as there will not be steam enough to stain the sacks; or posts or beams will answer. It was formerly considered necessary to use great pressure in order to squeeze out all the air contained in the cut fodder (about 100 pounds pressure to square foot), but it has been found by experience that when cut ⅜ to ¾ of an inch long and in full juice, the shrinkage of fodder compacts it sufficiently close without any great weight besides weight of cover. If the crop has dried so as to show pith, the air has already entered its cells, and it would be well to increase the weight.

It is probable that the practice will become more general of covering with earth instead of any other cover. This has the advantage of avoiding all unevenness, but it requires some watching for cracks. The earth will cake so that it can be removed without trouble and thrown in the manure heap.

In either kind of silo the fodder should be fine enough to pack close; the finer it is cut the better is the preservation. It should be taken from the silo the evening before it is fed, in order that it may have 15 hours to become alcoholic. Eight hours later it will have passed the proper limit of time, and will rapidly spoil as food. It should never remain over 48 hours out of the pit without being fed.

The advantages claimed for the ensilage system are: It enables the farmer to store green fodder, palatable and nutritious, for winter use; it provides him a way to raise a large quantity of fodder to the acre, cornstalks being the crop grown late in the season for this purpose; the increased product enables the farmer to feed a large number of cattle, and thus he can make a larger quantity of manure.

Epidemic (ep-i-dem'ic), prevailing among the people: said of diseases, such particularly as small-pox, Asiatic cholera, scarlet fever, measles, hooping-cough, influenza, etc., some of which are contagious (see Contagion). The epithet "epidemic" signifies "upon the people," and properly designates prevailing diseases among human beings, while the term "epizootic," signifying "upon brutes," is the corresponding proper designation of prevailing distempers among the lower

animals. Yet many writers speak of epidemic diseases in reference as much to brutes as to men.

Epilepsy, a violent nervous disease in man and in domestic animals. Among men it is known by the following symptoms: Rigidity of the muscles, distorted countenance, purple color or ashy paleness of the skin, rolling of the eyes, often finally fixed, as it were looking at some point within the forehead, protrusion of the tongue, champing of the jaws, loss of consciousness, hurried breathing and frothing at the mouth; the fit is followed by a stupid condition for some hours. In most cases the mind of the patient is affected for life. Treatment: During the spasm, nothing; afterward, to prevent its return, cold water to the head and hot applications to the feet; or a teaspoonful every five or ten minutes of the following: One pint each of lobelia tincture, prepared from the seed, tincture of myrrh and nervine tincture: the latter is composed of extract of cypripedium, 1 ounce, oil of anise, ½ ounce, camphor ½ ounce, and tincture of garden lettuce, 1 pound; or brom. potassa, 800 grains, bicarbonate potassa, 90 grains, tincture columbo, 2 ounces, water, 3 ounces. Dose, one-half teaspoonful in a little water three times a day, before eating. Of course a physician will be called in all such frightful attacks as these.

Epizootic (ep-i-zo-ot′ic), prevailing among animals; said of certain diseases, as Texas (or splenic) fever, hog cholera, distemper or influenza, chicken cholera, etc., some of which are contagious, or infectious. See Contagion, and Epidemic.

Epsom Salt, the sulphate of magnesia. This is a mild and safe cathartic, producing watery stools. It also acts as a diuretic and a refrigerant. It has been popular in fevers and inflammatory affections, in colic and for constipation. The medium dose for a person is an ounce, and the most agreeable form for taking it is a solution in carbonic-acid water and lemon syrup.

Epsom salts is a valuable medicine in diseases of cattle and sheep. No other purgative should ever be thought of or given to either cattle or sheep. Even supposing other purgatives to be as good, none certainly can be so cheap as Epsom and Glauber salts, or the sulphate of soda. For all purgative purposes, the one is as good as the other. Salts should be largely diluted with water: for the quantity of fluid given with them, facilitates their operation. In domestic practice, half an ounce of salts, in one tumbler full of water, will operate as strongly as one ounce, in half the quantity of water.

Doses. For ordinary-sized cows, one to two pounds is the dose, mixed with four quarts of cold water, one ounce of ginger in powder, and the whole sweetened with molasses or coarse sugar. For average-sized calves, two to four ounces; for sheep, four to six ounces. A few drops of commercial sulphuric acid, say 20 to 60 drops, will greatly remove the nauseous taste.

Equestrian, pertaining to horseback-riding; also, a man who rides horseback. An "equestrienne" is a lady who rides horseback. See Horseback Riding.

Equine, pertaining to the horse genus.

Equity (ek′wit-y), justice. A "court of equity" is one held to supply deficiencies of courts of law, in order to attain the ends of justice.

Ergot, a very poisonous fungus, which grows on diseased rye,—sometimes, though rarely in this country, on other plants,—and is known by its honey-like appearance in the latter part of May, enlarging the grain, and finally turning brown. It is nicknamed "honey-dew." It is supposed by some to be an excrescence similar to the oak-apple and the nutgall, and to be occasioned by the puncture of some insect. By others it is thought to be a monstrous development, or morbid swelling of the seed, occasioned by some disturbance in the organs of circulation or secretion. Still others think it a foreign vegetable growth, occasioned by a parasitic fungus. Whatever be its origin and its physical nature, it exerts a dreadfully noxious power upon the system of man or brute who receives even a small portion of it in their food. It has been ascertained by experiments upon many of the lower animals, to produce the most horrible gangrenes, rotting of the extremities, internal tortures, and death. It has been known to cause sloughing and kill many persons who have eaten grain or flour infected with it. It is supposed to have been the cause of dangerous epidemics which have at various periods scourged the poor in parts of France. If a farmer wishes to keep himself and family and all his stock from being poisoned by it, he must look out for it in May, and destroy all infected heads.

Ergot, in the hands of cautious and skillful practitioners, is a very valuable medicine for rousing weak or exhausted uterine action in cases of prolonged and difficult labor; but it is by far too critical in its proper use, and too dangerous in its misapplication, to be ever safely prescribed by persons of small professional education or of raw and youthful experience. It has also been very beneficially used in cases of difficult parturition in the mare, the cow, and the sheep; yet it ought never to be administered to any of these, especially the cow, except in cases of extremity.

Ergot in rye occurs most frequently in wet and stiff land, and may probably be either much increased by raising the crop on soil which will keep the roots constantly moist, or much diminished by raising the crop on naturally thirsty soil, or on land that has been thoroughly sub-soil-drained. When ergot has, in any district, been detected in wheat, the health of the whole community loudly demands the thorough draining of every field on which wheat may at any time be growing.

Erysipelas, a general fever, attended with rapidly spreading inflammations of the skin, characterized by redness and swelling. Sometimes about the third day little blisters appear which contain a yellowish fluid, but often no eruption appears, and the disease "strikes in," often becoming chronic. This is another disease for which a physician should be called.

Esculent, any plant whose roots, stem, shoots, leaves, or other bulky parts are suitable food for man. Familiar examples of esculents are carrots, turnips, and all our common garden vegetables.

Escutcheon, in dairying, is the direction of the growth of the hair on the hinder portion of a cow's bag and adjacent parts, as an index to her qualities as a milch-cow. See "Milk-Mirror," page 298.

Essence, the virtue of any medicinal or flavoring herb, drawn out either by boiling, by soaking in alcohol or oil, or by distillation. A real essence, strictly so termed, requires the complications of a scientific laboratory for their proper preparation, but many substitutes can be prepared at any home by making extracts (see Extracts), or pulverizing the dried herb, root, or whatever is desired.

ESSENCE OF GINGER. Grate and put into a quart of brandy, 3 ounces of fresh ginger, with the yellow part of the rind of a fresh lemon; shake it up well, and daily, ten days, when it may be used. It is nice for flavoring many kinds of sweetmeats; and a little of it mixed with water, or put on a piece of sugar, subserves all the purposes of ginger tea, and is far more palatable.

ESSENCE OF LEMON. The best way of obtaining the essence of lemon peel, is to rub all the yellow part of the peel off, with lumps of white sugar, and scrape off the surface of the sugar into a preserving pot as fast as it becomes saturated with the oil of the lemon. Press the sugar close, and cover it tight. A little of this sugar imparts a fine flavor to puddings, pies, and cakes. This is the preferable mode of obtaining and preserving the essence of lemon.

Essential Oils. This name is applied to those volatile fluids usually obtained from aromatic plants, by subjecting them to distillation with water. The oil is volatilized with the aqueous vapor, and is easily condensed; a small portion of it is retained in solution by the water, but the greater part separates, and is obtained pure from the difference in their specific gravity. In some instances, as, for example, in the rind of the orange and lemon, the oil exists in distinct vesicles, and may be obtained by expression. The principal volatile or essential oils are those of turpentine, anise-seed, nutmeg, lavender, cloves, caraway, peppermint, spearmint, sassafras, chamomile and citron. The taste of these oils is acrid and burning, and their odor very pungent, generally resembling the taste and smell of the vegetables affording them. They are generally fluid, and remain so even at a low temperature; but some congeal at a very moderate degree of cold, and others are naturally concrete. They are extremely volatile, very soluble in strong alcohol, but do not form soaps with the alkalies, by which they are distinguished from the fixed oils. They are readily inflamed by strong nitric acid, especially with the precaution of adding a little sulphuric acid to render the former more concentrated. Exposed to the action of the air they undergo an alteration in consequence of the absorption of oxygen, become thickened, and gradually change into a solid matter, resembling the true resins. One of the most useful and abundant of the essential oils is that of turpentine, commonly called spirits of turpentine. In general, the volatile oils are used in the practice of medicine, or as perfumes. Those applied to the latter use, as the essence of roses, of jasmine, violet, etc., are possessed of a more feeble odor, and being obtained from the flowers of their respective plants, require much care in their preparation.

Estate, in law, is the title or interest which a person has in lands, tenements, hereditaments or other effects. Estate is real or personal. The phrase "personal estate" is applied not only to movable goods, money, bonds and notes, but also to some fixtures temporarily attached to lands or buildings, and the distinction between those fixtures which are temporarily such and those which belong to and form a part of the house or other real estate, is of importance, as this distinction will determine how it is to be attached on mesne process, or seized and sold, or set off on an execution, and also how it descends on the decease of the proprietor. But personal estate also applies to some interest in lands or houses; thus, a lease of them for a certain number of years. Real estate in lands is of various kinds and descriptions, according to the quantity of interest, its duration, or the time by which it is limited in respect to its commencement or termination, and the number and condition of the owners. A fee simple is the amplest estate which the law admits of. A freehold is an estate for the life of any person or persons. An estate in tail is one limited to certain heirs. An estate in remainder is one of which the owner is to come into possession after the expiration of an intermediate estate of another person, or number of persons or heirs; and so, also, is an estate in reversion; thus, if one grants an estate tail, this estate may expire, in which case the lands will come back or revert to the grantor, and his estate, which still remains to him after he has granted the estate tail, is therefore called a reversion. As to the number of owners, an estate in common is a freehold belonging to more than one proprietor, in individual shares; and so also is an estate in joint-tenancy; but there is this distinction between these two kinds of estates,—that when one joint-tenant dies his share goes to the other joint tenants, which is not the case in tenancies in common. An estate in coparcenary arises when an estate in fee simple descends, on the decease of the owner, to his daughters, sisters, aunts, or female cousins, or their representatives, being females, and they are called coparceners, or, for brevity, parceners. Real estate left to any one by will is called a devise, or an estate by devise, in distinction from a bequest of personal property, which is called a legacy.

Estrays are domestic animals wandering about on the commons, or public roads, or in the fields, whose owners are unknown. Any resident citizen and householder may take up estrays, in nearly all the States, during some portion of the year. When an estray is

taken up, write out a particular discription of the animal, then go to the nearest justice of the peace and notify him you have taken up such animal as an estray, and ask him to show you the estray law of your State. The statutes of the several States are so voluminous and unlike that it is impossible to give correct instructions in this book. Remember, however, that estrays can only be taken up at, near or on your own premises. You cannot go out upon the commons or upon the road away from your own farm to take up stock of any kind, and when you do take up estrays, consult the State law.

Etiquette (et-i-ket′), the forms essential to social or official intercourse. Politeness includes etiquette, along with pleasing manners in every little detail of conduct and conversation. Politeness has been defined as "minor morals," and all true politeness is based upon the golden rule, "Do unto others as ye would that they should do unto you." This is the governing motive of good society, influencing all its thoughts, modifying all its speech, and controlling all its actions. True politeness requires that we shall exercise our faculties to secure the approbation, and, if possible, the admiration of all with whom we come in contact. Good manners are habits of mind and body, derived from right thinking and acting; such thinking and acting as shall afford us the greatest happiness, and at the same time preserve the rights and feelings of our neighbor. These habits are acquired by observation and study, and by association with persons of refined taste and elegant culture. For the sake of convenience we shall give the laws and forms of etiquette and the principles of politeness all together under one head, in this place.

In this article we shall endeavor to give such rules of action as will enable the young to enter good society with pleasure to themselves and satisfaction to their friends. The importance of such knowledge should be apparent to every person who has sons and daughters ready to be introduced into society. It always affords a pleasure to even the most uncultured parents to have their children appear to advantage among persons of refinement and culture.

A thoroughly good-hearted person, a man or woman of correct principles, will always shape his or her conduct so as to command respect; but it is not sufficient to always act justly or from right principles to fulfill one's duty in society. There are so many observances to be met, so many things to be considered and provided for, that, without an exact knowledge of what is due to one's self and one's associates, it is impossible to fulfill all the requirements of society. This knowledge is obtained by the study of what is termed Etiquette.

Young men and women upon first entering society are made to feel keenly their ignorance of the many forms and customs to which all are expected to conform. No allowance is made for the inexperience of the young persons, and any social blunder or awkwardness is sharply criticised. Even those who are well informed in this respect are sometimes at a loss to know just what to do under certain circumstances. To all such an article embodying the rules recognized by the best society, and stating simply and plainly the exact thing required, and what should be done, must be a welcome assistance. It can be consulted at any time, and will show what the best society, in all parts of the country, regards as good manners. Then what means have young persons who have been reared and educated in the country and are brought into the society of a city, of learning its customs except through this channel, or through dearly bought lessons of experience? Good breeding is the same in the country as in the city, it is true, but social intercourse is so differently conducted that customs and formalities entirely foreign to country life are in vogue. Then there are few young gentlemen and ladies of the country but have occasion to visit the city, or village, either to see relatives or friends, or on business or a tour of sight-seeing. Such should certainly be informed beforehand at least of the more common customs of city life. To neglect to learn and practice the rules prescribed by good society for the regulation of social intercourse, brings with it its own punishment. Those who are rough, coarse and vulgar do not merit the respect of well-bred people, much less than they command any good social influence. It is the duty of every one to gain friends by making the best impression possible, providing it can be done without the sacrifice of principle or honor. Daily experience shows that civility is not only one of the essentials of high success, but that it is almost a fortune of itself, and that he who has this quality in perfection, though a blockhead, is almost sure to get on where, without it, even men of ability fail. "Give a boy address and accomplishments," said an eminent writer, "and you give him the mastery of palaces and fortunes wherever he goes; he has no trouble of earning or owning them; they solicit him to enter and possess." Among strangers a good manner is the best letter of recommendation; for a great deal depends upon first impressions, and these are favorable or unfavorable according to a man's bearing, as he is polite or awkward, shy or self-possessed. While coarseness and gruffness lock doors and close hearts, courtesy, refinement and gentleness are an "open sesame" at which bolts and bars fly back and doors swing open. The rude, boorish man, even though well meaning, is avoided by all. Even virtue itself is offensive when coupled with an offensive manner.

For convenience we will treat the various topics alphabetically, after giving a few remarks as to personal care, both as to appearance and health. In the articles given on the several subjects we do not lay down any arbitrary rules of our own, but simply give the principles and observances that govern in good society, adapted especially to the rural residents.

The first care of all persons in society should be for their personal appearance. The preservation of health and comfort, good taste, and the approbation of friends, require cleanliness of person and dress The habits

of neatness and cleanliness should be cultivated. The hands, face, neck and ears should be thoroughly washed every morning in soft water, then briskly rubbed with a crash towel until they are dry and warm. There is nothing that preserves and promotes personal beauty like this. It gives softness and pliancy to the skin and imparts a beautiful glow to the cheeks. Good health and cleanliness also requires that the whole body should be frequently bathed. The garments of an individual may be plain or coarse, or even worn "thin and shiny," but if carefully brushed, neat and worn with dignity, the true lady or gentleman is indicated. The matter of cleanliness extends to all articles of clothing, underwear as well as outer-wear.

The hair and teeth should receive the utmost attention. The skin of the head should be as white as that of the hands, and the hair thoroughly brushed and kept. So, also, with the beard of men. It should be adapted to the style of the face, and carefully attended to, or it will become offensive to its wearer. A man may be as cleanly in all respects at the table with a beard as without one, but not without care and attention. One of nature's most beautiful gifts is fine teeth. The laws of health require that they be kept in good order, and social law demands that they be presented clean, pure and sweet. For information as to the preservation of both hair and teeth, hands, face, feet and eyes, see respective articles in this book.

Boots and shoes should be kept so neat and clean as to show that their owners are not lacking in good taste. One should also be careful not to perfume themselves with tobacco or odors of the hen-house, pig pen or barn.

BALLS. Persons giving balls or dancing parties should be careful not to invite more than their rooms will accommodate, so as to avoid a crush. Invitations to crowded balls are not hospitalities, but inflictions. A hostess is usually safe, however, in inviting one-fourth more than her rooms will hold, as that proportion of regrets are apt to be received. People who do not dance will not, as a rule, expect to be invited to a dancing party.

The Dances. The dances should be arranged beforehand, and for large balls programmes are printed with a list of the dances. Usually a ball opens with a waltz, followed by a quadrille, and these are succeeded by galops, lancers, polkas, quadrilles and waltzes in turn.

General Rules of the Ball Room. In private balls introductions are effected through the lady of the house or members of the family.

No gentleman should ask a lady to dance with him until he has received an introduction.

The usual form of asking a lady to dance is: "May I have the pleasure of dancing this quadrille with you?" Where there is great intimacy, "Will you dance?" may suffice. To accept is easy enough: "Thank you," is sufficient; to decline with delicacy, and without giving offence, is more difficult—"Thank you; I am engaged," suffices when that expresses the fact: when it does not, and a lady would rather not dance with a gentleman applying to her, she must beg to be excused, as politely as possible, and it is in better taste for her not to dance at all in that set.

Ladies should take especial care not to accept two partners for the same dance; nor should a gentleman ask a lady to dance with him more than twice during the same evening; if he is intimate with a lady he may dance with her three, or even four, times. Do not forget to ask the daughters of the house. When a lady has accepted, the gentleman offers her his right arm, and leads her to her place on the floor.

It is not necessary to bow to the lady at the end of a quadrille; in fact, anything like formality is now discountenanced; it is enough that you again offer her your right arm, and walk half round the room with her. You should inquire if she will take refreshments, and if she replies in the affirmative, you will conduct her to the room devoted to that purpose.

The gentleman who dances with a lady in the last dance before supper, conducts that lady to the supper-room, attends on her while there, and escorts her back to the ball-room. At a private ball the lady of the house may ask a gentleman to take a lady down to supper, and he is bound to comply and to treat her with the utmost delicacy and attention.

It is not well to dance every dance, as the exercise is unpleasantly heating and fatiguing. Never forget an engagement: it is an offense that does not admit of excuse, except when a lady commits it; and then a gentleman is bound to take her word without a murmur. It is not the mode for married persons to dance together. Engaged persons should not dance together too often; it is in bad taste. Gentlemen should endeavor to entertain the ladies who dance with them with a little conversation, or something more novel than the weather and the heat of the room; and in round dances they should be particularly careful to guard against collisions, and to see that their dresses are not torn.

Assemblies of this kind should be left quietly. If the party is small, it is permissible to bow to the hostess; but at a large ball this is not necessary, unless, indeed, you meet her on your way from the room. The great thing is to avoid making your departure felt as a suggestion for breaking up the party, as you have no right to hint by your movements that you consider the entertainment has been kept up long enough.

Finally, let no gentleman presume on a ball-room introduction. It is given with a view to one dance only, and will certainly not warrant a gentleman in going farther than asking a lady to dance a second time. Out of the ball-room reach, an introduction has no force whatever.

DRESS. To dress well requires good taste, good sense and refinement. A woman of good sense will neither make dress her first nor her last object in life. No sensible wife will betray that total indifference for her husband which is implied in the neglect of her appearance, and she will remember that to dress consistently and tastefully is one of the duties which she owes to society. Every lady, however insignificant

her social position may appear to herself, must exercise a certain influence on the feelings and opinions of others. An attention to dress is useful as retaining, in the minds of sensible men, that pride in a wife's appearance which is so agreeable to her, as well as that due influence which cannot be obtained without it. But a love of dress has its perils for weak minds. Uncontrolled by good sense and stimulated by personal vanity, it becomes a temptation at first, and then a curse. When it is indulged in to the detriment of better employments, and beyond the compass of means it cannot be too severely condemned.

Consistency in regard to station and fortune is the first matter to be considered. A woman of good sense will not wish to expend in unnecessary extravagances money wrung from an anxious, laborious husband; or, if her husband be a man of fortune, she will not, even then, encroach upon her allowance. In the early years of married life, when the income is moderate, it should be the pride of a woman to see how little she can spend upon her dress, and yet present that tasteful and creditable appearance which is desirable. Much depends upon management, and upon the care taken of garments. She should turn everything to account, and be careful of her clothing when wearing it.

Gloves. Gloves are worn by gentlemen as well as ladies in the street, at an evening party, at the opera or theater, at receptions, at church, when paying a call, riding or driving; but not in the country or at dinner. White should be worn at balls; the palest colors at evening parties and neutral shades at church.

Evening Dress for Gentlemen. The evening or full dress for gentlemen is a black dress suit—a "swallow-tail" coat, the vest cut low, the cravat white, and kid gloves of the palest hue or white. The shirt front should be white and plain; the studs and cuff-buttons simple. Especial attention should be given to the hair, which should be neither short nor long. It is better to err upon the too-short side, as too long hair savors of affectation, destroys the shape of the physiognomy, and has a touch of vulgarity about it. Evening dress is the same for a large dinner party, a ball or an opera. In some circles, however, evening dress is considered an affectation, and it is as well to do as others do.

Morning Dress for Gentlemen. The morning is a black frock-coat, or a black cut-away, white or black vest, according to the season, gray or colored pants, plaid or stripes, according to the fashion, a high silk (stove-pipe) hat, and a black scarf or necktie. A black coat with black pants is not considered a good combination, nor is a dress coat and colored or light pants. The morning dress is suitable for garden parties, Sundays, social teas, informal calls, morning calls and receptions.

Jewelry for Gentlemen. It is not considered in good taste for men to wear much jewelry. They may with propriety wear one gold ring, studs and cuff-buttons, and a watch chain, not too massive, with a modest pendant, or none at all. Anything more looks like a superabundance of ornament, and even affectation.

Evening Dress for Ladies. Evening dress for ladies may be as rich, elegant and gay as one chooses to make it. It is everywhere the custom to wear full evening dress in brilliant evening assemblages. It may be cut either high or low at the neck, yet no lady should wear her dress so low as to make it quite noticeable or a special subject of remark. Evening dress is what is commonly known as "full dress," and will serve for a large evening party, ball or dinner. No directions will be laid down with reference to it, as fashion devises how it to is be made and what material should be used.

Ball Dress. Ball dressing requires less art than the nice gradations of costume in the dinner dress, and the dress for evening parties. For a ball, everything should be light and diaphanous, somewhat fanciful and airy. The heavy, richly-trimmed silk is only appropriate to those who do not dance. The richest velvets, the brightest and most delicate tints in silk, the most expensive laces, elaborate coiffures, a large display of diamonds, artifical flowers of the head-dress and natural flowers for hand bouquets, all belong, more or less, to the costume for a large ball.

The Full Dinner Dress. The full dinner dress for guests admits of considerable splendor. It may be of any thick texture of silk or velvet for winter, or light rich goods for summer, and should be long and sweeping. Every trifle in a lady's costume should be, as far as she can afford it, faultless. The fan should be perfect in its way, and the gloves should be quite fresh. Diamonds are used in broaches, pendants, ear-rings and bracelets. If artificial flowers are worn in the hair, they should be of the choicest description. All the light neutral tints, and black, dark blue, purple, dark green, garnet, brown and fawn are suited for dinner wear.

Dress of Hostess at a Dinner Party. The dress of a hostess at a dinner party should be rich in material, but subdued in tone, so as not to eclipse any of her guests. A young hostess should wear a dress of rich silk, black or dark in color, with collar and cuffs of fine lace; and if the dinner be by daylight, plain jewelry, but by gaslight, diamonds.

Ordinary Evening Dress. The ordinary evening house dress should be tasteful and becoming, with a certain amount of ornament, and worn with jewels. Silks are the most appropriate for this dress, but all the heavy woolen dress fabrics for winter, and the lighter lawns and organdies for summer, elegantly made, are suitable. For winter, the colors should be rich and warm, and knots of bright ribbon of a becoming color should be worn at the throat and in the hair. The latter should be plainly dressed. Artificial flowers and diamonds are out of place. This is both a suitable dress in which to receive or make a casual evening call. If a hood is worn, it must be removed during the call. Otherwise a full dress bonnet must be worn.

Traveling Dress. Comfort and protection from dust and dirt are the requirements of a traveling dress.

When a lady is about making an extensive journey, a traveling suit is a great convenience; but for a short journey, a large linen overdress or duster may be put on over the ordinary dress in summer, and in winter a waterproof cloak may be used in the same way. For traveling costumes a variety of materials may be used, of soft, neutral tints, and smooth surface which does not retain the dust. These should be made up plainly and quite short. The underskirts should be colored, woolen in winter and linen in summer. The hat or bonnet must be plainly trimmed and completely protected by a large veil. Velvet is unfit for a traveling hat, as it catches and retains the dust; collars and cuffs of plain linen. The hair should be put up in the plainest manner. A waterproof and warm woolen shawl are indispensable and may be rolled in a shawl strap when not needed. A satchel should be carried, in which may be kept a change of collars, cuffs, gloves, handkerchiefs, toilet articles, and towels. A traveling dress should be well supplied with pockets, the waterproofs should have large pockets, and there should be one in the underskirt in which to carry such money and valuables as are not needed for immediate use.

Mourning. The people of the United States have settled upon no prescribed periods for the wearing of mourning garments. Some wear them long after their hearts have ceased to mourn. Where there is profound grief, no rules are needed, but where the sorrow is not so great, there is need of observance of fixed periods for wearing mourning.

Deep mourning requires the heaviest black of serge, bombazine, lusterless alpaca, delaine, merino or similar heavy clinging material, with collar and cuffs of crape. Mourning garments should have little or no trimming; no flounces, ruffles or bows are allowable.

The bonnet is of black crape; a hat is inadmissible. The veil is of crape or barege with heavy border; black gloves and black-bordered handkerchief. In winter dark furs may be worn with the deepest mourning. Jewelry is strictly forbidden, and all pins, buckles, etc., must be of jet. Lusterless alpaca and black silk trimmed with crape may be worn in second mourning, with white collars and cuffs. The crape veil is laid aside for net or tulle, but the jet jewelry is still retained. A still less degree of mourning is indicated by black and white, purple and gray, or a combination of these colors. Crape is still retained in bonnet trimming, and crape flowers may be added. Light gray, white and black, and light shades of lilac, indicate a slight mourning. Black lace bonnet, with white or violet flowers, supersedes crape, and jet and gold jewelry is worn.

The deepest mourning is that worn by a widow for her husband. They wear deep mourning for one year, then ordinary mourning for one year. For parents, from one to two years. For brothers and sisters that have reached maturity, one year.

Harmony of Colors. A lady must always consider what colors will suit her complexion. If she be dark, blue will not look well upon her; or if she be fair, pink will not become her. The most trying color is yellow. Only very prominent brunettes can wear it.

Red and blue, red and yellow, blue and yellow, and scarlet and crimson may never be united in the same costume. If the dress be red, green may be introduced in a minute quantity; if blue, orange; if green, crimson. Scarlet and Solferino are deadly enemies, each killing the other whenever they meet.

Two contrasting colors, such as red and green, may not be used in equal quantities in the dress, as they are both so positive in tone that they divide and distract the attention. When two colors are worn in any quantity, one must approach a neutral tint, such as gray or drab. Black may be worn with any color, though it looks best with the lighter shades of the different colors. White may also be worn with any color, though it looks best with the darker tones. Thus, white and crimson, black and pink, each contrast better and have a richer effect than though the black were united with the crimson and the white with the pink. Drab, being a shade of no color between black and white, may be worn with equal effect with all.

A person of very fair, delicate complexion should always wear the most delicate of tints, such as light blue, mauve, and pea-green. A brunette requires bright colors, such as scarlet and orange, to bring out the brilliant tints in her complexion. A florid face and auburn hair call for blue.

Black hair has its color and depth enhanced by scarlet, orange, or white, and will bear diamonds, pearls, or lusterless gold.

Dark-brown hair will bear light blue or dark blue in a lesser quantity.

If the hair has no richness of coloring, a pale yellowish green will by reflection produce the lacking warm tint.

Light-brown hair requires blue, which sets off to advantage the golden tint.

Pure golden or yellow hair needs blue, and its beauty is also increased by the addition of pearls or white flowers.

Auburn hair, if verging on the red, needs scarlet to tone it down. If a golden red, blue, green, purple, or black will bring out the richness of its tints.

Flaxen hair requires blue.

Size in Relation to Dress and Colors. A small person may dress in light colors which would be simply ridiculous on a person of larger proportions. So a lady of majestic appearance should never wear white, but will be seen to the best advantage in black or dark tints. A lady of diminutive stature is dressed in bad taste when she appears in a garment with large figures, plaids, or stripes. Neither should a lady of large proportions be seen in similar garments, because, united with her size, they give her a "loud" appearance. Indeed, pronounced figures and broad stripes and plaids are never in perfect taste.

Heavy, rich materials suit a tall figure, while light, full draperies should only be worn by those of slender proportions and not too short. Short people must be content with meager drapery and quiet colors.

Tall and slim persons should avoid stripes; short, chunky ones flounces, or any horizontal trimming of the dress which, by breaking the outline from the waist to the feet, produces an effect of shortening.

CALLS. There are calls of various kinds to be made by people of good breeding, and as the young lady who has been reared in her quiet country home emerges into womanhood, and enters society, she should know something of the etiquette of calling and receiving calls. She should be able to entertain in the best manner those who visit or call at her rural home, or present herself properly to her friends, acquaintances or strangers, in the neighborhood. Often, too, she may visit a relative or friend in the village or city where she will receive callers. Likewise the young man may have occasion to call in the city, or upon lady friends in his vicinity, and should be posted as to the proper manner to make the calls and conduct himself. Thus it is the object of this article to give such information as will enable persons to familiarize themselves with the rules governing calls. We do not forget the matron, but incorporate such information as is adapted to her.

Calls upon Strangers. When strangers enter a community, either to make a visit or secure a home, those who desire to make their acquaintance shall manifest their disposition to be sociable by giving them the first call. When a call is thus made upon a stranger he or she should be politely invited to return the compliment, which should be done at the earliest convenience. When calls are not returned it is understood that even a formal sociability is not considered agreeable.

Formal Calls. It frequently happens that persons have a long list of acquaintances, with whom, on account of pressure of domestic cares, or other important business which demands the greater part of their time, they cannot be on terms of intimacy, and yet who desire to cultivate their friendship by the exercise of at least a formal sociability. In order to accommodate this social necessity for recognition it is the custom to make brief visits or calls. As the call is necessarily short it is not expected that ladies shall remove their bonnets or shawls.

The lady of the house rises on the entrance of her visitors, who at once advance to pay their respects to her before speaking to others. If too many callers are present to enable her to take the lead in conversation, she pays special attention to the latest arrivals, watching to see that no one is left alone, and talking to each of her guests in succession, or seeing that some one is doing so.

A lady who is not in her own house does not rise, either on the arrival or departure of ladies, unless there is some great difference of age. Attention to the aged is one of the marks of good breeding which is never neglected by the thoughtful and refined.

When introductions are given, it is the gentleman who should be presented to the lady; when two ladies are introduced it is the younger who is presented to the older.

A lady receiving gives her hand to a stranger as to a friend, when she wishes to bestow some mark of cordiality in welcoming a guest to her home, but a gentleman should not take the initiatory in handshaking. It is the lady's privilege to give or withhold as she chooses.

A gentleman rises, when those ladies with whom he is talking rise to take their leave. He also rises upon the entrance of ladies, but he does not offer seats to those entering, unless in his own house, or unless requested to do so by the hostess, and then he does not offer his own chair if others are available.

A call should not be less than 15 minutes in duration, nor should it be so long as to become tedious. A bore is a person who does not know when you have had enough of his or her company, and gives more of it than is desirable. Choose a time to leave when there is a lull in the conversation, and the hostess is not occupied with fresh arrivals. Then take leave of your hostess, bowing to those you know as you leave the room, not to each in turn, but let one bow include all.

If, on making a call, you are introduced into a room where you are unknown to those assembled, at once give your name and mention upon whom your call is made.

In meeting a lady or gentleman whose name you cannot recall, frankly say so if you find it necessary. Sensible persons will prefer to recall themselves to your memory rather than to feel that you are talking to them without fully recognizing them. To affect not to remember a person is despicable, and reflects only on the pretender.

Gentlemen as well as ladies, when making formal calls, send in but one card, no matter how many members of the family they may wish to see. If a guest is stopping at the house, the same rule is observed. If not at home, one card is left for the lady, and one for the guest. The card for the lady may be folded so as to include the family.

General Rules Regarding Calls. A gentleman in making a formal call should retain his hat and gloves in his hand on entering the room. The hat should not be laid upon a table or stand, but kept in the hand, unless it is found necessary from some cause to set it down. In that case, place it upon the floor. An umbrella should be left in the hall. In an informal evening call, the hat, gloves, overcoat, and cane may be left in the hall.

A lady, in making a call, may bring a stranger, even a gentleman, with her, without previous permission. A gentleman, however, should never take the same liberty.

No one should prolong a call if the person upon whom the call is made is found dressed ready to go out.

A lady should be more richly dressed when calling on her friends than for an ordinary walk.

A lady should never call upon a gentleman except upon some business, officially or professionally.

Never allow your children, dogs or pets of any sort

to accompany you in a call. They often prove disagreeable and troublesome.

Two persons out of one family, or at most three, are all that should call together.

It is not customary in cities to offer refreshments to callers. In the country, where the caller has come from some distance, it is exceedingly hospitable to do so.

Calls in the country may be less ceremonious and of longer duration than those made in the city.

A person making a call should not, while waiting for a hostess, touch an open piano, walk about the room examining pictures, nor handle any ornament in the room.

Never offer to go to the room of an invalid upon whom you have called, but wait for an invitation to do so.

In receiving morning calls, it is unnecessary for a lady to lay aside any employment, not of an absorbing nature, upon which she may happen to be engaged. Embroidery, crocheting or light needle-work are perfectly in harmony with the requirements of the hour, and the lady looks much better employed than in absolute idleness.

A lady should pay equal attention to all her guests. The display of unusual deference is alone allowable, when distinguished rank or reputation or advanced age justifies it.

A guest should take a seat indicated by the hostess. A gentleman should never seat himself on a sofa beside her, nor in a chair in immediate proximity, unless she specially invites him to do so.

A lady need not lay aside her bonnet during a formal call, even though urged to do so. If the call be a friendly and unceremonious one, she may do so if she thinks proper, but not without an invitation.

A gentleman caller must not look at his watch during a call, unless, in doing so, he pleads some engagement and asks to be excused.

In calling upon a person living at a hotel or boarding-house, it is customary to stop in the parlor and send your card to the room of the person called upon.

When a person has once risen to take leave, he should not be persuaded to prolong his stay.

Visits of friendship are conducted by no particular rules of etiquette, as it is presumed that intimate friends or relatives understand each other's tastes and peculiarities, and will conduct themselves in a manner mutually agreeable.

A sick person sometimes desires visits or calls from acquaintances, and sometimes not; and it is absolutely necessary that a friend or neighbor should ascertain, from the responsible attendant, the desires of the sick in this respect, as well as the orders of the physician, before incurring the risk of intrusion. Do not be too officious. Be willing to serve, but not to consume time in wearying the patient with long calls, visits or anything else that might be tedious. Nor is it proper to insist on remedies and prescriptions of your own.

On hearing of the death of a friend, or in the family of a friend, it is well to make a short call of condolence, ascertaining first, of some responsible person in charge of affairs, whether such call might be agreeable. Calls of condolence are often proper, made in the parlor in the presence of the person in charge, even if the bereft party does not personally appear.

Cards. A card used in calling should have nothing upon it but the name of the caller. A lady's card should not bear her place of residence. A physician may put the prefix "Dr.," or the affix "M. D.," upon his card, and an army or navy officer his rank and branch of service.

Wedding Cards. Wedding cards are only sent to those people whom the newly married couple desire to keep among their acquaintances, and it is then the duty of those receiving the cards to call first on the young couple.

Size and Style of Visiting or Calling Cards. A medium-sized is in better taste than a very large card, for married persons. Cards bearing the name of the husband alone are smaller. The cards of unmarried men should also be small. The engraving in simple writing is preferred, and without flourishes. Nothing in cards can be more common-place than large printed letters, be the type what it may. Young men should dispense with the "Mr." before their names. Tinted or colored cards are not in good taste.

Card for Mother and Daughter. The name of young ladies are sometimes printed or engraved on their mother's cards; both in script. It is, of course, allowable for the daughter to have cards of her own.

Calling at Hotels. In calling upon a person living or stopping temporarily at a hotel, wait in the parlor and send up your card. Even intimate friends should observe this rule. Gentlemen may wait in office or hall of the hotel while the waiter takes up their card.

Conversation. It is not given to every man to be a brilliant talker. There is no reason, however, why any person who goes into society should be ignorant of the rules of polite intercourse. To be able to converse well is an attainment which should be cultivated by every intelligent man and woman. It is better to be a good talker than a good singer or musician, because the former is more widely appreciated, and the company of a person who is able to talk well on a great variety of subjects, is much sought after. The importance, therefore, of cultivating the art of conversation cannot easily be over-estimated. It should be the aim of all intelligent persons to acquire the habit of talking sensibly and with facility upon all topics of general interest to society, so that they may both interest others and be themselves interested, in whatever company they may chance to be thrown.

The training for this should be commenced in early childhood. Parents should not only encourage their children to express themselves freely upon everything that attracts their attention and interests them, but they should also incite their faculties of preception, memory and close observation, by requiring them to recount everything, even to its minutest details, that they may have observed in walking to and from school, or in taking a ride in a carriage or in the cars.

By training a child to a close observation of everything he meets or passes, his mind becomes very active, and the habit having once been acquired, he becomes interested in a great variety of objects; sees more and enjoys more than one who has not been so trained.

Topics. It is almost useless to say that your conversation should be adapted to your company, but this is the golden rule on this subject. Some men make a point of talking common-place to all ladies alike, as if a woman could only be a trifler. Others, on the contrary, seem to forget in what respect the education of a lady differs from that of a gentleman, and commit the opposite error of conversing on topics with which ladies are seldom acquainted, and in which few or any are seldom interested. Religion, politics and all disputed points whereon party lines are strongly drawn, are topics that should never be introduced into general conversation, for they are subjects dangerous to harmony. Persons are most likely to differ, and least likely to preserve their tempers on these topics. Long arguments in general company, however entertaining to the disputants, are very tiresome to the hearers.

Gossip, or tattling, is the telling of unfounded suspicions or unreliable stories about a neighbor. This is probably the most difficult vice to avoid.

Talk of yourself and your own affairs as little as possible. If you wish to be an agreeable listener, show an interest in the affairs of others as related by them.

Correct Use of Words. The correct use of words is indispensable to a good talker who would escape the unfavorable criticism of an educated listener. There are many words and phrases used in some cases by persons who have known better, but who have become careless from association with others who make constant use of them. "Because that" and "but that" should never be used in connection, the word "that" being entirely superfluous. The word "avocation" is often used for "vocation." "Unhealthy" food is spoken of when it should be "unwholesome, or unhealthful." "Had not ought to" is sometimes heard for "ought not to;" "banister" for "baluster;" "handsful" and "spoonsful" for "handfuls" and "spoonfuls;" "it was him" for "it was he;" "it was me" for "it was I;" "whom do you think was there?" for "who do you think was there?" "a mutual friend" for "a common friend;" "like I did" instead of "as I did;" "those sorts of things" instead of "that sort of thing;" "laying down" for "lying down;" "setting on a chair" for "sitting on a chair;" "try and make him" instead of "try to make him;" "she looked charmingly" for "she looked charming;" "loan" for "lend;" "to get along" instead of "to get on;" "cupalo" instead of "cupola;" "who" for "whom"—as, "who did you see?" for "whom did you see?" double negatives, as, "he didn't want no money;" "lesser" for "least;" "off-set" instead of "set-off," and many other words which are often carelessly used by those who have been better taught as well as those who are ignorant of their proper use.

Profanity. No gentleman uses profane language. It is unnecessary to add that no gentleman will use profane language in the presence of a lady. For profanity there is no excuse. It is a low and paltry habit, acquired from association with low and paltry spirits, who possess no sense of honor, no regard for decency, and no reverence or respect for beings of a higher moral or religious nature than themselves. The man who habitually uses profane language lowers his moral tone with every oath he utters. Moreover, the silliness of the practice, if no other reason, should prevent its use by every man of good sense.

Profanity never did any one the slightest good. No one is richer, wiser, happier, or more esteemed for it. It helps no man's education or manner; it commends no one to good society; it is disgusting to man and insulting to God.

Expletives. It exhibits a want of culture to interlard your sentences with hackneyed phrases of emphasis, as, "sure as death," "quick as lightning," "most horrid sight I ever saw," "Jerusalem!" "by hoky," "upon my honor," "you may bet your bottom dollar," "plague take it," "you bet," etc.

Attention. Polite people always look the person to whom their conversation is addressed in the face, and he, to appear respectful, must look directly at the speaker.

Things to be Avoided. It must be remembered that a social gathering should never be made the arena of a dispute. Consequently every subject liable to provoke a discussion should be avoided. Even slight inaccuracy in statement of facts or opinions should rarely be remarked on in conversation.

Do not permit yourself to lose your temper in society, or show that you have taken offense at a supposed slight.

If any one should assume a disagreeable tone of voice or offensive manner toward you, never return it in company, and above all, do not adopt the same style of conversation with him. Appear not to notice it, and generally it will be discontinued, as it will be seen that it has failed in its object.

Avoid all coarseness and undue familiarity in addressing others. A person who makes himself offensively familiar will have few friends.

Never attack the character of others in their absence; and if you hear others attacked, say what you can consistently to defend them.

Do not ask the price of articles you observe, except from intimate friends, and then very quietly, and only for some good reason.

Do not appear to notice an error in language, either in pronunciation or grammar, made by the person with whom you are conversing, and do not repeat correctly the same word or phrase. This would be as ill-bred as to correct it when spoken.

Mimicry is ill-bred and must be avoided.

Sneering at the private affairs of others has long ago been banished from the conversation of well-mannered people.

Never introduce unpleasant topics, nor describe re-

volting scenes or incidents in general company.

Never give officious advice. Even when sought for, give advice sparingly.

Never, directly or indirectly, refer to the affairs of others, which it may give them pain in any degree to recall.

Do not intrude upon those who appear to be engaged in any conversation which they may be unwilling for you to hear.

Do not interrupt a person in speaking, without his consent or asking his pardon.

Never hold your companion in conversation by the button-hole. If you are obliged to detain him forcibly in order to say what you wish, you are pressing upon him what is disagreeable or unwelcome, and you commit a gross breach of etiquette in so doing.

Especially avoid contradictions, interruptions and monopolizing all conversation yourself. These faults are all intolerable and very offensive.

To speak to one person in a company in ambiguous terms, understood by him alone, is as rude as if you had whispered in his ear.

Avoid stale and trite remarks on common-place subjects; also all egotism and anecdotes of personal adventure and exploit, unless it should be called out by persons you are conversing with.

To make a classical quotation in a mixed company is considered pedantic and out of place, as is also an ostentatious display of your learning.

Long arguments or heated discussions are apt to be tiresome to others, and should be avoided.

It is considered extremely ill-bred for two persons to whisper in society, or to converse in a language with which all persons are not familiar.

Avoid talking too much, and do not inflict upon your hearers interminably long stories, in which they can have but little interest.

COURTSHIP AND MARRIAGE. The correct behavior of a young man toward young ladies, and of young ladies toward young men, during that portion of their lives when they are respectfully paying attention to and receiving attention from, one another, is a matter which requires no little consideration.

A Gentleman's Conduct Toward Ladies. Young people of either sex, who have arrived at mature age, and who are not engaged, have the utmost freedom in their social intercourse in this country, and are at liberty to associate and mingle freely in the same circles with those of the opposite sex. As soon, however, as a young gentleman neglects all others, to devote himself to a single lady, he gives that lady reason to suppose that he is particularly attracted to her, and may give her cause to believe that she is to become engaged to him, without telling her so. A gentleman who does not contemplate matrimony should not pay too exclusive attention to any one lady.

Ladies' Conduct Toward Gentlemen. A young lady who is not engaged may receive calls and attentions from such unmarried gentlemen as she desires. She should use due discretion, however, as to whom she favors by the acceptance of such invitations. A young lady should not allow special attention from any one to whom she is not specially attracted, because, first, she may do injury to the gentleman in seeming to give his suit encouragement; and, secondly, she may keep away from her those whom she likes better, but who will not approach her under the mistaken idea that her feelings are already interested. A young lady should not encourage the address of a gentleman unless she sees that she can return his affections. It is the prerogative of a man to propose, and of the woman to accept or refuse, and a lady of tact and kind heart will exercise her prerogative before her suitor is brought to the humiliation of an offer which must result in a refusal.

No well-bred lady will too eagerly receive the attentions of a gentleman, no matter how much she admires him; nor, on the other hand, will she be so reserved as to altogether discourage him. A man may show considerable attention to a lady without becoming a lover; and so a lady may let it be seen that she is not disagreeable to him without discouraging him. She will be able to judge soon from his actions and deportment, as to his motive in paying her his attentions, and will treat him accordingly. A man does not like to be refused when he makes a proposal, and no man of tact will risk a refusal. Neither will a well-bred lady encourage a man to make a proposal which she must refuse. She should endeavor, in discouraging him as a lover, to retain his friendship. A young man of sensibilities, who can take a hint when it is offered him, need not run the risk of a refusal.

Premature Declarations. It is very injudicious, not to say presumptuous, for a gentleman to make a proposal to a young lady on too brief an acquaintance. A lady who would accept a gentleman at first sight can hardly possess the discretion needed to make a good wife.

Perhaps there is such a thing as love at first sight, but love alone is a very uncertain foundation upon which to base marriage. There should be thorough acquaintanceship and a certain knowledge of harmony of tastes and temperaments before matrimony is ventured upon.

An Acceptable Suitor. Parents should always be able to tell from observation and instinct just how matters stand with their daughter; and if the suitor is an acceptable one and everything satisfactory, then the most scrupulous rules of etiquette will not prevent their letting the young couple alone. If the lover chooses to propose directly to the lady and consult her father afterward, consider that he has a perfect right to do so. If her parents have sanctioned his visits and attentions by a silent consent, he has a right to believe that his addresses will be favorably received by them.

Requirements for a Happy Marriage. Respect for each other is as necessary to a happy marriage as that the husband and wife should have an affection for one another. Social equality, intellectual sympathy, and sufficient means are very important matters to be considered by those who contemplete matrimony.

It must be remembered that husband and wife,

after marriage, have social relations to sustain, and perhaps it will be discovered, before many months of wedded life have passed, when there is a social inequality, that one of the two have made sacrifice for which no adequate compensation has been or ever will be received. And so both lives become soured and spoiled, because neither receives nor can receive the sympathy which their efforts deserve, and because their cares are multiplied from a want of congeniality. One or the other may find that the noble qualities seen by the impulse of early love were but the creation of an infatuated fancy, existing only in the mind where it originated.

Another condition of domestic happiness is intellectual sympathy. Man requires a woman who can make his home a place of rest for him, and woman requires a man of domestic tastes. While a woman who seeks to find happiness in a married life will never consent to be wedded to an idler or a pleasure-seeker, so a man of intelligence will wed none but a woman of intelligence and good sense. Neither beauty, physical characteristics nor other external qualifications will compensate for the absence of intelligent thought, and clear and quick comprehensions. An absurd idea is held by some that intelligence and domestic virtues cannot go together, that an intellectual woman will never be content to stay at home to look after the interests of her household and children. A more unreasonable idea has never been suggested; for, as the intellect is strengthened and cultured, it has a greater capacity of affection, of domesticity, and of self-sacrifice for others.

Mutual trust and confidence are other requisites for happiness in married life. There can be no true love without trust. The responsibility of a man's life is in a woman's keeping from the moment he puts his heart into her hands. Without mutual trust there can be no real happiness.

Another requisite for conjugal happiness is moral and religious sympathy, that each may walk side by side in the same path of moral purpose and social usefulness, with joint hope of immortality.

Proposals of Marriage. Rules in regard to proposals of marriage cannot be laid down, for they are and should be as different as people. The best way is to apply to the lady in person, and receive the answer from her own lips. If courage should fail a a man in this, he can resort to writing, by which he can clearly and boldly express his feelings. A spoken declaration should be bold, manly, and earnest, and so plain in its meaning that there can be no misunderstanding. As to the exact words to be used, there can be no set formula: each proposer must be governed by his own ideas and sense of propriety in the matter.

A gentleman should evince a sincere and unselfish affection for his beloved, and he will show as well as feel that her happiness must be considered before his own. Consequently, he should not press an unwelcome suit upon a young lady. If she has no affection for him, and does not conceive it possible ever to entertain any, it is cruel to urge her to give her person without her love. The eager lover may believe, for the time being, that such possession would satisfy him; but the day will surely come when he will reproach his wife that she had no love for him, and he will possibly make that an excuse for all manner of unkindness.

A Lady's First Refusal. It is not always necessary to take a lady's first refusal as absolute. Diffidence or uncertainty as to her own feelings may sometimes influence a lady to reply in the negative, and after consideration cause her to regret that reply.

Though a gentleman may repeat his suit with propriety after having been once repulsed, still it should not be repeated too often or too long, lest it should degenerate into importuning.

No lady worthy any gentleman's regard will say "No" twice to a suit which she intends ultimately to receive with favor. A lady should be allowed all the time she requires before making up her mind; and if the gentleman grows impatient at the delay, he is always at liberty to insist on an immediate answer and abide by the consequences of his impatience.

Nothing can be more unfair or more unjustifiable than a doubtful answer given under the plea of sparing the suitor's feelings. It raises false hopes. It renders a man restless and unsettled. It may cause him to express himself or to shape his conduct in such a manner as he would not dream of doing were his suit utterly hopeless.

How to Treat a Refusal. As a woman is not bound to accept the first offer that is made to her, so no sensible man will think the worse of her, nor feel himself personally injured, by a refusal. That it will give him pain is most probable. A scornful "No" or a simpering promise to "think about it" is the reverse of generous.

In refusing, the lady ought to convey her full sense of the high honor intended her by the gentleman, and to add, seriously but not offensively, that it is not in accordance with her inclination, or that circumstances compel her to give an unfavorable answer.

It is only the contemptible flirt that keeps an honorable man in suspense for the purpose of glorifying herself by his attentions in the eyes of friends. Nor would any but a frivolous or vicious girl boast of the offer she had received and rejected. Such an offer is a privileged communication. The secret of it should be held sacred. No true lady will ever divulge to anyone, unless it may be to her mother, the fact of such an offer. It is the severest breach of honor to do so. A lady who has once been guilty of boasting of an offer should never have a second opportunity for thus boasting.

No true-hearted woman can entertain any other feeling than that of commiseration for the man over whose happiness she has been compelled to throw a cloud, while the idea of triumphing in his distress, or abusing his confidence, must be inexpressibly painful to her.

Presents. When a couple become engaged, the

gentleman presents the lady with a ring, which is worn on the ring-finger of the right hand. He may also make her other small presents from time to time, until they are married; but if she has any scruples about accepting them, he can send her flowers, which are at all times acceptable.

An Engaged Woman. An engaged woman should eschew all flirtations, though it does not follow that she is to cut herself off from all association with the other sex because she has chosen her future husband. She may still have friends and acquaintances, she may still receive visits and calls, but she must try to conduct herself in such a manner as to give no offense.

An Engaged Man. The same rules may be laid down in regard to the other party to the contract, only that he pays visits instead of receiving them. Neither should assume a masterful or jealous attitude toward each other. They are neither of them to be shut up away from the rest of the world, but must mingle in society after marriage nearly the same as before, and take the same delight in friendship. The fact that they have confessed their love to each other ought to be deemed a sufficient guarantee of faithfulness; for the rest let there be trust and confidence.

The conduct of a gentleman who is engaged should be tender, assiduous and unobtrusive. He will be kind and polite to the sisters of his betrothed and friendly with her brothers. Yet he must not be in any way unduly familiar or force himself into family confidences on the ground that he is to be regarded as a member of the family. Let the advance come rather from them to him, and let him show a due appreciation of any confidences which they may be pleased to bestow upon him. The family of the young man should make the first advances toward an acquaintance with his future wife. They should call upon her or write to her, and they may with perfect propriety invite her to visit them in order that they may become acquainted.

INTRODUCTION. The initiatory step to the formation of an acquaintanceship or friendship is usually by introduction, though it is by no means uncommon that when it has taken place without an introduction, it is not of the best and purest, and results to the advantage of both.

We briefly give the rules governing introduction that will apply equally to the country or city. One of the fundamental principles is the care and discrimination that should be exercised in making introductions, especially of gentlemen to ladies. It is to be remembered that an introduction is regarded as a social indorsement of the person introduced, and that under certain circumstances it would be wrong to introduce to our friends casual acquaintances of whom we know nothing, who may prove to be anything but desirable persons to know. By introducing a man of bad character to a lady you do her a positive wrong. She cannot shake him off as easily as a man can, and his association with her is an injury to her reputation.

How to Introduce. The proper form of introduction is to present the gentleman to the lady, the younger to the elder, the inferior in social standing to the superior. In introducing, you bow to the lady and say, "Miss R., allow me to introduce to you Mr. D. Mr. D., Miss R." It is the duty of Mr. D. upon bowing to say, "It gives me great pleasure to form your acquaintance, Miss R.," or a remark of this nature.

If gentlemen are to be introduced to one another, the form is, "Col. Blank, permit me to introduce to you Mr. Cole. Mr. Cole, Col. Blank." The exact words of an introduction are immaterial, so long as a proper form and order is preserved.

The word "present" is often used in place of "introduce." While it is customary to repeat the names of the two parties introduced at the close of the introduction, it is often omitted as a useless formality. It is of the utmost importance that each name should be spoken distinctly. If either of the parties does not distinctly hear the name of the other he should say at once, without hesitation or embarrassment, before making the bow, "I beg your pardon; I did not catch (or understand) the name," when it may be repeated to him.

If several persons are to be introduced to one individual, mention the name of the single individual first, and then call the others in succession, bowing slightly as each name is pronounced.

Introducing Relatives. In introducing members of your own family, be careful not only to specify the degree of relationship, but to give the name also. It is awkward to a stranger to be introduced to "My brother Tom," or "My sister Carrie." When either the introducer or the introduced is a married lady, the name of the party introduced can only be guessed at.

Bestowing of Titles. In introducing a person give him his appropriate title. If he is a clergyman, say "The Rev. Mr. Clark" If a doctor of divinity, say "The Rev. Dr. Clark." If he is a member of Congress, call him "Honorable," and specify to which branch of Congress he belongs.

Whom to Introduce. A gentleman should not be introduced to a lady unless her permission has been previously obtained, and no one should ever be introduced into the house of a friend except permission is first granted. As a rule, gentlemen should not be introduced to each other until their wishes on the subject are ascertained.

A friend visiting at your house must be introduced to all callers, and courtesy requires the latter to cultivate the acquaintance while your visitor remains with you. If you are the caller introduced, you must show the same attention to the friend of your friend that you wish shown your own friends under the same circumstances. Persons meeting at a public place need not introduce each other to the strangers who may chance to be with them; and, even if the introduction does take place, the acquaintance need not be continued unless desired.

The Salutation. A slight bow is all that is required by courtesy, after an introduction. Shaking hands is optional, and it should rest with the older, or the superior in social standing, to make the advances. It is

often an act of kindness on their part, and as such to be commended. It is a common practice among gentlemen, when introduced to one another, to shake hands, and, as it evinces more cordiality than a mere bow, is generally to be preferred. An unmarried lady should not shake hands with gentlemen indiscriminately.

Recognition. It is the privilege of the lady to determine whether she will recognize a gentleman after an introduction, and he is bound to return the bow. In bowing to a lady on the street, it is not enough that a gentleman should touch his hat: he should lift it from his head.

The "Cut Direct." The "cut direct," which is given by a prolonged stare at a person, if justified at all, can only be in case of extraordinary and notoriously bad conduct on the part of the individual "cut," and is very seldom called for. If any one wishes to avoid a bowing acquaintance with another, it can be done by looking aside or dropping the eyes. It is an invariable rule of good society that a gentleman cannot "cut" a lady under any circumstances, but circumstances may arise when he may be excused for persisting in not meeting her eyes; for if their eyes meet, he must bow.

Meeting in the Street. If, while walking with one friend in the street, you meet another and stop a moment to speak to the latter, it is not necessary to introduce the two who are strangers to one another; but when you separate the friend who accompanies you gives a parting salutation, the same as yourself. The same rule applies if the friend you meet chances to be a lady.

Introducing Yourself. If, on entering a drawing-room to pay a visit, you are not recognized, mention your name immediately. If you know but one member of the family and you find others only in the room, introduce yourself to them. Unless this is done, much awkwardness may be occasioned.

Shaking Hands. When a lady is introduced to a gentleman she should merely bow but not give her hand, unless the gentleman is a well known friend of some member of the family. In that case she may do so if she pleases, as a mark of esteem or respect. A gentleman must not offer to shake hands with a lady until she has made the first movement.

A married lady should extend her hand upon being introduced to a stranger brought to her house by her husband or common friend, as an evidence of her cordial welcome.

New-Year's Calls. The custom of New-Year's calling is so prevalent in cities, and most villages, that we deem a few paragraphs on the etiquette of New-Year's calling necessary. Often a farmer's wife or daughter wishes to "receive" with a friend or relative in the village or city, or the farmer or his sons may be in the city and wish to make New-Year's calls, and not being accustomed to such will neglect it, or meet with many embarrassments in receiving or making them. We thus append a few of the simplest rules to be observed in both receiving and calling.

January first is the day when gentlemen keep up their acquaintanceship with ladies and families, some of whom they are unable to see, probably, during the whole year. For convenience, and to add to the pleasure of the day, several ladies frequently unite in receiving calls at the residence of one of their number, but this is usually done when only one or two members of a family can receive. When there are several members of a family who can do so, they usually receive at their own home.

Gentlemen call either singly, in couples, by threes or fours, and sometimes even more, in carriages or on foot, as they choose. Calls commence about ten o'clock in the morning, and continue until about nine in the evening. When the gentlemen go in parties they call upon the lady friends of each, and if all are not acquainted those who are introduce the others. The length of a call is usually from five to fifteen minutes, but it is often governed by circumstances and may be prolonged to even an hour.

Refreshments are usually provided for the callers, and should always be offered, but it is not necessary that they should be accepted. If not accepted, an apology should be tendered, with thanks for the offer. The refreshments may consist of oysters, raw or scalloped, cold meats, salads, fruits, cakes, sandwiches, etc., and hot tea and coffee.

When callers are ushered into the reception-room, they are met by the ladies, when introductions are given, and the callers are invited to remove their overcoats, but it is optional with them whether they do so or not. It is also optional with them whether they remove their gloves.

A gentleman may call at the house of a friend whether he knows they are receiving or not. If they are not receiving leave your card. In some places families not receiving calls close the front windows of the house, and hang a tasteful basket from the knob of the front door. The visitor simply deposits his card in the basket without ringing the bell.

Gentlemen provide themselves with cards which vary in style with the seasons, and according to the tastes of the different individuals. They leave one at each place where they have called, and where more than one lady is receiving together a card is left for each one. Ladies generally preserve these cards, as they constitute a pleasant reminiscence of the occasion.

Public Places. All well-bred persons will conduct themselves at all times and in all places with perfect decorum. Wherever they meet people they will be found polite, considerate of the comfort, convenience and wishes of others, and unobtrusive in their behavior. Many people, however, either from ignorance, thoughtlessness or carelessness, are constantly violating some of the observances of etiquette pertaining to places of public assemblages. It is for this reason that rules are here given by which may be regulated the conduct of people in various public gatherings, where awkwardness and ostentatious display often call forth unfavorable criticism.

Conduct in Church. A gentleman should remove

his hat upon entering the auditorium of a church.

When visiting a strange church, you should wait in the vestibule or just inside the door, until an usher appears to show you to a seat.

A gentleman may walk up the aisle either a little ahead of, the lady or by her side, allowing her to first enter the pew. There should be no haste in passing up the aisle.

People should preserve the utmost silence and decorum in church, and avoid whispering, laughing, staring, or making a noise of any kind with the feet or hands.

It is ill-mannered to be late at church. If one is unavoidably late, it is better to take a pew as near the door as possible.

Ladies always take the inside seats, and gentlemen the outside or head of the pew. When a gentleman accompanies a lady, however, it is customary for him to sit by her side during church services.

A person should never leave church until the services are over, except in some case of emergency.

Do not turn around in your seat to gaze at anyone, to watch the choir, to look over the congregation or to see the cause of any disturbing noise.

If books are passed in church, let them be offered and accepted, or refused with a silent gesture of the head.

It is courteous to see that strangers are provided with books; and if the service is strange to them, the places for the day's reading should be indicated.

It is pefectly proper to offer to share the prayer-book or hymn-book with a stranger if there is no separate book for his use.

In visiting a church of a different belief from your own, pay the utmost respect to the services and conform in all things to the observances of the church; that is, kneel, sit and rise with the congregation. No matter how grotesquely some of the forms and observances may strike you, let no smile or contemptuous remark indicate the fact while in the church.

When the services are concluded, there should be no haste in crowding up the aisle, but the departure should be conducted quietly and decorously. When the vestibule is reached, it is allowable to exchange greetings with friends, but here there should be no loud talking nor boisterous laughter.

Invitation to Opera or Concert. A gentleman, upon inviting a lady to accompany him to opera, theater, concert, or other public place of amusement, must send his invitation the previous day. The lady must reply immediately, so that if she declines, there will yet be time for the gentleman to secure another companion.

Conduct in Theater, Opera, or Public Hall. On entering the hall, theater, or opera house, the gentleman should walk side by side with his companion unless the aisle is too narrow, in which case he should precede her. Upon reaching the seats, he should allow her to take the inner one, assuming the outer one himself.

A gentleman should, on no account, leave the lady's side from the beginning to the close of the performance.

If it is a promenade concert or opera, the lady may be invited to promenade during intermission. If she declines, the gentleman must retain his position by her side.

There is no obligation whatever upon a gentleman to give up his seat to a lady. On the contrary, his duty is solely to the lady whom he accompanies. He must remain beside her during the evening to converse with her between the acts, and to render the entertainment as agreeable to her as possible.

During the performance complete quiet should be preserved, that the audience may not be prevented from seeing or hearing. Between the acts it is perfectly proper to converse, but it should be done in a low tone, so as not to attract attention. Neither should one whisper.

It is proper and desirable that the actors be applauded when they deserve it. It is their only means of knowing whether they are giving satisfaction.

The gentleman should see that the lady is provided with a programme, and with a libretto also if they are attending opera.

In passing out at the close of the performance the gentleman should precede the lady, and there should be no crowding or pushing.

If the means of the gentleman warrant him in so doing, he should call for his companion in a carriage. This is especially necessary if the evening is stormy. He should call sufficiently early to allow them to reach their destination before the performance commences.

Salutation. In meeting a friend upon the road, street, or in company, you should make your salutation quietly, but cordially and with dignity, always paying the highest respect to the person saluted.

The Bow. Gentlemen should always salute a lady by raising the hat and making a formal bow. Between gentlemen an inclination of the head, a gesture of the hand, or mere touching of the hat is sufficient. If you know people slightly, you recognize them slightly; if you know them well you bow with more familiarity. The body is not bent at all in bowing; the inclination of the head is all that is necessary.

If the gentleman is smoking he withdraws his cigar from his mouth before lifting his hat to a lady, or if he should happen to have his hand in his pocket he removes it.

At the moment of the first meeting of the eyes of an acquaintance you bow. Any one who has been introduced to you, or any one to whom you have been introduced, is entitled to this mark of respect.

The bow is the touchstone of good breeding, and to neglect it, even to one with whom you may have a trifling difference, shows deficiency in cultivation and in the instincts of refinement. A bow does not entail a calling acquaintance. Its entire neglect reveals the character and training of the person; the manner of its observance reveals the very shades of breeding that exist between the ill-bred and the well-bred.

Returning a Bow. A gentleman walking with a lady returns a bow made to her, whether by a lady or gentleman (lifting his hat not too far from his head), although the one bowing is an entire stranger to him.

It is civility to return a bow, although you do not know the one who is bowing to you. Either the one who bows knows you, or has mistaken you for some one else. In either case you should return the bow and probably the mistake will be discovered to have occurred for want of quick recognition on your own part, or from some resemblance that you bear to another.

How to Avoid Recognition. If a person desires to to avoid a bowing acquaintance with a person who has been properly introduced, he may do so by looking aside, or dropping the eyes as the person approaches, for, if the eyes meet there is no alternative; bow he must.

On Public Promenades. Bowing once to a person upon a public promenade or drive is all that civility requires. If the person is a friend, it is in better form, the second and subsequent passings, should you catch his or her eye, to smile slightly instead of bowing repeatedly. If an acquaintance, it is best to avert the eyes.

It is very proper that farmers driving with their wagons or carriages on the country roads should salute one another, though they be not acquainted.

Words of Salutation. The words commonly used in saluting a person are "Good Morning," "Good Afternoon," "Good Evening," "How do you do?" (sometimes contracted into "Howdy" and "How dye do?") and "How are you?" The three former are most appropriate, as it seems somewhat absurd to ask after a person's health unless you stop to receive an answer. A respectful bow should accompany the words.

Hand-shaking. An authority upon this subject says: "The etiquette of hand-shaking is simple. A man has no right to take a lady's hand until it is offered. He has even less right to pinch or retain it. Two ladies shake hands gently and softly. A young lady gives her hand, but does not shake a gentleman's unless she is his friend. A lady should always rise to give her hand; a gentleman, of course never dares to do so seated. On introduction in a room, a married lady generally offers her hand; a young lady, not. In a ball-room, where the introduction is to dancing, not to friendship, you never shake hands; as a general rule, an introduction is not followed by shaking hands,—only by a bow. It may perhaps be laid down that the more public the place of introduction, the less hand-shaking takes place. But if the introduction be particular, if it be accompanied by personal recommendation, such as, 'I want you to know my friend Jones;' or if Jones comes with a letter of presentation, then you give Jones your hand, and warmly, too. Lastly, it is the privilege of the superior to offer or withhold his or her hand, so that an inferior should never put his forward first."

When a lady so far puts aside her reserve as to shake hands at all, she should give her hand with frankness and cordiality. There should be equal frankness and cordiality on the gentleman's part, and even more warmth, though a careful avoidance of anything like offensive familiarity or that which might be mistaken as such.

In shaking hands, the right hand should always be offered, unless it be so engaged as to make it impossible, and then an excuse should be offered. The French give the left hand, as nearest the heart,—which as a matter of fact is not true, as it is exactly in the center, or if any difference slightly to the right.

The mistress of a household should offer her hand to every guest invited to her house.

A gentleman must not shake hands with a lady until she has made the first move in that direction. It is a mark of rudeness not to give his hand instantly, should she extend her own.

The Kiss. This is the most affectionate form of salutation, and is only proper among near relations and dear friends.

The kiss of friendship and relationship is on the cheeks and forehead. In this country this act of affection is generally excluded from public eyes, and in the case of parents and children and near relations, it is perhaps necessarily so.

The custom which has become quite prevalent of women kissing each other when they meet in public, is regarded as vulgar, and by ladies of delicacy and refinement is entirely avoided.

STREET ETIQUETTE. The manners of a person are clearly shown by his treatment of the people he meets on the public roads, in the streets of a city or village, in public conveyances and in traveling generally. The true gentleman, at all times, in all places, and under all circumstances, is kind and courteous to all he meets, regards not only the rights, but the wishes and feelings of others, is deferential to women and to elderly men, and is ever ready to extend his aid to those who need it.

The true lady walks the street wrapped in a mantle of proper reserve so impenetrable that insult and coarse familiarity shrink from her, while she, at the same time, carries with her a congenial atmosphere which attracts all, and puts all at their ease.

A lady walks quietly through the streets, seeing and hearing nothing that she ought not to see and hear, recognizing acquaintances with a courteous bow, and friends with words of greeting. She is always unobtrusive, never talks loudly or laughs boisterously, or does anything to attract the attention of the passers by.

Recognizing Friends. No one, while walking the streets, should fail to recognize friends or acquaintances, either by a bow or some form of salutation. If two gentleman stop to talk they should retire to one side of the walk. If a stranger should be in company with one of the gentleman an introduction is not necessary. If a gentleman meets another gentleman in company with a lady whom he does not know, he lifts his hat to salute them both. If he knows the lady he should salute her first. The gentleman who accompanies a lady always returns a salutation made to her

A Crowded Street. When a gentleman and lady are walking in the street, if at any place, by reason of the crowd, or from other cause, they are compelled to proceed singly, the gentleman should always precede his companion.

The First to Bow. In England strict etiquette requires that a lady, meeting upon the street a gentleman with whom she has acquaintance, shall give the first bow of recognition. In this country, however, good sense does not insist upon an imperative following of this rule. A well-bred man bows and raises his hat to every lady of his acquaintance whom he meets, without waiting for her to take the initiative. If she is well-bred she will certainly respond to his salutation. As politeness requires that each salute the other, their salutations will thus be simultaneous.

Talking with a Lady in the Street. In meeting a lady it is optional with her whether she shall pause to speak. If the gentleman has anything to say to her he should not stop her, but turn around and walk in her company until he has said what he has to say, when he may leave her with a bow and lift of the hat.

Manner of Walking Together. A gentleman walking with a lady should treat her with the most scrupulous politeness, and may take either side of the walk. It is customary for the gentleman to have the lady on his right-hand side, and he offers her his right arm when walking arm in arm. If, however, the street is crowded, the gentleman must keep the lady on that side of him where she will be the least exposed to crowding.

Offering the Arm to a Lady. A gentleman should, in the evening, or whenever her safety, comfort or convenience seems to require it, offer a lady companion his arm. At other times it is not customary to do so unless the parties be husband and wife or engaged. In the latter case, it is not always advisable to do so, as they may be made the subject of unjust remarks.

Keeping Step. In walking together, especially when arm in arm, it is desirable that the two keep step. Ladies should be particular to adapt their pace as far as practicable to that of their escort. It is easily done.

Opening the Door for a Lady. A gentleman should always hold open the door for a lady to enter first. This is obligatory, not only in the case of the lady who is with him, but also in that of any strange lady who chances to be about to enter at the same time. A gentleman must never pass before a lady anywhere, if he can avoid it, or without an apology.

Offensive Behavior. No gentleman is ever guilty of the offense of standing on street corners and the steps of hotels or other public places and boldly scrutinizing every lady who passes.

Carrying Packages. A gentleman will never permit a lady with whom he is walking to carry a package of any kind, but will insist upon relieving her of it. He may even accost a lady when he sees her overburdened and offer his assistance, if their ways lie in the same direction.

SHOPPING ETIQUETTE. In inquiring for goods at a store or shop, do not say to the clerk or salesman, "I want" such an article, but, "Please show me" such an article, or some other polite form of address.

You should never take hold of a piece of goods or an article which another person is examining. Wait until it is replaced upon the counter, when you are at liberty to examine it.

It is rude to interrupt friends whom you meet in a store before they have finished making their purchases, or to ask their attention to your own purchases. It is rude to offer your opinion unasked, upon their judgment or taste in the selection of goods.

It is rude to sneer at and depreciate goods, and exceedingly discourteous to the salesmen. Use no deceit, but be honest with them, if you wish them to be honest with you.

Avoid "jewing down" the prices of articles in any way. If the price does not suit, you may say so quietly, and depart, but it is generally best to say nothing about it.

It is an insult for the salesman to offensively suggest that you can do better elsewhere, which should be resented by instant departure.

Ladies should not monopolize the time and attention of salesmen in small talk, while other customers are in the store to be waited upon.

Whispering in a store is rude. Loud and showy behavior is exceedingly vulgar.

TABLE ETIQUETTE. When friends have been invited to dinner or tea they should be prompt and not keep the hostess and other guests waiting. When dinner is announced the master of the house offers his right arm to that lady to be escorted by him; the others follow, arm in arm, the hostess being the last to enter the dining-room. Age should take the precedence in proceeding to the dining-room, the younger falling back until the elder have advanced. The host escorts the eldest lady or greatest stranger, or if there be a bride present, precedence is given to her, unless the dinner is given for another person, in which case he escorts the latter. The host places the lady whom he escorts at his right. The hostess is escorted either by the greatest stranger, or some gentleman whom she wishes to place at the seat of honor, which is at her right. The seats of the host and hostess may be in the middle and at opposite sides of the table, or at the opposite ends. Husbands should not escort their wives, or brothers their sisters, as this partakes of the nature of a family gathering.

Courses. Soup is the first course. All should accept it even if they let it remain untouched, because it is better to make a pretense of eating until the next course is served, than to sit waiting, or compel the servants to serve one before the rest. Soup should not be called for a second time. A soup-plate should never be tilted for the last spoonful.

Fish follows soup and must be eaten with a fork, unless fish knives are provided. If fish knives are not provided, a piece of bread in the left hand answers the purpose as well, with the fork in the right hand.

Fish may be declined, but must not be called for a second time.

After soup and fish come the side dishes, which must be eaten with the fork, though the knife is used in cutting meats and anything too hard for a fork.

For the carving of meats poultry and game, see Carving.

The Knife and Fork. The knife and fork were not made for playthings, and should not be used as such when people are waiting at the table for the food to be served. Do not hold them erect in your hands at each side of the plate, nor cross them on your plate when you have finished, nor make a noise with them. The knife should only be used for cutting meats and hard substances, while the fork, held in the left hand, is used in carrying food into the mouth. A knife must never on any account be put into the mouth. When you send your plate to be refilled, do not send your knife and fork, but put them on a piece of bread, or hold them in your hand.

Greediness. To put large pieces of food into your mouth appears greedy, and if you are addressed when your mouth is so filled, you are obliged to pause, before answering, until the vast mouthful is masticated, or run the risk of choking, by swallowing it too hastily. To eat very fast is also a mark of greediness, and should be avoided. The same may be said of soaking up gravy with bread, scraping up sauce with a spoon, scraping your plate and gormandizing upon one or two articles of food only.

General Rules on Table Etiquette. Refrain from making a noise when eating or supping from a spoon, and from smacking the lips or breathing heavily while masticating food, as they are marks of ill-breeding. The lips should be kept closed in eating, as much as possible.

Cheese is eaten with a fork and not with a knife. Vegetables are eaten with a fork.

Bread is broken at dinner.

You are at liberty to refuse a dish that you do not wish to eat. If any course is set down before you that you do not wish, do not touch it. Never play with food, nor mince your bread, nor handle the glass and silver near you unnecessarily.

When a dish is offered you, accept or refuse at once, and allow the waiter to pass on. A gentleman will see that the lady whom he has escorted to the table is helped to all she wishes, but it is officiousness to offer to help other ladies who have escorts.

If the guests pass the dishes to one another instead of being helped by a servant, you should always help yourself from the dish, if you desire it at all, before passing it on to the next.

Be careful to remove the bones from the fish before eating. If a bone inadvertently should get into the mouth, the lips must be covered with the napkin in removing it. Cherry stones and grape skins should be removed from the mouth as unobtrusively as possible, and deposited on the side of the plate.

Never use a napkin in place of a handkerchief for wiping the forehead, face, or nose.

Pastry should be eaten with a fork. Everything that can be cut without a knife should be eaten with the fork alone. Pudding may be eaten with a fork or spoon.

Never lay your hand, or play with your fingers, upon the table. Do not toy with your knife, fork, or spoon, make crumbs of your bread, or draw imaginary lines upon the table-cloth.

Never bite fruit. An apple, peach or pear should be peeled with a knife, and all fruit should be broken or cut.

Do not hesitate to take the last piece of bread or cake in a dish handed to you. Your host has more for other guests.

When a plate containing food is handed to you, set it down before you, and do not pass it to your neighbor.

Do not keep others waiting for you either at the beginning or close of the meal.

Do not sip soup from the tip, but from the side of the spoon.

Be careful not to drop or spill anything on the table-cloth.

Keep your plate neat; do not heap all sorts of food on it at once.

In passing your plate to be re-helped, retain the knife and fork.

When asked for a dish, do not shove, but hand it.

While drinking do not look around.

Instruct the servant to hand the cup at the left side so that it may be received by the right hand.

Do not drink your tea or coffee without first removing the teaspoon from the cup to the saucer. We need hardly say that it should not be poured into the saucer to cool.

Break your bread into small pieces and rest them on your plate while spreading.

Do not eat too fast; besides giving one the appearance of greed, it is not healthful.

If you find anything unpleasant in your food put it aside as quietly as possible, without drawing the attention of others to it.

Do not open the lips nor make any unnecessary noise in chewing.

Do not rest the elbow on the table.

Do not touch the head.

Do not speak with the mouth full.

Brush the table neatly before bringing on the dessert.

Be thoughtful of and attentive to the wants of those sitting near you.

Converse on pleasant subjects with those sitting near you.

Do not say anything not intended for all present to hear.

Never pick your teeth at the table.

Do not begin to eat meat until you have all the accessories—the vegetables and gravy.

Do not load your plate with different kinds of vegetables. Eat them with a fork.

Leave your plate with the knife and fork lying parallel, the handles pointing to the right.

Never leave the table before others without asking the lady or gentleman who presides, to excuse you.

TRAVELING. In these days of railroad travel, when every railway is equipped with elegant coaches for the comfort, convenience and sometimes luxury of its passengers, and provided with gentlemanly conductors and servants, the longest journeys by railroad can be made alone by self-possessed ladies with perfect safety and but little annoyance.

Duties of an Escort. When a gentleman undertakes the escort of a lady, he should proceed with her to the depot, or meet her there a sufficient time before the departure of the train to attend to the checking of her baggage, procure her ticket, and obtain for her an eligible seat in the cars, allowing her to choose such seat as she desires. He will then dispose of her packages and hand-baggage in their proper receptacle, and make her seat and surroundings as agreeable for her as possible, taking a seat near her, or by the side of her if she requests it, and do all he can to make her journey a pleasant one.

Upon arriving at her destination, he should conduct her to the ladies' waiting-room or to a carriage, until he has attended to her baggage, which he arranges to have delivered where the lady requests it. He should then escort her to whatever part of the city she is going and deliver her into the hands of her friends before relaxing his care.

The Duty of a Lady to her Escort. The lady may supply her escort with a sum of money, ample to pay all the expenses of the journey, before purchasing her ticket, or furnish him the exact amount required, or, at the suggestion of her escort, she may allow him to defray the expenses from his own pocket, and settle with him at the end of the journey. The latter course, however, should only be pursued when the gentleman suggests it, and a strict account of the expenses incurred must be insisted on.

A Lady Traveling Alone. A lady in traveling alone may accept services from her fellow-travelers, which she should always acknowledge graciously. Indeed, it is the business of a gentleman to see that the wants of an unescorted lady are attended to. He should offer to raise or lower her window if she seems to have any difficulty in doing it herself. He may offer his assistance in carrying her packages upon leaving the car, or in engaging a carriage or obtaining a trunk. Still, women should learn to be as self-reliant as possible; and young women particularly should accept proffered assistance from strangers, in all but the slightest offices, very rarely.

The Comfort of Others. In seeking his own comfort, no passenger has a right to overlook or disregard that of others. If for his own comfort, he wishes to raise or lower a window he should consult the wishes of the passengers immediately around him before doing so. The discomfort of traveling should be borne cheerfully, for what may enhance your own comfort may endanger the health of some fellow-traveler.

Attending to the Wants of Others. See everywhere and at all times that ladies and elderly people have their wants supplied before you think of your own. Nor is there need for unmanly haste or pushing in entering or leaving cars or boats. There is always time enough allowed for each passenger to enter in a gentlemanly manner and with a due regard to the rights of others.

If, in riding in the street-cars or crossing a ferry, your friend insists in paying for you, permit him to do so without serious remonstrance. You can return the favor at some other time.

Occupying too many Seats. No lady will retain possession of more than her rightful seat in a crowded car. When others are looking for accommodations she should at once and with all cheerfulness so dispose of her baggage that the seat beside her may be occupied by any one who desires it, no matter how agreeable it may be to retain possession of it.

It shows a great lack of proper manners to see two ladies, or a lady and gentleman, turn over the seat in front of them and fill it with their wraps and bundles, retaining it in spite of the entreating of remonstrating looks of fellow-passengers. In such a case any person who desires a seat is justified in reversing the back, removing the baggage and taking possession of the unused seat.

Retaining Possession of a Seat. A gentleman in traveling may take possession of a seat and then go to purchase tickets or look after baggage or procure a lunch, leaving the seat in charge of a companion, or depositing traveling-bag or overcoat upon it to show that it is engaged. When a seat is thus occupied the right of possession must be respected, and no one should presume to take a seat thus previously engaged, even though it may be wanted for a lady. A gentleman cannot, however, in justice vacate his seat to take another in a smoking-car, and at the same time reserve his rights to the first seat. He pays for but one seat, and by taking another he forfeits the first.

It is not required of a gentleman in a railway car to relinquish his seat in favor of a lady, though a gentleman of genuine breeding will do so rather than allow the lady to stand or suffer inconvenience from poor accommodations.

WEDDINGS. The circumstances under which weddings take place are so varied, and the religious forms observed in their solemnization so numerous, that to lay down rules applicable to all cases would be a matter of great difficulty, if not an impossibility.

The Bridesmaids and Groomsmen. Only relatives and the most intimate friends are asked to be bridesmaids—the sisters of the bride and of the bridegroom, where it is possible. The bridegroom chooses his best man and the groomsmen and ushers from his circle of relatives and friends of his own age, and from the relatives of his fiancee of a suitable age. The dresses of the bridesmaids are not given unless their circumstances are such as to make it necessary.

Wedding Dress. It is impossible to lay down

specific rules for dress, as fashions change and tastes differ. The great art consists in selecting the style of dress most becoming to the person. A stout person should adopt a different style from a thin person; a tall one from a short one. Peculiarities of complexion and form of face and figure should be duly regarded; and in these matters there is no better course than to call in the aid of any respectable milliner and dressmaker, who will be found ready to give the best advice. The bridegroom should simply appear in full dress, and should avoid everything eccentric and broad in style. The bridesmaids should always be made aware of the bride's dress before they choose their own, which should be determined by a proper harmony with the former.

Ceremonials. When there are no bridesmaids or ushers the marriage ceremonials at the church are as follows: The members of the bride's family proceed to the church before the bride, who follows with her mother. The bridegroom awaits them at the church and gives his arm to the bride's mother. They walk up the aisle to the altar, the mother falling back to her position on the left. The father, or relative representing him, conducts the bride to the bridegroom, who stands at the altar with his face turned toward her as she approaches, and the father falls back to the left. The relatives follow, taking their places standing; those of the bride to the left, those of the groom to the right. After kneeling at the altar for a moment, the bride, standing on the left of the bridegroom, takes the glove off from her left hand, while he takes the glove off from his right hand. The service then begins. The father of the bride gives her away by bowing when the question is asked, which is a much simpler form than stepping forward and placing his daughter's hand in that of the clergyman. Perfect self-control should be exhibited by all parties during the ceremony.

The bride leaves the altar, taking the bridegroom's right arm, and they pass down the aisle without looking to the right or left. It is considered improper to recognize acquaintances by bows and smiles while in the church.

The bride and bridegroom drive away in their own carriage, the rest following in their carriages.

Another Form of Church Ceremonials. The ceremonials for the entry to the church by the bridal party may be varied to suit the taste. Precedents for the style already described are found among the highest social circles in New York and other large cities, but there are brides who prefer the fashion of their grandmothers, which is almost strictly an American fashion. In this style, the bridesmaids, each leaning upon the arm of a groomsman, first pass up the aisle to the altar, the ladies going to their left, and the gentlemen to their right. The groom follows with the bride's mother, or some one to represent her, leaning on his arm, whom he seats in a front pew at the left. The bride follows, clinging to the arm of her father (or a near relative), who leads her to the groom. The father waits at her left and a step or two back of her, until asked to give her away, which he does by taking her right hand and placing it in that of the clergyman. After this he joins the mother of the bride in the front pew, and becomes her escort while they pass out of the church.

In case there are no bridesmaids, the ushers walk into church in pairs, just in advance of the groom, and parting at the altar, half of them stand at one side and half at the other. While the clergyman is congratulating the bride, they pass out in pairs, a little in advance of the wedded couple.

Weddings at Home. Weddings at home vary but little from those at church. The music, the assembling of friends, the entree of the bridal party to the position selected, are the same. An altar of flowers and a place of kneeling can be easily arranged at home. The space behind the altar need be no wider than is allowed for the clergyman to stand. The altar is generally only a fender or railing entirely wound and concealed by greenery or blossoms. Other floral accessories, such as the marriage-bell, horse-shoe or white dove, etc., can be arranged with ease by a skillful florist, if desired.

When the marriage ceremony is concluded, the party turn in their places and face their friends, who proceed to congratulate them. If space be required, the kneeling-stool and floral altar may be removed, a little later, without observation.

The Evening Wedding. If the wedding occur in evening, the only difference in the ceremonials from those in the morning is that the ushers or groomsmen wear full evening dress, and the bridal pair retire quietly to dress for their journey before the dancing party disperses, and thus leave unobserved. At the morning wedding only bridesmaids, ushers and relatives remain to witness the departure of the pair.

"At-Home" Receptions. When the newly married couple commence life in a home of their own, it is customary to issue "at-home" cards for a few evenings, at an early date after the wedding, for informal receptions. Only such persons are invited as the young couple wish to keep as friends, or perhaps only those whom they can afford to retain. This is a suitable opportunity to carefully re-arrange one's social list, and their list of old acquaintances may be sifted at the time of the beginning of housekeeping. This custom of arranging a fresh list is admitted as a social necessity, and nobody is offended.

Calls. All guests and friends who receive "at-home" invitations, or who are invited to the church, are required by etiquette to call upon the family of the bride, or to leave their cards, within ten days after the wedding.

Wedding Ring. Many churches at present use the ring, and vary the sentiment of its adoption to suit the customs and ideas of their own rites. A jeweled ring has been for many years the sign and symbol of betrothal, but at present a plain gold circlet, with the date of the engagement inscribed within, is generally preferred. This ring is removed by the groom at the altar, passed to the clergyman and used in the cere-

mony. A jeweled ring is placed upon her hand by the groom on the way home from the church, or as soon after the service as is convenient. It stands guard over its precious fellow, and is a confirmation of the first promise.

The Marriage Ceremonials of a Widow. The marriage ceremonials of a widow differ from those of a young lady in not wearing the veil and orange blossoms. She may be costumed in white and have her maids at the altar if she pleases. This liberty, however, has only been given her within a few years. On her wedding cards of invitation her maiden name is used as a part of her proper name; which is done in respect to her parents. Having dropped the initials of her dead husband's name when she laid aside her mourning, she uses her Christian name. If she has sons or unmarried daughters at the time she becomes again a wife, she may prefix the last name of her children to her new one on all ceremonious occasions in which they are interested in common with herself. This respect is really due them, and etiquette permits it, although our social usages do not command its adoption. The formalities which follow the marriage of a widow can seldom be regulated in the same manner as those of a younger bride. No fixed forms can be arranged for entertainments, which must be controlled by circumstances.

Invitations. Wedding invitations should be handsomely engraved in script. Neither Old English nor German Text is admissible in invitations. The following is given as the latest form for invitations:

MR. & MRS. CLIFFORD MORTIMER,
request your presence at the marriage of their daughter,
MISS CORA MORTIMER,
TO
MR. MILO C. JOHNSON,
on Wednesday, March 6th, at one o'clock.
SUMMER HILL CHURCH.

This invitation requires no answer.

In some circles the young couple send out cards stating the day and hour they will receive callers, after their return from their wedding tour. These are enclosed in the same envelope as the invitation, and generally on a square card, the same size as the sheet of note paper which bears the invitation for the ceremony after it has been once folded across the middle. The following is one of the adopted forms:

AT HOME,
Wednesday, September 7th,
from 12 until 3 o'clock.

Separate cards of the bride and groom are no longer necessary.

The Wedding Fees. There is no prescribed fee for performing the marriage ceremony. It is regulated according to the means and liberality of the bridegroom, but no less amount than five dollars should be given under any circumstances.

Wedding Tour. The wedding tour should be definitely arranged before the marriage. It is best that the young couple should make the tour unaccompanied by any of their friends.

A Home. After marriage one of the first requirements for happiness is a home. This can seldom be found in a boarding house or at a hotel, and not always beneath the parental roof of either husband or wife. It will oftenest be found in a house or even a cottage apart from the immediate association of relatives or friends, acquaintances or strangers, and here husband and wife may begin in reality that new life of which they have had fond dreams, and upon their own actions must depend their future welfare.

MISCELLANEOUS RULES. A gentleman precedes a lady passing through a crowd; ladies precede gentlemen under ordinary circumstances.

Give your children, unless married, their Christian names only, or say "my daughter" or "my son," in speaking of them to any one except servants.

Ladies in escorting each other never offer to take the arm.

Acknowledge an invitation to stop with a friend, or any unusual attention, without delay.

Never boast of birth, money or friends, or of any superior advantages you may possess.

Never ridicule others, be the objects of your ridicule present or absent.

Always show respect for the religious opinions and observances of others, no matter how much they may differ from your own.

You should never scratch your head, pick your teeth, clean your nails or pick your nose in company.

Never lean your head against the wall, as you may disgust your wife or hostess by soiling the paper of her room.

Never slam a door or stamp noisily on entering a room.

Always be punctual. You have no right to waste the time of others by making them wait for you.

Always hand a chair for a lady, pick up her glove and perform any little service she may seem to require.

Never attract attention to yourself by talking or laughing loudly in public gatherings.

Keep yourself quiet and composed under all circumstances. Do not get fidgety. If you feel that time drags heavily, do not let this be apparent to others by any visible sign of uneasiness.

Refrain from absent-mindedness in the presence of others. You pay them a poor compliment if you thus forget them.

Never refuse to accept an apology for an offense, and never hesitate to make one, if one is due from you.

Never answer another rudely or impatiently. Reply courteously, at whatever inconvenience to yourself.

Never intrude upon a business man or woman in business hours unless you wish to see them on business.

Never engage a person in private conversation in presence of others, nor make any mysterious allusions which no one else understands.

On entering a room, bow slightly as a general salutation, before speaking to each of the persons assembled.

Do not seem to notice, by word or glance, the deformity of another.

To administer reproof to any one in the presence of others is very impolite. To scold at any time is unwise.

Never undertake a commission for a friend and neglect to perform it.

Never play a practical joke upon any one, or answer a serious remark by a flippant one.

Never lend a borrowed book, and never keep such a book a single day after you are done with it.

Never pass between two persons who are talking together; and never pass before persons when it is possible to pass behind them. When such an act is absolutely necessary, always apologize for so doing.

"Never speak of a man's virtues before his face, or his faults behind his back," is a maxim to be remembered.

Another maxim is: "In private watch your thoughts; in your family watch your temper; in society watch your tongue."

Never address a mere acquaintance by his or her Christian name. It is a presumption at which the acquaintance may take offense.

Haughtiness and contempt are among the habits to be avoided. The best way is to deal courteously with the rude as well as with the courteous.

In the presence of others, talk as little of yourself as possible, or of the business or profession in which you are engaged.

It shows a want of courtesy to consult your watch, either at home or abroad. If at home, it appears as if you were tired of your company, and wished them to be gone. If abroad, it appears as though the hours dragged heavily, and you were calculating how soon you would be released.

Do not touch or handle any of the ornaments in the house where you visit. They are intended to be admired, not handled by visitors.

Do not read in company; a gentleman or lady may, however, look over a book of engravings or a collection of photographs with propriety.

Every species of affectation should be avoided, as it is always detected, and exceedingly disagreeable.

Impolite Acts. Loud and boisterous laughter.

Reading when others are talking.

Reading aloud in company without being asked.

Talking when others are reading.

Sitting about the house smoking or chewing.

Cutting finger-nails in company.

Leaving a church before public worship is closed.

Whispering or laughing in the house of God.

Gazing rudely at strangers.

Leaving a stranger without a seat.

A want of respect and reverence for seniors.

Correcting older persons than yourself, especially parents.

Receiving a present without an expression of gratitude.

Joking others in company.

Making yourself the hero of your own story.

Sitting with your back to a person without asking to be excused.

Standing or sitting with your feet apart.

Humming, whistling or singing in suppressed tones.

Using profane language, or stronger expressions than the occasion justifies.

Evaporation by Heat. The conversion of water into steam by heat is a familiar illustration of evaporation by heat, of which we need say nothing here. Liquids while evaporating absorb heat, and it is for this reason that ether, which requires comparatively little heat to convert it into vapor, is used to relieve the pain of a scald or a burn. Ether is converted into vapor at 96° Fahrenheit. Water, which requires 212° Fahrenheit to convert it into steam, is often sprinkled about a room in summer weather to cool the air, and it does so by withdrawing the heat which is absorbed during its evaporation. The refreshing coolness of a summer shower is due to the same cause. Winds aid evaporation by removing the vapor more rapidly. Grass allowed to remain in the garden uncut, or dead leaves allowed to accumulate on the paths, promote cold by retaining moisture and consequently absorbing heat. Wet feet and wet clothes absorb heat by evaporation, and by rapidly lowering the natural temperature of the body, so affect the circulation as to injure the health more or less seriously. A damp bed for the same reason is an extremely dangerous one to sleep in. Salt in the water retarding evaporation, sea-water consequently does not have the same effect as other water does. The rapidly revolving wheels of certain machines would catch fire if they were not kept constantly wet, in order that the heat might be kept down by evaporation. Tea poured into a saucer grows cool more quickly than it does in a cup, because, having a larger surface, evaporation proceeds more rapidly. Thick clothing worn while taking active exercise, by which the perspiration is increased, is often unhealthful because it retards evaporation, and so increases the heat of the body beyond its natural standard.

Evener (eav′-ner), a double-tree or whiffle-tree. See Whiffletree.

Evergreens, plants which retain their leaves green through the winter, and acquire a growth of new ones before fully shedding the old. In the United States they are mainly trees and shrubs of the pine and cedar kind, and constitute the most substantial and popular ornament of the lawn and landscape. They are also the best resource for wind-breaks, the Norway spruce being perhaps the best of all the trees in the world for the purpose.

Varieties. Among the smaller evergreens adapted to places of limited extent and village grounds

are the following: The Mugho pine, growing 15 or 20 feet high, with numerous ascending or creeping branches, the foliage resembling that of the Scotch pine. It is sometimes confounded with the dwarf mountain pine, but differs in shorter leaves and more upright tree form. The mountain dwarf pine has a more rounded growth of the tree. A very small variety of the Mugho pine grows only about two feet high. The stone pine, although ultimately attaining 30 or 40 feet, grows so slow that for many years it keeps well

FIG. 1.—*White Spruce.*

within bounds, and forms a neat and handsome pyramid, varied by the tufts of foliage on its outline. The dwarf white pine is a bushy variety of the common white pine, of a compact form, growing from six to ten feet high. Another larger variety, known as the compacta, is double the size of the last named, making an annual growth of three or four inches, and forming a beautiful tree.

There are several varieties of the Norway spruce of various sizes, from the pigmy fir, a foot high, to those that become small trees. The common Norway spruce may be kept to the size of a small tree or shrub by continually cutting back; there are, however, two objections, one of which is the common want of skill and taste required to preserve a graceful, natural form, instead of a heavy, formal or stiff figure; and the other the liability to neglect this cutting back until the tree has grown beyond the limited bounds allotted to it. The white spruce forms a handsome tree of moderate size, growing 40 or 50 feet high; and there is a dwarf variety about the size of a currant bush. A more beautiful tree is the black spruce, which has less stiffness and more grace of outline than many other spruces; it sometimes attains a height of 70 feet. The red spruce much resembles the black, and while some regard them as distinct species, others look upon them as only varieties.

There are some other rarer firs worthy of attention, among which are the Cephalonian fir and Nordmann's fir, the latter being regarded by some as the most beautiful and reliable of all the new sorts.

Among the larger pines, none can exceed, and few equal, the common white pine and the Austrian pine, while the native hemlock is one of the finest of all our evergreen trees, when allowed full space to grow and develop its graceful form.

Turning again to some of the smaller evergreens, we should not omit to mention the Siberian arbor-vitæ and the red cedar and common juniper. The tree box, although a slow grower, forms a beautiful broad and dense mass of green foliage, and becomes one of the best winter ornaments. Dwarf pine, a European species, is perfectly hardy, and easily transplanted, and grows in a dense rounded form ten or twelve feet high.

By a due share of attention to these winter ornaments, there is no necessity whatever for the bleak and dreary appearance of which so many complain, and even the bare branches and the shining buds which invest them become objects of study and delight. A proper blending and contrast in various shades of different evergreens may be made to give additional charms to the plantings of the grounds.

Small ornamental undergrowth beneath the trees and larger shrubs should not be overlooked, as it gives a beautiful effect late in autumn, early in spring, and when the ground is bare of snow in winter. Evergreen shrubs, like the wild yew; such small plants, with broad, thick, evergreen leaves, as the Chimaphila, and the evergreen ferns; the whole surface carpeted with such species of moss as give a soft, green surface, —all add greatly to the effect. Among the evergreen ferns very few may be mentioned. The common polypody is rather small, very hardy, and will grow on or among rocks. The hard fern is common along wooded ravines and hillsides, and is a large, handsome plant; also the Woodwardias and Aspleniums, and several Aspidiums, which may be easily collected in our wild woods early in spring.

Among the flowers that may be made to bloom in early winter is the Christmas rose, so called, which, if planted under the protection of evergreens, and on the south side, facing the sun, may be often seen in bloom half hid under the snow.

For early spring blooming, even before all the snow-

drifts are gone, plant the bulbs of the snow-drop, crocus, and Siberian squill, in similarly sheltered places; and plant such early bloomers among the wild flowers of the woods as the Claytonia and Hepatica, and they will add greatly to the charms of the grounds while all the deciduous trees and shrubs are yet destitute of foliage, and buds have not begun to swell.

Propagation. All evergreen seed needs planting in raised beds so that the water will run off, covered slightly with sand about a quarter of an inch deep, then shaded by a lath cover, leaving the spaces not wider than the lath, and of a convenient size to re-

Fig. 2.—*Juniperus Venusta.*

move, both for watering and weeding. The object of the cover is to break the heat of the sun; in fact, make it cloudy. Brush about a foot above the bed will answer, with the leaves on. After the seedlings are well cared for, the first summer a light mulch should be given them, and in the spring following they can be transplanted to a new bed and shaded as before, and the second or third spring they can safely be set 12 by 8 feet, or 12 by 12 feet for timber. The pine, when three years old, may be 8 to 12 inches, and if well cultivated they will not be more than 10 feet high when ten years old. After that they grow much more rapidly. A good way to utilize the ground is to set larch 3 by 3 feet on all the ground between the pine, and after they become 8 to 10 feet high, thin out around the pine and give them room. Part of the larch may remain till they are 15 to 20 feet high, and will make good fence-posts, poles, etc. Nineteen out of twenty will fail in raising evergreen seedlings, and after they are removed from the seed-bed, there will be just as good a chance for failure, unless set thickly together and shaded. Forest seedlings and evergreens may be safely set out if kept damp and shaded the first year; they can be set 4 to 6 inches each way and remain one or two years in the transplanted bed, the first year always under shade. Select those specimens which are in the most exposed situations, protect the roots from the sun and air, and take the springtime for the work of transplanting. But it is much safer to transplant nursery-grown trees. Removals any time during the summer are often successful. Manure, mulch, and cultivate as you would any other tree.

Red cedar berries should be bruised early in March, and mixed with an equal or greater bulk of wet wood-ashes. In three weeks the alkali will have "cut" the resinons gum, when the seeds can be washed clean from the pulp. In preparing the seed-beds, dig the ground a foot or more in depth, mix for three or four inches at the surface a liberal dressing of well-rotted leaf-mold, or wood soil, and sharp sand. Lay off the beds 4 feet wide, lengthwise, east and west; sow the seeds in rows a foot apart, running across the bed. This gives room for deep culture, which is essential. Along the south side of the bed, drive stout stakes 1½ feet above the surface, also another row on the north side, 2½ feet high. Rails are nailed on the tops of the stakes, across which freshly cut brush with foliage on is placed, before very hot weather, to screen from the scorching rays of the sun; also, a wide board is laid along the south side of the short stakes, to keep out the sun and drying winds. If there is a prospect of drouth, water occasionally, in the evening. In October the shading may be removed, and a mulching of two inches of leaves put along the rows. Cultivate in seed-bed the second year; unless the season is very dry, they will need no shading if the ground is worked deeply. They are transplanted to nursery rows 2 feet apart the second spring, shortening the tap-root at the time. Give them plenty of room in the row to develop the lower branches. In taking up plants for sale the two succeeding seasons, it is best to thin them in the rows by removing each alternate plant. When three years in nursery, remove each alternate row and root-prune the ones left with a Harkness tree digger, an invaluable implement for nurserymen.

For ordinary screens of moderate height, the red cedar is preferable to any other evergreen for the Northwestern States.

Foreign varieties of evergreens are best imported at two years from the seed, and native varieties from the forests of Michigan and New York.

Evergreen Seeds, Number of, to the Pound; Norway spruce, 58,000; Hemlock, 1000,000 White pine, 20,000; White spruce, 160,000; Scotch pine, 69,000; Austrian pine, 28,000; Balsam fir, 45,000; Cembran, or stone pine, 2,700; American arbor vitæ, 320,000; European larch, 70,000; pear and apple (not evergreen), 12,000. It is remarkable how these large trees have so small seeds compared with the nuts, etc., of other trees.

Pruning. In pruning no one should cut a branch, large or small, evergreen or deciduous, without having a clear idea of what he does it for. Pruning may be done to accomplish the most opposite ends. We may prune to promote the growth of limb, or we may prune to check the growth, and so on. Whatever else is done to an evergreen, do not cut it away below. Left to themselves, these trees form pyramids of verdure of the greatest beauty. A tree with its broad base resting upon the ground, and tapering gracefully upwards, is a most pleasing object and gratifying in its symmetry and apparent stability to every person of taste. Cut away the lower limbs, leaving a naked trunk of six or eight feet, and all beauty and symmetry are destroyed. This treatment is often excused by the plea that the trees were at first planted too closely and now light and air are shut out; hence this cutting away of the lower branches. Light and air are of course necessary, but the better remedy is to take out a portion of the trees altogether. Do this rather than to mutilate all by removing the lower branches. If trees are too near the house, either remove or cut them down, but do not cut them "up." There is no proper time for pruning of this kind. If a tree grows one-sided, or irregular, and it is desired to have an increased growth at any point, the proper way to secure this is to cut the branches back to induce a new growth to push vigorously. Pruning for this purpose should be done when the season of growth is well matured in early autumn. If the irregularity is due to an excess of growth, and it is necessary to repress this, then the proper time to do it is immediately after the growth in length has been completed, but before the wood has become hardened and matured. Much may often be done to improve the form of a tree, and fill out their places by bending some of the branches and tying them in the proper position, taking care that the ligatures are nowhere so tight as to check the enlargement of the branches. If held thus for a few years, they will retain their position. The pruning of evergreen hedges is governed by the same rules. In the first years of a hedge, one wishes it to grow as quickly as possible to the required height; therefore if the growth can anywhere be encouraged by cutting back, it is to be done in early autumn. In the Northern States, October is the proper time. When the hedge is as high and broad as desired, and you wish to repress further growth, the main pruning should be done as soon as the spring's growth has been made, but while the shoots are still tender. Cutting in that state tends to check the growth. In the Northern States, June is the month for this. In cutting all horizontal branches half an inch or more in diameter, make a sloping cut on the under side of the branch, so that in looking down upon it the wound is not seen.

See also Floriculture, Forestry Lawn and Lanscape Gardening.

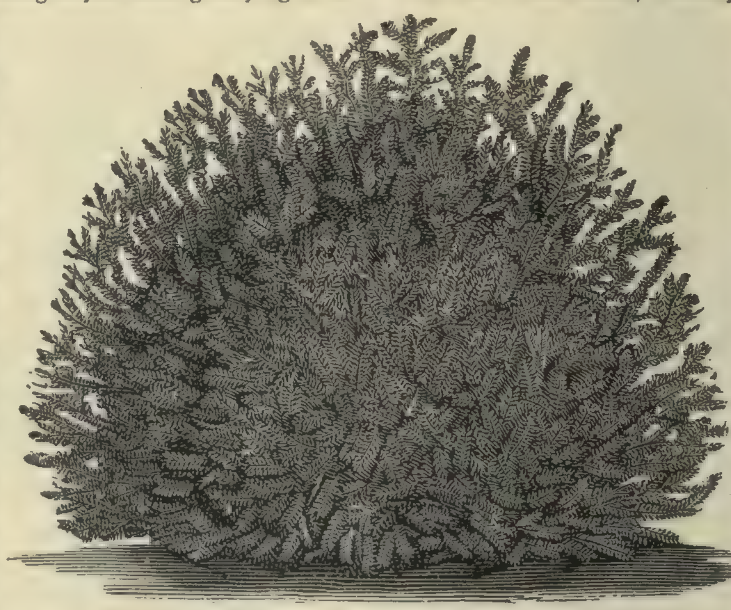


Fig. 3.—*Dwarf American Arbor Vitæ.*

Ewe (u), a female sheep.

Executors and Administrators. An executor in law is one appointed by a man's last will to carry its provisions into execution after the testator's death. Letters of executorship and administration must be taken out in the county where the deceased resided immediately preceding his death. Usually the widow and next other kindred have first right to administration unless there is a will appointing some person or persons. Administrators are required to give bond in double the amount of personal property of deceased. When the executor is authorized by will to sell property, the bond must be double the amount of the whole property, unless a bond is waived by the will. If relatives do not take out letters, then creditors are next in order. If no person petitions for letters, the probate court appoints some discreet person of its own motion. Executors appointed by will may refuse to act or resign by permission of the court.

Exemptions from Seizure on Executions. Each State provides by law that its *bona-fide* residents shall be allowed to own and hold certain specified property which shall be exempt from seizure upon any writ or execution for debt. Generally the exemption ceases when the debtor attempts to remove the exempted

property from the State. Upon the death of the husband the exemption rights extend to the widow and minor children. The law is so different in the States we cannot give it all in this work, and can only say, the best way to obtain a knowledge of the same is to consult the statutes, which may be found at the justice's office and at all the public offices of the county.

Exercise: see Hygiene.

Exhaustion of Soils: see Fertilizers, Manure, etc.

Exhaust-Pipe, in a steam engine, is the pipe which permits the steam to escape from the cylinder, either to a condenser or to the open air.

Exhibition, Agricultural: see Fairs.

Exotic (egz-ot'ic,) foreign, as a plant which is not native. Palms, for example, are exotic in the Northern United States.

Expansion by Heat. Heat causes air to expand or grow lighter. A familiar illustration of this may be observed in roasting chestnuts. When they have been made sufficiently hot, the air and moisture in them expand, and being unable to escape, force their way violently through the thick rind, which bursts with a loud crack. Under the same influence even a stone when put into the fire flies into pieces. From a bottle of ale placed before a fire, the cork will sometimes be forced out by the expansion by heat of the carbonic acid. Hot air ascends a chimney in consequence of the lightness which is due to its expansion. It is expansion by heat which causes ice to melt into water and water to become steam. The kettle sings because the heated air is escaping unequally, and it does not sing when it boils, because the air is expanding equally. Water is increased in bulk by heat, just as air is, and hence it boils over. Iron expands by heat, and for this reason iron hoops used by coopers for tubs are put on hot, so that as they grow cold and contract, they may hold the pieces of the tub more securely together. The cracking of iron stoves is due to this cause. A glass is frequently broke by hot water being poured into it, because of its unequal expansion, the inside expanding suddenly with heat instead of gradually, while the outside surface is cold. Lamp glasses often break in consequence of this unequal expansion by heat. Glass is like china, a bad conductor of heat, and the heat of the inner surface permeates it so slowly that the outer surface is not affected by the heat which expands the inner surface, and is consequently torn asunder. A glass tumbler must not, therefore, be put upon a hot stove.

The force with which water expands when in the act of congelation is immense. It is by this means that huge fragments of rock are separated, the water that penetrates into fissures expanding with such force during congelation as to break off the corners and projections. The same circumstance is sometimes taken advantage of in splitting slate. The benefit that frost is known to afford to plowed land is effected by the expansion of water breaking and crumbling down the clods of earth. The sparks of fire which fly with a crackling noise from burning wood are due to the expansion of air in the pores of the wood. Ingenious modes of breaking glass in any required direction are founded on expansion, by which means broken glass vessels are very ingeniously fashioned and fitted for a variety of uses. One mode is to dip a piece of thread or string in spirits of turpentine, wrap it around the glass in the direction you require it to be broken, and then set fire to it. Another mode is to draw a red-hot skewer across the glass in the desired direction, and a third is to wrap a red-hot wire round the glass, and if it does not immediately crack, to throw cold water on it whilst the wire remains hot. The two former modes depend upon the sudden expansion, and the last upon the sudden contraction of the particles upon the surface of the glass.

The draughts of air perceived in rooms where large fires are burning consist of these currents of air rushing in to supply the place of expanded air escaping up the chimney. It is by facilitating the egress of the heated air that rooms are properly ventilated, and by contriving means to prevent its escape that stores and hot-houses are able to preserve their increased temperature.

Expectorant, a medicine or medicinal appliance which promotes the discharge of morbid mucous secretion of the air passages of animals, and, in consequence relieves cough and difficulty of breathing. Watery vapor, whether simple or medicated, is the only expectorant which acts directly or by immediate contact with the affected organs, and all the other expectorants, exceedingly great in number and variety, are gathered from among sedatives, vegetable stimulants, balsams, gum-resins, and other classes of substances; are swallowed like food or condiments, and can operate on the affected organs only by sympathy or by some other obscure mode of action. Expectorants for the human subject, as in instance of many of the popular and quack nostrums for common coughs, are sometimes so ill-chosen as to occasion great eventual injury to the patient. In the horse the action of expectorants is not easily perceptible. It has been said that as a horse breathes only through his nostrils the effect of such medicines (if they would have any), would be shown by a discharge from the nostrils, and as they are not observed to cause such discharge, they must be ineffectual. But in coughing air is expired by the mouth, and it is not improbable that mucus may be discharged by the lungs at the same time, though this point is difficult to be ascertained with precision. Some of the medicines termed expectorants frequently prove serviceable in the horse by relieving or curing cough and difficulty in breathing, or what is termed thickness of wind; among these are squills and gum ammoniacum.

Experimentations, in Farming, should always be conducted on a small scale, but thoroughly enough to be of value; and particular care must be taken not to attribute an effect to the wrong cause. For example, a man turns his horse from a constant stable life

into a pasture some time in June; the next day the animal is drooling at the mouth and is sick; the owner forthwith attributes his sickness to clover, while it may have been due to any one of a half-dozen other causes; as, too large a quantity of green stuff; semi-poisonous herbs, or toadstool, taken accidentally in the animal's eagerness to obtain a "square meal" of his more natural food; the development of some ailment which was already in existence in his stall confinement; too much exercise, etc. Next to connection of cause and effect, is a faithful *written* memorandum, from which results can be obtained with mathematical certainty. The almost universal practice is to assert that "experience teaches" so and so, when no pencil and paper account has been kept, and the statistical result often very different from the assertion. For instance, a man will assert that his experience teaches him that potatoes planted in the "dark" of the moon always do better than those planted during the "light of the moon," when another member of the family, perhaps, has been quietly keeping a written memorandum of that man's "experience" from year to year, and he finds no difference whatever, in the average results, between the one time of planting and the other. As a rule, the more vehemently one asserts what "experience teaches," the more sure we may be that he has not kept a written account. Memory is curiously treacherous when it is trusted under the influence of a pre-adopted belief. We are all inclined to read facts as we do the Bible, as supporting our own creed. Two persons, looking at the same thing, often interpret it differently,—sometimes in direct opposition to one another; and in such a case one will afterward report that he has witnessed a "fact," as supporting his idea, and the other party will also report that he observed the same "fact," as proving the opposite, and "there is no denying *facts*." The "fact" is, the words "fact" and "experience teaches," etc., are very commonly used in the spirit of scoffing. The man who really has facts on his side will be neither vehement nor repetitious. The celebrated old story to illustrate false reasoning from facts is this: An Englishman observed that a Frenchman, who had a fever, ate a red herring and got well, and he so noted it in his memorandum book. Afterward a fellow citizen had the same kind of fever, and he was persuaded to eat a red herring. He died, and the "observer" noted in his book, "Red herring will cure a Frenchman but kill an Englishman!"

Hence the emphasis in our schools and colleges laid on the necessity of training, first how to observe, and secondly how to tabulate in statistical form, and reason out the results. This, indeed, is almost all there is of mental discipline, and we become proficient in it in proportion to our inherited mental capacity and disposition.

It is a common saying that "there are exceptions to all rules;" but a more careful wording of the idea would be, "There are exceptions to most generalizations made by man, but none to any law of nature."

Most experiments in farming, stock-raising, horticulture, gardening and household economy do not have to be purposely instituted as such. A systematic record of the ordinary work is nearly or quite sufficient. Systematic experiments as such should be conducted at the agricultural colleges, as they are indeed established and supported in great part for this express purpose. What devolves upon the farmer is to endeavor to obtain the best results he can, from year to year availing himself of what knowledge the agricultural schools and societies afford him. This information is published by the State in annual volumes for free distribution. This encyclopedia is in a large proportion a classified and condensed alphabetical statement of these reports—the first effort of the kind ever made.

Express Companies are "common carriers," and are bound to carry all merchandise offered them at uniform rates; are liable for the safe delivery of such merchandise, except such damages as may result from the "acts of God" or the public enemy, unless a contract is made exempting them from liability. Usually they are not liable beyond their own lines.

Extracts, FLAVORING, are preparations of vegetable principles obtained either by putting the plants in a solvent, such as water or alcohol, and then evaporating the liquid down to the consistency of honey; or by expressing the juice of plants, and then evaporating. Extracts contain only those vegetable principles that are either held in solution in the juices of the plants themselves, or are soluble in the liquid employed in extracting them, and, at the same time, are not so volatile as to be lost during evaporation. Hence, we find in an extract generally a great variety of substances, as mucilage, sugar, tannin, resin, gluten, etc. If water alone is employed in solution it is called a watery extract; if alcohol or proof spirit, then the product is a spirituous extract. To make a watery extract, the substances are generally boiled in water, the decoction is strained, and then boiled down till it has attained the desired consistence, and, perhaps, gently dried on a stone. If a spirituous extract be required, a tincture of the substance is first made, and this is evaporated gently in a water or sand bath, or a distilling apparatus may be employed, and thus the spirit is saved. In performing the operation of making a watery extract a higher temperature than boiling water must be employed, and yet the evaporation must be effected as quickly as possible by having the evaporating vessel broad and shallow, and set in a water-tub. Some extracts are made by a mixture of spirits and water, it being found that some plants contain both a resin and a gum, the first being soluble only in spirit and the latter in water, as, extract of jalap, or Peruvian bark, etc.

A number of flavoring extracts are in domestic use. These are prepared according to the general principle above set forth. The most common preparations known in domestic economy are, lemon extract, orange extract, extract of rose, cinnamon, nutmeg, ginger, pepper, coriander, vanilla, celery, soup-herb ,

bitter almond, cloves, mace, thyme, sweet marjoram. The fruit flavors are generally used in the form of essences, and are the essence of pine-apple, strawberry, raspberry, peach, and other fruits. The essences are articles of frequent adulteration, and purchasers should be careful to procure their flavors only from responsible dealers, and buy only the best, even if the cost is considerably greater.

Eye, the organ of vision. It is possessed by all the active species of animals, except the few who live in darkness and do not need it, and in every instance, from its largest size in man and quadrupeds, to its minutest and microscopic form in the smallest insects, it is a museum of wonder, a collection of complicated organizations, a system of intricate and multitudinous adaptations, a mimic universe of the results of design and wisdom and beneficence on the part of the Creator. To describe it fully would require a volume, and to trace all its mechanisms, its adaptations, its chemical relations, and, above all, its evidences of the being and perfections of its Divine Father, might fill volumes enough to constitute a library. We must refer, for general information upon it, to technical works and special treatises, and we feel obliged to restrict ourselves to a few sentences in close connection with the immediate design of our work.

The eye of quadrupeds, though usually somewhat different from the human eye in form, and sometimes widely different from it in appendages, strictly resembles it in structure. The eye of the horse is proportionately larger than that of some other quadrupeds; it is situated less in front and more to the side than in man in order to command a wider lateral range of view; its pupilar opening is elliptical, and has a long axis parallel to the horizon, so as to increase the lateral field of vision, and its edge is provided with a peculiar plum-colored fringe, which is supposed to absorb occasional excesses of light. The horse has excellent vision, and though not a nocturnal animal, can see better in obscure light than a man. His eye, when healthy, is full, clear, dark-colored, and nearly circular, and when eminently good it is comparatively large, yet not over-prominent. But this important organ in the most valuable of domestic animals is so frequently obscured, defective, or totally blinded from disease as always to require close examination on the part of the purchaser of the horse, and special tenderness and care on the part of his owner. If the eyeball is sunk into the orbit, producing a corrugated appearance of the lids, we may suspect latent disease. If a horse shies we should be doubly careful in the examination of these organs, as this habit often arises from defective vision. Some horses, usually with a considerable quantity of white about the face, have what is termed wall-eyes. In these cases the iris is found to be deficient in its natural color, giving a white appearance to it. They are known to be more liable to affections of the eye than those in which this peculiar defect is absent; but certainly it does not increase the beauty of the animal. A horse whose eye exhibits more than a normal proportion of white, has generally a vicious temper. The principal diseases which attack the eyes of horses are amaurosis, cataract, inflammation, ophthalmia and filaria.

The eye of the ox is situated more on the side of the face, more in a situation to command a wide lateral field of vision than even in the horse. "The ox in a state of nature," remarks Youatt, "being exposed to the attacks of ferocious animals, needs an extended field of vision in order that he may perceive the approach of danger from every quarter. He is oftener the pursued than the pursuer, and therefore requires a lateral instead of a somewhat forward direction of the eyes. The eyes are prominent, in order to increase the field of vision; and they are rendered thus prominent by the mass of fat which is accumulated at the back of them. A prominent eye is reckoned as a good point in a beast: it shows the magnitude of this mass of fat, and therefore the probability of fat being accumulated elsewhere. This prominence, however, should not be accompanied by a ferocious or unquiet look; for feeders have agreed that neither the grazing nor the milking beast can have too placid a countenance, or be too quiet or docile in her habits." See Breeding, Cattle and Cow.

Care of the Eyes. There are more individuals who ascribe their weakness of sight to a use of their eyes under an insufficient artificial illumination than to any other one cause. In a great many instances this may not be strictly true, but there can be no doubt that faulty artificial light is one of the most productive causes of a certain class of injuries to which the eye can be exposed. The two sources of trouble with the ordinary artificial lights are—first, that they are not pure white, and secondly, that they are unsteady.

The position of light in relation to the body is of great importance. If a shade is used on the lamp or burner (it should, by preference, be of ground or "milk" glass, never of colored glass), the light may stand directly in front of the body and the work be allowed to lie in the light under the shade, which will protect the eyes from the glare of the flame. If no shade is used, the back should be turned to the source of the light, which ought to fall over the left shoulder. The same rule applies in the management of daylight. In this case the light should come from behind and slightly above, and fall directly on the work, whence it is reflected to the eye. It should never fall directly in the face. The light in the room during sleep is also not without its influence. Even the strongest eyes are, after the repose of night, more or less sensitive to the impression of intense light. The eyes must have time to accustom themselves to the stimulus. Attention should be called to the injurious effects that sometimes follow reading on railroad cars. On account of the unsteadiness of a page, reading under these circumstances is exceedingly trying to the eyes and should never be persisted in for any considerable length of time. During convalescence from severe sickness the eyes are generally the last to regain their lost power.

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FAINTING. This is produced by various causes, among which may be named great loss of blood, and in some persons the sight of blood; violent passions of the mind; severe pain and suffering; excessive joy; disgusting sights; fright; excessive eating and drinking; offensive odors; impure and confined atmosphere; and intense study. It is also a symptom of other diseases, particularly of the heart and brain. Persons of weak and delicate constitutions are liable to it from very slight causes. If it occur frequently in a person otherwise apparently healthy, and without any known cause, a diseased state of the heart or brain is to be apprehended.

TREATMENT. A person who has fainted or swooned should be immediately laid in a horizontal position, the clothes about the chest and neck loosened, and cold water sprinkled freely in the face. If the fainting has taken place in a tight or crowded room, the patient should be immediately removed to where there is plenty of fresh air. The hands, legs, and arms should be freely rubbed. Spirits of ammonia or the salt of hartshorn should be held to the nose. A teaspoonful or two of compound spirits of lavender, with some spirits of hartshorn, is very good, to be taken internally. There should be about four times as much lavender as hartshorn, or in about that proportion. A teaspoonful of No. 6 is also good. It may be diluted with a little brandy, or other spirits. But in a majority of cases, pure air, and a little cold water in the face, are all that will be required.

Persons subject to fainting should avoid all crowded assemblies and places where the air is impure or confined. They should also avoid mental excitement, too much fatigue, and tight-lacing.

Fair. This word, in the olden time, in England, applied as a name to holidays. Fairs, or outdoor fetes, were held in churchyards. Later, the term "fair" was applied to a public sale, where the people gathered at a market town, on fixed days, and exposed cattle, farm products, home manufactures, etc., for sale. Much pastime and carousal was indulged in on these occasions. Under the patronage of the "Highland Society" of Scotland, annual exhibitions of stock, etc., have been held alternately in the large towns of that country for many years. In the United States the term "fair" applies to the annual exhibitions of agricultural societies. There are State, county, township, district, sectional, and national societies and fairs. The first agricultural exhibition, or fair, of England was held in 1723. The first agricultural society ever incorporated in America was that established in South Carolina in 1785, called the Society for the Promotion of Agriculture. Its object included the institution of a farm for experiments in agriculture, and the importation and distribution of foreign productions suited to the climate of that State. Another prominent object was to direct the attention of the farmers to the economies connected with the agriculture of the State, and to enlist them generally in the improvement of their condition.

The society accomplished an excellent work, among other things, that of introducing the cultivation of the olive and the vine into the State. Societies for the promotion of agriculture were always regarded by the planters and statesmen of the South as being of the first importance; and naturally so, for the reason that agriculture always was the dominant, in fact, almost the exclusive, interest there; more than this, however, from the settlement of the country until about 1860, it was confined to special products, as, at first, tobacco, then cotton, and, later, sugar, these, with blooded horses and cattle, comprising the chief sources of wealth of the southern planter. In the earlier history of the South, her clubs and societies were composed of men of wealth and position, and, like the earlier kindred societies of Great Britain, were exclusive in their nature. More recently, agricultural societies in the South have taken on a more popular character, and the last ten years has witnessed a wonderful increase in the number of clubs and similar organizations which have had the effect to re-awaken interest in this rich and diversified portion of our common country.

The primary purpose of fairs in this country was to promote the advancement of agriculture and the industrial arts. That object has always been real or ostensible. The interest that progressive and thinking men felt in the improvement of farming and manufacturing processes was, no doubt, the motive for instituting annual exhibitions in the country towns, where competition in display should beget emulation in producers. As in all things, money was required to conduct fairs, and men of speculative minds saw an opportunity to handle this money to their own benefit. The fairs of the present time undoubtedly contribute much to the benefit of the farmer, the artisan, and the householder, but it is thought by many who are both wise and interested in the success of agriculture and kindred interests that the later manner of conducting

fairs is fraught with abuse and damage. One of these alleged abuses is horse-racing and its accompaniment, betting; another is the show business connected with most fairs—the permission of various itinerant catch-penny affairs, by which the money of the farmer is persuaded from him; the roulette tables, wheels-of-fortune, lifting machines, etc., are deprecated by many. Others decry the scheme of having a programme of amusements, like foot-races, bag races, base-ball games, military displays, balloon ascensions, and the like, as vicious, diverting from the real object, and detracting from the dignity of an industrial exposition. This section of the farming community embraces individuals of the soberer classes, who are intensely practical, and, having no taste for variety and amusement, seek to bring others to their standpoint. They are, no doubt, partly right, and their opinions should have their due weight.

There are persons of the other extreme, who would have the agricultural exhibitions turned into a sort of annual circus and horse-trot, with all the accompaniments of sporting crowds—free liquor, boisterous amusement and reckless folly. The opinions of this class are worthy only of contempt.

A middle class believe that the annual fairs should combine both amusement and profit. While anxious that such expositions should be always a collection of valuable exhibits, so arranged and prized that industrial benefit may thereby result, yet they realize that fairs are designed for all classes of the people; and if an interest in them is to be maintained, and the highest results are to accrue, men, women, and children, old and young, are to find something inside the gates to please and instruct.

Besides, all who have had experience in the management of fairs know that each annual exhibition costs money, and that enough must be taken at the gates for admissions to pay this outlay, or else the association that is responsible for the fair will be in debt. For this reason some programme of entertainment has to be provided to call the people together. If the views of the first class prevail the middle section argues the attendance at the average fair, now numbered by thousands, would dwindle to hundreds, and a depleted treasury would be the result.

Following are some further reflections on the difficulties and abuses of State and county fairs, with remedies, as suggested from high sources:

State Fairs. It has been urged that an evil of great magnitude connected with State exhibitions is the hurry with which the exhibits are collected together, preventing adequate classification, and doing injustice to exhibitors, judges and visitors. In Great Britain and New York, and perhaps other States, the practice has been for some years to have all the entries made and the books closed thirty days before the opening of the fair. A catalogue is also published showing all entries in each department and class, and the names of the exhibitors, and their post-office addresses. These catalogues are offered for sale, and the money from this source generally pays for the publication of the catalogue.

Some of the wisest farmers of the country have given much attention to the question of exciting amusements at State fairs. It is held, probably by the majority, that the State exhibitions, at least, should be kept free from such features. They hold that the great interests attaching to a State show will call together a large number of exhibitors and visitors in any event, and, that if there be a necessity for exciting amusements at county fairs, it does not apply to State expositions. They hold that the care and expense of providing such means of drawing people together are not balanced by the results in dollars and cents; that it distracts the managers from the absorbing and graver purpose they have in hand, and thus the value of the exhibition is impaired.

In this connection horse-racing is made to receive a large share of deprecation. It is pronounced outside the objects of the enterprise, and vicious in the extreme. It promotes the spirit and practice of gambling; it fosters a disposition for reckless gaming, and brings together the sporting fraternity from all quarters, with their habits of drinking and debauchery. New York has banished races from its programme, and the agricultural societies of Great Britain have, despite the racing influence of the higher orders, refused to open their grounds to speeding practices.

The objection is probably true that in the case of State fairs many exciting amusements and spectacles and an unlimited amount of horse-racing are deleterious to the interests of the fairs. The object of State fairs is to bring together a collection of the products of the State—animal, vegetable, mechanical, and, in a measure, artistic, in the greatest possible variety and perfection. This is to stimulate emulation, impart information, and promote progress. It requires grave consideration and hard work on the part of the management. It is only reasonable to conclude that the diversion of the thought and effort of the individuals charged with this work will impair their efficacy. And besides, farmers from different parts of the State, who visit the fair, are not as apt to be benefited by what they see if their minds are captivated by the passage of a frivolous daily pageant. It seems apparent that if the sole purpose of our State exhibitions was that they should be just as replete as possible with valuable exhibits, their character would be raised appreciably.

But the argument of horse-men also deserves consideration. They truly assert that the horse is a product of the farm, and that the roadster and the speedy horse deserve as much notice as the draft animal. They point to the fact that roadsters of speed are always in demand, and command a high price; that the breeding of this kind of stock has become large and remunerative. They ask, not without reason, why their interests should be excluded from State fairs.

This much agitated question will doubtless be settled by a compromise. Horses entered by their owners, and for legitimate purposes of exhibition of speed

should always be welcome. The trotting course should always be the arena on which owners can exhibit and test the speed of their favorites. Moderate prizes can be given, as in case of any other exhibit, but the gambling element should be banished from our State fairs. It can hardly be seen how the exhibition of running stock can be of benefit.

Show herds have caused much discontent among ordinary exhibitors. It is the practice of breeders and others to feed and foster a selection of half a dozen cattle, sheep or swine, with which they travel from fair to fair, and sweep the prizes. They enter the herd together and separately, bulls, cows, yearlings, calves, and gather in a large list of premiums. Having been long in the business they are able by well-matured arts to captivate the committee-men and procure prizes in their favor. Regular breeders have but little encouragement to compete against these "professional" exhibitors, and hence the loud complaints and deprecation of fairs as fraudulent and partial.

A cure of this evil has been suggested in this wise: All stock for exhibition should be entered by actual resident breeders or owners. There should also be two general descriptions of exhibition stock—the breeders' and the sweepstakes. The first should be open to breeders only; the second to all, with the provision that they should be entered by the owners only. Different breeds should be shown separately. There should be no general sweepstakes department, where all breeds compete together.

Following the lead of these suggestions there can be no doubt about the improvement of our State fairs.

The proposition to exclude intoxicating liquors from State fair grounds has also been much discussed. Generally the stronger liquors have been banished, but a single beer stand is allowed, which is a privilege that somebody is willing to pay roundly for. The temptation to gather in this revenue is generally omnipotent with most agricultural boards.

The renting of refreshment, amusement and gaming stands on fair grounds is one also of revenue. Where the grounds are ample they can do but little harm. In the matter of refreshments, privileges of this sort are an absolute necessity.

County Fairs. When we arrive at the consideration of county, district and local exhibitions, the aspect somewhat changes. There is less dignity attaching to them, and rules that apply to one cannot always adhere to the other. The general object is the same in both. The argument regarding "show herds;" favoritism in awarding premiums; the determination to have a full and praiseworthy exhibition; the plan of having entries close 30 days before the opening of the show; and the suggestions about the division of the breeders' and sweepstakes classes, apply to both State and county fairs. But in questions of amusements, horse-racing, etc., the two are somewhat different.

State fairs are supported by the entire State. Their importance will call together numerous entries and a large attendance in any event. Not so with the county fairs; many of them have hard work to be self-sustaining. It requires careful and judicious, as well as ingenious management, to conduct a successful county fair. The interests connected with them are local. Managers and patrons are neighbors. Bickerings and dissatisfaction are liable to arise. The people are apt to expect more than they realize. The demands upon the management are rigorous and onerous. For this reason they are obliged to furnish the people something that will entertain. This often brings down upon the managers the censure of the sages of the community, and thickens the difficulties of the managers. No wonder that many local fairs dwindle out a sickly existence, and finally die of financial debility.

The first requisite for a good county fair is an ample, convenient and pleasant ground. A natural amphitheater, with rising ground at one side, is the best. Plenty of water and shade are indispensable. Another feature should be ample and convenient stalls, and pens for all classes of stock. This invites exhibitors. Commodious and tasteful exhibition halls, fully weather-proof and tasteful in construction, should be provided. In these, tables, racks and cases should be placed for the use of exhibitors.

A fair-ground is always beautified by an ornamentally constructed floral and art hall. A little effort in filling this with floral displays, miniature landscapes, etc., makes it a point of general attraction. Ample accommodation should be given to the domestic department, and full encouragement to household exhibits. The departments, mechanical and other, where selfish interest is the prompter, will more readily take care of themselves. Liberal premiums should be awarded at county fairs; for it is a fact that wherever this is done, there the fair has been the most successful. Encouragement to art exhibitions and other attractive features should be given.

A late feature of county fairs in some instances has been the awarding of premiums to competitive schools. This is done by a system of lesson papers, and becomes a very interesting and valuable part of the fair.

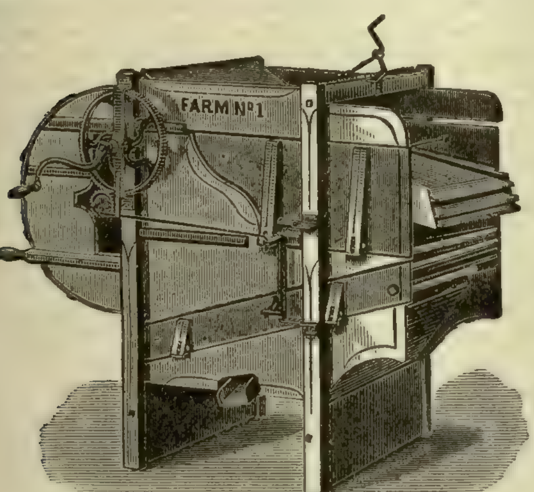
It has been suggested that the small girls be encouraged in sewing by receiving premiums for excellence in this useful art. Anything domestic, such as cookery, model housekeeping, bread-making and the like, should enter into competition at county fairs.

The county fair is the farmer's great annual holiday time, and he who would reduce it to a mere show of farm products is unwise in that he prevents the æsthetic and amusing from entering into the festive occasion, and thus deprives it of half its attractiveness. He also deprives the management of half their revenues. The young people from the farm certainly attend the county fair to be amused as much as profited in the more substantial things of life. If the means of amusement are not furnished on the fair ground they will not attend. The same may be said of two-thirds who visit the fair out of the villages and cities of the county. The necessity therefore seems imperative that amusements be furnished at county exhibitions; but this does not imply that the more important features be neglected.

Fallow, to plow, harrow and break up, as land, without seeding, for the purpose of destroying weeds and insects, and rendering it mellow. The word is also used as an adjective and as a noun.

Fan, of a windmill, is the "tail," or vane, to keep the sails facing the wind.

Fanning-Mill, a mill used for fanning out chaff and other light material from grain, beans, etc. A mill as illustrated in the accompanying engraving should be on every farm. The modern threshers are provided with a fanning mill for cleaning grain, yet a farmer will find more or less service for a good fanning mill.



Fanning-Mill.

The best fanning-mills must not only winnow out all the chaff, but remove every foul seed which may have found its way among the grain. Cockle and chess must be taken from winter wheat, oats from spring wheat and from barley, and most important of all, grass seed must be thoroughly cleaned—clover separated from timothy, sorrel or plantain seed; and timothy from other small seeds.

Farce, in cookery, is a stuffing or mixture of viands, like that used in dressing a fowl; force-meat.

Farcy, a disease of horses similar to mange or glanders. See Horse.

Farding-Bag, the first stomach of a cow or other ruminant animal; the paunch.

Farina (fa-rī'-na or fa-re'-na), the flour of corn or of any starchy tuber or root, as potato, manihot, etc. It is sold at drug-stores and groceries. To prepare it for eating, stir a large tablespoonful of it into a cup of boiling water, in a vessel which is inside a kettle of boiling water; boil 15 minutes, stirring constantly until it is well thickened; then stir in gradually a cup of fresh milk and boil 15 minutes longer; sweeten, if desired, and eat as soon as it is sufficiently cool. Enough can be made in the morning to last all day, as it can be warmed up with a little milk.

Farinaceous Food. Wheat, barley, sago, chestnuts, beans, potatoes, etc., are classified as farinaceous. Farinaceous food, although much recommended for invalids, is often injurious. A weak stomach is frequently made still more feeble by the long and exclusive use of farinaceous food. It should always be combined with a little animal food given either as a solid or in the form of gravy. Of all farinaceous food the best is probably gruel. When passing through a course of farinaceous diet, if the invalid should find a perceptible increase in the clammy or metallic sensation in the mouth, it may be taken as an indication that this diet is enfeebling the stomach, and that a slight change toward animal food must be made.

Farm. Farms have a great variety of both character and objects, and are capable of distribution into many classes. The farms of hot countries differ in the aggregate from those of the cold countries, and at the same time considerably differ among themselves.

Size of Farms. A controversy has long existed, and has at times been acrimonious and engrossing, as to the comparative advantages of very small farms and very large ones. The most common argument in favor of large farms are, that they call into play large capital, that they command the requisite facilities of both science and art for the proper working of the land, that they afford scope for enterprise and incite the peculiar activities requisite for progressive improvement, that they greatly economize labor and expenditure; and that they evoke both a better and a bulkier produce, and possess a freer and stronger subserviency to the national wealth, and, therefore, to the common well being. The most prominent arguments in favor of very small farms are, that they reward merit, that they encourage industry, that they keep up and multiply the population, that they promulgate a general feeling of manliness and independence throughout the community, that they furnish the best class of men in all subordinate stations of life, and that, in such peculiar circumstances as those of a large part of Ireland, with a crowded population, and without any other general means of support than the cultivation of the land, they are essential to the prevention of extensive starvation and general misery. Some enthusiastic advocates of the minute subdivision of land have contended that small farms are not necessarily encumbered with any disadvantages whatever, except such as are common to farms of all sizes, that they possess some advantages peculiar to themselves, and that, under almost any kind of treatment, they actually yield a larger produce than if they were consolidated into large farms. But the controversy is in a great degree unmeaning. Either small farms or large ones will produce much or little according as they are or are not worked with energy and skill; and small farms possess just the same adaptation to men

of small capital as large farms possess to men of large capital. A controversy about the size of workshops and factories in the world of manufacture would appear to us nearly as wise as the controversy about the size of farms in the world of agriculture. Let interested parties observe what arrangement is most desirable in the circumstances of their own portion of the community; and instead of fomenting discontent and creating disorder by comparing its advantages and disadvantages with those of arrangements in other States or counties, let them do all they can to push all its parts into the grand and rapid current of general agricultural improvement.

Renting Farms. The hiring or renting of a farm is the most serious professional act of the farmer's life, and requires a nice exercise of judgment. A person who wishes to rent a farm must call all his abilities and information into play: he must take a comprehensive and symmetrical view of the numerous circumstances which determine both the intrinsic character of the farm and its relative adaptation to his capital and knowledge; he must examine alike the advantages and disadvantages, and assign to each its due or comparative degree of importance; he must discard both a too solicitous prudence, which doubts every benefit, and too daring courage, which overlooks or lessens every evil; and he must carefully beware of having his choice principally or even partially determined by considerations which are merely incidental, or which do not belong to the real merits or demerits of the farm. It must be obvious to almost every person that the common farmers often lose themselves in deliberating concerning a farm. They have so many mistaken rules of judgment that they often reject farms that soon after make the fortunes of those who hire them. In particular, they are very apt to take one false guide, the success of the last renter. If a man makes a good deal of money upon a farm, or leaves it for a much larger one, numbers will immediately apply, almost without viewing it; but if a renter or two breaks, or is poor, most of the neighbors look down on it without further consideration. They attribute all to the land, and avoid it under an idea that without a reduction of rent the farm cannot be profitable. These notions are absurd in the extreme; for the management of various farmers is so essentially different that success often depends very little on rent. A farmer with a proper sum of money in his pocket hires a farm and thrives upon it; another with one hundred dollars less, hires it and starves. Suppose two farmers of the same means, and living upon similar farms: one manages his land with judgment and spirit, makes all the manure he can, sells no hay or straw, does not injudiciously crop his land, drains his fields, and keeps his fences in good order: this man grows rich; the other, a sloven in these particulars, falls into poverty. These are the circumstances that make one man rich and the other poor; the rent has but little influence. And surely it must be apparent that the succeeding renters, judging of the respective farms by the success of others, are taking as blind a guide as they can possibly fix on.

One important consideration is the quality and condition of the soil. The mere color and mechanical texture of the land, or the general resemblance of its appearance to other lands with whose power of production the party is acquainted, are very insignificant circumstances, and are quite as likely to mislead the judgment as to direct it. Both the elementary constitution of the soil and the precise condition into which recent cultivation has brought it, ought to be ascertained, the former by analysis, and the latter by searching through courteous inquiry into the method of tillage which has been practiced, the course of rotation which has been pursued, the kind of manure which has been applied, and the species and comparative bulk of the weeds which have been encountered. A soil of very inferior constitution may be very similar in both color and comminution to a soil of very superior constitution, and a soil of mediumly fertile powers, in a state of good health, will for a number of years to come yield more valuable crops than a soil of very highly fertile powers in a state of rankness from mismanagement or exhaustion.

Another important consideration is the compactness of the farm, and the convenient distribution of its enclosures. Every farm, in order to be managed with ease and economy, or without an irritating and wasteful expenditure of daily labor, requires to be free from the intrusions of any other man's ground, and free also from intricacy, angularity, and unequal distribution of its own parts. When the fields of a farm are mutually straggling and disjointed, the general business of it is never collectively under the eye; all the operations of tillage and after culture involve waste of time and labor, the equal distribution of manure is difficult and perhaps impossible, the maintaining of fences is very troublesome and not a little expensive, and depredations of all sorts by both men and brutes are comparatively frequent and disastrous.

Another important consideration is the nature of the fences, the condition of the gates, and the yearly expense which will be requisite for keeping all the enclosures in a state of efficient repair. Some fences are so incompetent as to entail enormous damage from exposure or depredation; some are so unsuitable, or so positively mischievous, as to impoverish the fields, embarrass the tillage, annoy the flocks, counteract much of the beneficial effect of draining; and some, though otherwise unobjectionable, may require from the renter, for their repair or maintenance, an amount of expense which probably may both surprise and distress him. The nature and state of the fences is a very important item, insomuch that it alone is sufficient to render some farms unprofitable for renting which otherwise would be very remunerative. See article on Fence.

A fourth important consideration is the situation of the farm with reference to the public market, to sources of mineral manures, to sources of fuel, to roads and other public facilities of conveyance, and to the com-

munication of neighboring grounds. A greater distance from the public market than a majority of farms of similar character, involves the cost of carrying produce the additional distance, and subtracts the amount of that cost from the net price which the renter obtains for his produce.

Ample and free facilities of conveyance, in the form of roads, bridges, canals and railways, exert so mighty an influence as speedily to raise a starving and barbarous agricultural district to a condition of plenty and refinement; and limited or ragged means of communication from any one farm to the rest of the country, particularly if these means consist of bad roads, repress enterprise, shut out ameliorating influences, and occasion great wear of vehicles, excessive jading of horses, much irritation of farm help, great, wasteful expenditure of strength, and an incredibly large aggregate of incidental or general expense.

A fifth important consideration is the character of the farming or the condition of the farm buildings.

A sixth important consideration is the kind and amount of restriction imposed by the conditions of the lease. The conditions exacted by some landlords, especially when viewed with specific reference to peculiarities of soil, and to improved methods of cultivation, are incompatible with some of the best professional interests of a farmer, and even with the practice of sound principles of husbandry.

A seventh important consideration is the amount of rent. This is, in a great degree, controlled and determined by the other considerations, yet it must be separately viewed, and both minutely and comprehensively examined. The evils of an exorbitant rent are too obvious to require mention, and have been too often and dismally exemplified to need illustration. Four highly controlling elements over rent are the quality of the soil, the duration of the tenure, the stipulations of the lease, and the aggregate of all sorts of current and professional expenses; but another controlling element, perhaps quite as high and yet far from being so obvious, is the amount of capital to be invested in the cultivation.

An eighth important consideration, immediately dependent on the preceding, is adaptation of the size and capacities of the farm to the amount of capital to be employed in its cultivation. Many a renter is poor, and maintains a severe struggle upon a large farm, who might live in ease and comfort, and even acquire a considerable property upon a farm of less extent. A man who possesses less capital than the full stocking and free working of his farm require, becomes embarrassed at the very outset, and passes through a constant series of varied and harassing difficulties; he lives in penury, in anxiety, and in hard labor; he keeps fewer cattle and accumulates less manure than the state of his land demands; he overworks his horses, and either neglects or abuses a portion of his fields; he sells his produce in any state of the market, and for anything it will bring, and in the first season of poor crops or incidental misfortune, he either becomes insolvent or passes through an ordeal most perilous to both his credit and his health.

Selection of a Farm is a most important question to be considered by any man who proposes to begin farming, or one who expects to change his location. Perhaps he has been a renter and expects to go into another district and become the owner of a tract of land. It is much better, when possible, for a man to own the farm he tills than to rent, even though he can buy but a small one and not pay cash down for it. The man who owns his farm, though illy improved and meagerly provided with implements, is much happier than he who expends his force on another man's land. The thought that he must leave at the owner's bidding, the improvements, associations, the conveniences and all that he has brought around him, perhaps just at the age or condition of health when he is least able to encounter the fatigues and embarrassments attending the moving and making of a new home, is an ever-present specter. In the selection of a location health is the first thing to be sought; the quality of the soil, surroundings, etc., are after considerations. Before making the purchase of a farm upon which one expects to live, he should ponder well over features in any way connected with it. Remember you are selecting a home—a spot where you will rear your children, expend your life-forces, and pass from earth, leaving the harvests you have sown to be garnered by others. In thus purchasing a farm, observe the following rules and you will be enabled to select a place that will suit you, and where you may live happily and prosperously:

Always avoid a district known to be unhealthful, no matter how cheap the land may be.

Determine in advance what kind of farming you will follow, and seek a soil to suit. If you are going to make a speciality of any single crop, as corn, wheat, sugar-cane, rice, fruit, etc., read up well, that you may be posted as to the nature of the soil, climate, etc., required, and as to the most desirable location of such lands. If you are going to engage in stock-raising, then seek a locality possessing all the requisites, and where stock has been successfully raised by others. But if you are to engage in "mixed farming," there are few townships in the country where suitable soil can not be found. It is true there is poor land in almost every county of every State in the Union, and rich land as well; hence care must be observed, or disappointment will follow.

By all means, if possible, see the land yourself upon which you would make a life settlement, before purchasing. Remember, such a settlement is fraught with vital interests—interests you yourself understand better than anybody else. In examining a piece of land you think of purchasing, if a stranger in the locality, learn all you can from neighboring farmers. Ascertain the cost of labor, the quality and size of the crops they raised last year and the year before, how much manure and other fertilizers they use, and many other things which will readily suggest

themselves to the wide-awake man, seeking a permanent home for himself and family.

Ascertain what are the present and prospective facilities for furnishing a school education for your children, and social enjoyments for your family; also, regarding religious meetings and privileges. They are important items in building up happy and contented homes, and which have to be taken into consideration, particularly in the sparsely settled districts of the West and South.

Look out for pure water on the land you buy, both for family and stock purposes. An inexhaustible spring or small stream upon a farm is almost indispensable, and adds largely to its value.

Do not forget to inquire how far it is to the nearest saw and grist mills, for you will want lumber for building houses and fences, and wheat and corn ground for family and animal use.

Facilities for marketing your produce, too, must be taken into consideration, as it is a subject of no little importance. How far it is, by wagon road, to the nearest market town or city, the distance to the nearest railway station, the probable construction of other railroads in the vicinity, if upon a navigable stream or body of water, the running of boats, are all points to be investigated in purchasing a farm, or land out of which you propose to construct a farm.

Examine the soil and subsoil upon every square rod of the contemplated purchase, that you may know exactly what you are buying. Satisfy yourself thoroughly that it will produce what you desire to raise, or that you can make it so produce by the use of fertilizers, etc. If the soil is naturally thin and unproductive, while so much good land "lies out of doors" in this country, do not touch it for general farming purposes, though it may do for special farming.

It is better to buy a farm much run down and out of repair, provided you pay only its present value, than to purchase one with improvements which do not suit your purpose; for, depend upon it, the changing and altering into what you do require will be a source of annoyance for years. In other words, it is better to pay $40 an acre for a place that $40 more will make just what you want, than $80 for one which will never exactly suit you.

See to it that the land has a clear, sightly spot upon it for the dwelling-house and yard—a site which can be made beautiful by means of trees, flowers, shrubbery, etc. For the sake of wife and children, as well as the cash value, if you should desire to sell out afterward, do not overlook this suggestion.

Count your money and then invest only a portion of it in land, reserving sufficient for improvements, implements, and machinery for its successful cultivation.

Buy but few acres, and pay for them, if you have but limited means, rather than go largely in debt and run the risk of losing all. One small farm paid for is worth more than a large one only half paid for, unless you are sure of your ability to meet obligations. Debt, with ever-growing interest, is the nightmare of far too many farmers in this country. Forty acres of land thoroughly and intelligently cultivated will put more money in the owner's purse than two or three times that amount "skimmed over" in a slovenly, hurried manner. System and thoroughness in all things apply most emphatically to farmers; and if the farm is too large for the farmer and his means, many things have to be neglected, whereby he loses money. Therefore, it is better to purchase a few acres at a time, bearing in mind that as your means will allow, land adjoining your farm can be purchased, and thus you will gradually, but safely and surely, enlarge your domain.

Consider the proposed purchase in the light of a cash investment. Will it produce sufficient to pay fair interest upon your money, not only that invested in the land directly, but in improvements, machinery, etc., thereafter to be expended? Unless it will do this, besides yielding a fair profit on the labor of care and cultivation, do not invest. It won't pay. Consider, also, the prospects of a material advance in value, leaving the improvements you make out of consideration. All things considered, what will the land be apt to be worth five, ten or twenty years from now? More money is sometimes made through such advance than from "hard knocks" on the farm. Remember you are buying not only in your own interest, but in that of your children, and buy so as never to regret it, for discontent, dissatisfaction and partial failure follow regret.

As circumstances may arise making a future sale of your farm desirable, it is perhaps well in selecting and improving land to bear this possibility in mind. Indeed, the spirit of speculation is so strong in the make-up of some men that this idea forms about the only incentive to action. It is commendable when not carried to extremes. In general, it is better not to consider the question of selling at all unless you have bought an exhausted farm and buy for the purpose of building up and then selling. Men who intend to follow farming as an occupation should look upon their calling more from the stand-point of living than a mere occupation. Do not consider money invested in improvements in the light of the selling value they will add to the farm so much as with reference to the annual return they will bring in health, economy, comfort, convenience or fertility. Consider the farm a part of yourself and cherish it accordingly.

Farm Buildings: see Residence, Barn, etc.

Farm Accounts, a regular arithmetical record, or systematic and daily course of book-keeping, of all the pecuniary affairs of the farm. See Book-keeping.

Farmer's Calling: see next article.

Farming, the art of cultivating the ground for the production of food for the support of man. In its broad sense, farming embraces all that pertains to the working of the soil, and obtaining sustenance and clothing therefrom, whether it be from the cereal grains, pasturage, hay, the herding, feeding and fattening of

animals; all that relates to the making and applying of manures, the draining, and in fact to all which goes to increase the productive capacity of the soil. Farming may properly be divided into two great divisions, that which relates to the farm proper, and that which relates to the forest, the orchard, and the garden. The former is termed husbandry, the latter horticulture. Husbandry is divided into several departments: the cultivation of the farm crops, as grass, grain, etc., stock breeding and feeding and dairying. As the country develops, these subdivisions become more widely separated. Many farmers have their specialty, some turning their attention exclusively to stock, others to grain, while some are engaged solely in the dairying business, or even in the butter, cheese or milk department of the latter subdivision.

Horticulture, the second great division of agriculture, embraces pomology, or that which relates to the orchard; arboriculture, or that which relates to the planting and care of trees and the rearing and caring of groves, forests and wind-breaks; vegetable gardening, or the cultivation of plants for culinary use; floriculture, or the cultivation and the care of flowers in the garden, conservatory, greenhouse and hot-house; landscape gardening, or all that pertains to the ornamentation of the home, public and private parks.

Farming, as a vocation, dates back beyond any other in the history of the world. After God had created the world and fitted it for the occupation of man He gave him directions to dress and to keep the beautiful garden in which he was placed. Then we read of Cain tilling the soil and Abel keeping the sheep. Thus we see the first inclination of man was to develop the resources of nature, and from the beginning of the world's history to the present time there has been a larger portion of the human family engaged in this calling than in any other. All rely upon the faithfulness, energy and enterprise of the farmer to be supplied with their daily food and the clothing they wear.

Traditional history traces man back to the time of the deluge. After that catastrophe, man seems to have recovered himself in the central part of Asia, and to first have attained to eminence in arts and government on the alluvial plains of the Nile. Egypt colonized Greece, Carthage, and some other places on the Mediterranean sea; and thus the Greeks received their arts from the Egyptians, afterwards the Romans from the Greeks, and finally the rest of Europe from Rome. Such is the route by which agriculture spread over Europe; how it may have reached the eastern countries of India and China is less certain, though from the great antiquity of their inhabitants and governments, it appears highly probable that arts and civilization were coeval there, or, if not, that they traveled to the east much more rapidly than they did to the west.

The early history of man in America rests on very indistinct traditions; their arts and civilization do not seem of such antiquity as in Asia; in North America they are of very recent introduction; but of the agriculture of either division of that continent and of India and China we shall attempt little more than some sketches of the modern history, and its present state. The history of agriculture among the nations of what may be called classic antiquity, is involved in impenetrable obscurity. Very few facts are recorded on the subject previously to the time of the Romans. This enterprising people considerably improved the art, and extended its practice with their conquests. After the fall of their empire it declined throughout Europe; and, during the dark ages, was chiefly preserved in the estates of the church. With the general revival of arts and letters, which took place during the sixteenth century, agriculture also revived,—first in Italy, then in France and Germany; but it flourished most in Switzerland and Holland; and finally, in recent times, has attained its highest degree of perfection in Britain. The modern agriculture of America is copied from that of Europe; and the same may be said of the agriculture of European colonies established in different parts of the world. The agriculture of China and the native agriculture of India, seem to have undergone no change for many ages. Such is the outline which we now proceed to fill up by details, and we shall adopt the usual division of time into the ages of antiquity, the middle ages, and the modern times.

The world, as known to the ancients, consisted of not more than half of Asia, and of a small part of Africa and Europe. During the inundation of the deluge, a remnant of man and of other animals is related to have been saved on the top of the high mountain of Ararat, near the Caspian sea, and when the waters subsided, to have descended and multiplied in the plains of Assyria. As they increased in numbers they are related to have separated, and, after an unknown length of time, to have formed several nations and governments. Of these, the principal are those of the Assyrian empire, known as Babylonians, Assyrians, Medes and Persians in Asia; of the Jews and the Egyptians chiefly in Africa; and of the Grecians, chiefly in Europe. Least is known of the nations which composed the Assyrian empire: of the Jews more is known of their gardening and domestic economy than of their field culture; the Egyptians may be considered the parent nation of arts and civilization, and are supposed to have excelled in agriculture; and something is known of that art among the Greeks. The authors whose writings relate to the period under consideration are few, and the relations of some of them are very contradictory. The earliest is Moses, who flourished B. C. 1600; Herodotus and Diodorus Siculus, who wrote more particularly on the history and geography of Egypt, lived, the former in the fifth and the latter in the sixth century B. C., and Hesiod, the ancient Greek writer on husbandry, in the tenth century preceding our era.

Estimating the writers of antiquity on these principles, they may be considered as reaching back to a period 1,600 years before our era, or nearly 3,500 years from the present time; and it is truly remarkable that in the Eastern countries the state of agriculture and

other arts, and even of machinery at that period, does not appear to have been materially different from what it is in the same countries at the present day.

Property in land was recognized, the same grains cultivated, and the same domestic animals reared and employed; some led a wandering life and dwelt in tents like the Arabs, and others dwelt in towns or cities, and pursued agriculture and commerce like the fixed nations. It is reasonable, indeed, and consistent with received opinions, that this should be the case; for, admitting the human race to have been exterminated at the deluge, those who survived that catastrophe would possess the more useful arts, and general habits of life, of the antediluvian world. Noah, accordingly, is styled a husbandman, and is said to have cultivated the vine and made wine. In little more than three centuries afterwards Abraham is stated to have had extensive flocks and herds, slaves of both sexes, silver and gold, and to have purchased a family sepulchre with a portion of territory around it. Isaac, his son, during his residence in Palestine, is said to have sown and reaped an hundred fold. Corn seems to have been grown in abundance in Egypt, for Abraham, and afterwards Jacob, had recourse to that country during times of famine. Irrigation was also extensively practiced there, for it is said the plain of Jordan was watered everywhere, even as the garden of the Lord, like the land of Egypt. Such is the amount of agricultural information contained in the writings of Moses, from which the general conclusion is that agriculture, in the East, has been practiced in all or most of its branches from time immemorial. The traditions of other countries, however, as recorded by various writers, ascribe its invention to certain fabulous personages, as the Egyptians to Osiris; the Greeks to Ceres and Triptolemus; the Latins to Janus; and the Chinese to Chin-hong, successor of Fo-hi.

Thus we see in the very morning of the labor of man on earth agriculture, in some of its subdivisions, engaged the attention of the great men. Even the most savage tribes have to some extent been farmers. They gathered seeds and nuts for food, and many till the soil in a crude way for the production of roots and grain. Civilization has always carried with it a higher development of agriculture. The civilization of the nineteenth century finds the art of agriculture as far advanced as any of the sciences and arts, and she has given to the world as great men as came from other walks of life.

As men multiplied upon the face of the earth it seemed necessary that some should engage in other callings, and great cities and manufacturing centers were the outgrowth; yet agriculture has continued to hold the most prominent place among the industries of the world. The earliest recorded history of farming, aside from those mentioned in the Bible, is from inscriptions and hieroglyphics upon the ancient tombs of Egypt. It is very probable, however, that even the Egyptians received the rudiments of her civilization from China. An ancient monument in Asia Minor shows a plow and yoke, supposed to be the oldest known, made wholly of wood, the natural crook of a tree. The ancient Egyptians carried the cultivation of the soil to a high state. They had some knowledge of the art of manuring, the value of rotation, and knew something of horticulture. The Carthaginians considered agriculture to be the most aristocratic of all callings, and the kings, princes and nobles were among the most active cultivators of the soil. When the Romans finally subdued and laid waste the land, the only books which they deemed worthy of preservation, it is said, were 28 volumes of manuscript relating to agriculture.

As above mentioned, perhaps China was the first nation to make any great advances in developing the wonderful resources of nature. Before the days of the reign of Solomon, and the building of the great Jewish temple they nurtured the delicate silk-worm; while Europe lay slumbering in the gloom of the dark ages they performed one of the most wonderful works of the world in the building of the great wall around their kingdom. A district near Shanghai has been tilled for countless generations, yet it is termed the Garden of China. In Greece agriculture flourished a thousand years before the dawn of the Christian era. The agricultural literature of the Greeks, and their knowledge of the art, were comparatively extensive and eminently practical. Their soil was inferior and much of it had to be reclaimed from sand-banks, morasses and swamps, making successful farming more difficult, and, therefore, requiring a greater knowledge of all its different departments. Agriculture was greatly esteemed by the Romans. The most illustrious senators of ancient Rome, during time not occupied with public affairs, applied themselves personally to agriculture. We are told that Cincinnatus left his fields to serve as Dictator of Rome, and Regulus left the Roman Senate to care for his farm. Great men wrote works on agriculture. The Emperor Constantine made a valuable compilation of these works, and after conquering the Saracens and Arabians, fixed his attention upon agriculture as the surest basis of his country's prosperity.

The Romans' love for this pursuit made them careful and scientific, and their crops were large. Devotion and profit mingled. Pliny claimed that the soil loved to be tilled by the hands of men. He states that 400 stalks of wheat, grown from a single grain, were sent to the Emperor Augustus, and 340, also from one seed, to Nero. That agriculture is the foundation of all prosperous nations is abundantly tested by history. During the golden age of agriculture, when eminent men themselves held the plow, the Roman Empire flourished, becoming the mightiest on the globe; but when its agricultural interests were intrusted to menials, and the nation came to rely upon the production of conquered provinces, the zenith of its glory was passed, and dissolution speedily followed. Countless hordes swept down upon it from the North, and the once powerful empire fell never to rise again.

The history of agriculture from the fall of the mighty Roman Empire until the present century is as varied

and interesting as the history of man during those centuries.

In the ages of anarchy and barbarism which succeeded the Roman Empire agriculture was almost wholly abandoned. Pasturage was preferred to tillage, because of the facility with which sheep, oxen, etc., could be driven away or concealed on the approach of an enemy. The conquest of England by the Normans contributed to the improvement of agriculture in Great Britain. Owing to that event, many thousands of husbandmen from the fertile and well cultivated plains of Flanders and Normandy, settled in Great Britain, obtained farms, and employed the same methods of cultivating them they had been accustomed to use in their native countries. The implements of agriculture at this period were similar to those in common use in more modern times. The various operations of husbandry, such as manuring, plowing, sowing, harrowing, reaping, threshing, winnowing, etc., are incidentally mentioned by the writers of those days, but it is impossible to collect from them a definite account of the manner in which these operations were performed.

From the Restoration down to the middle of the eighteenth century, agriculture remained almost stationary. Immediately after that period, considerable improvement in the process of culture was introduced by Jethro Tull, a gentleman of Berkshire, who began to drill wheat and other crops about the year 1701. Great Britain is perhaps more indebted to Lord Bacon than to any of his contemporaries for the impetus which agriculture received in his day. Arthur Young is justly celebrated for his labors in behalf of agriculture. He traveled extensively over Europe to observe the various methods of tillage which prevailed, and is said to have edited nearly one hundred volumes relating to the profession. Sir Humphrey Davy was another benefactor of husbandry. It was the result of his experiments which led to the establishment of agricultural chemistry as a recognized branch of modern science.

At the close of the seventeenth century, America was only just beginning to be settled by colonies, widely separated along the Atlantic coast. The interior was one unbroken primeval forest, until the great prairie region of the West was reached, which, after passing west of the Mississippi river, gradually merged itself into what is now known as the great plains, east of the Rocky mountains. All this great country was then, and continued to be until long after the Revolutionary war, inhabited by wild Indians, more savage and cruel than the wild beasts. But the fertile soil and the great diversity of climate and its great natural water systems, soon attracted emigration from all arts of the civilized world. They have continued to flock in from year to year, until now they have occupied much of the available land, in connection with our own hardy pioneers, from the Atlantic to the Pacific. It is true that many large and fertile tracts are yet remaining, but a very few years more will find these all settled. Of the agriculture of the early part of the present century we find the agricultural implements and farming operations of the United States, in most particulars, were very similar to those of Great Britain. Circumstances, however, required variations, which the sagacity of the American cultivator caused him to adopt, often in contradiction to the opinions of those who understand the science better than the practice of husbandry. In Europe, land was dear and labor cheap; in the United States, the reverse was the case. The European cultivator was led, by a regard to his own interest, to endeavor to make the most of his land; the American cultivator has the same inducement to make the most of his labor.

The climate and soil of the United States are adapted to the cultivation of Indian corn, which the climate of Great Britain is not. This entirely and very advantageously supersedes the field culture of the horse-bean, one of the most common fallow crops on that island. Root husbandry, or the raising of roots for the purpose of feeding cattle, is likewise of less importance in the United States than in Great Britain. The winters are so severe in the northern section of the Union that turnips can rarely be fed on the ground, and all sorts of roots are with more difficulty preserved and dealt out to stock in this country than in those which possess a milder climate. Besides, hay is more easily made from grass in the United States than in Great Britain, owing to the season for hay-making being generally more dry and the sun more powerful. There are many other circumstances which favor the American farmer and render his situation more eligible than that of the European. He is generally the owner as well as the occupier of the soil which he cultivates; is not burdened with tithes; his taxes are light, and the product of his labors will command more of the necessaries, comforts, and innocent luxuries of life.

In relation to the difficulties experienced in advancing agricultural art in the United States, it is well known that the earliest settlers found the country a wilderness, with many varieties of climate and soil, of which they were entirely ignorant, and to which the knowledge they had obtained in their mother country did not apply. Thus, they had to contend with the innumerable obstacles, such as the wilderness of nature, their ignorance of the climate, the hostility of the Indian, the depredations of wild beasts, the difficulty and expense of procuring seeds, farming implements, and superior stock. These various difficulties are quite sufficient to explain the slow progress they made in the way of improvement. For many years agriculture was in an exceedingly backward and depressed condition. Stocks and tools were poor, and there were obstacles and prejudices against any innovations in the established routine of practice. This state of things continued for many years with very little change.

No real efforts mere made to improve farming until after the Revolution, when a more settled state of the country and the gradual increase of the population

began to impress the intrinsic importance of the subject upon the minds of a few enlightened men. They sought, by associated effort, to awaken an interest in the subject, and spread abroad valuable information. The South Carolina Agricultural Society was established in 1784, and still exists, and the Philadelphia Society for the Improvement of Agriculture, established in the same year, and a similar association in New York in 1792, incorporated in 1798, and the Massachusetts Society for the Promotion of Agriculture, established in 1792, were active in their field of labor, and all accomplished important results. The correspondence at this period between Sir John Sinclair and Washington shows how anxious was the father of his country to promote the highest interests of the people by the improvement of agriculture. But all the efforts of the learned and all the investigations of the scientific prove comparatively unavailing unless the people themselves, the actual workers of the soil, are prepared to receive and profit by their teachings. Many years elapsed before the habit of reading became sufficiently common among the masses of the actual tillers of the soil to justify an expectation that any profit would arise from the annual publication of the transactions of the several societies. The improvements proposed fell dead upon the people, who rejected book farming as impertinent and useless, and knew as little of the chemistry of agriculture as of the problems of astronomy. Such has been the increase of intelligence and the growth of liberal ideas among all classes of men during the last half century, both in this country and Great Britain, that we, at this distance of time, can with difficulty realize the extent of the prejudices which blinded the eyes of the people of those days. The farmer who ventured to make experiments, to strike out new paths of practice, or to adopt new modes of culture, subjected himself to the ridicule of a whole neighborhood. For many years, therefore, the same routine of farm labor had been pursued in the older settlements, the son planting just as many acres of corn as the father did, in the old of of the moon, using the same number of oxen to plow, and getting in his crops on the same day, after having hoed them the same number of times as his father and grandfather. So all farm practices were merely traditional; no country or town agricultural societies existed to stimulate careful effort through competition. There were no journals devoted to the spread of agricultural knowledge, and the mental energies of the farmer lay dormant.

The stock of the farm was such as one might expect to find under such circumstances; the sheep were small and ill cared for in the winter, and even the size of cattle generally was but little more than half that of the present time. The value of manures was little regarded; the rotation of crops was scarcely thought of; the introduction even of new and labor-saving machinery was sternly resisted and ridiculed by the American farmers of that day as well as by the English laborers. It was long before the horse-rake was brought into use in opposition to the prejudices it encountered. It was equally long before the horse-power threshing-machine was adopted. In some parishes of Great Britain, even so late as 1830, the laborers actually went about destroying every machine they could find. Now, on the contrary, the use of the flail is a drudgery to which very few are willing to submit, and steam-power has in many instances been substituted for the horse, while new and improved implements of all kinds are sought to an extent unprecedented in the history of agriculture. Changes are gradually made everywhere, and the success which attends the introduction of new implements disarms prejudice.

Within the last half century, chemistry, the indispensable handmaid of agriculture, has grown with great rapidity, and in each new discovery some new truth applicable to practical agriculture has come to light, while willing experimenters have labored in the field to prove the truth or falsity of the theories proposed, and thus the well-established facts from which the science of agriculture is derived, and the sound theories deduced from these facts, are constantly increasing in number. The substitution of animal for manual power, and yet more, the saving of animal power by the substitution of natural and mechanical forces, are the surest indications of improvement. From the changes which have grown up in these respects, and from the more constant use of chemical analysis to determine the qualities of soils and manures within the last fifty years, we may safely assert that the progress made during this period, or within the last twenty years, is wholly unparalleled.

Turning now from this glimpse of the history of agriculture, we wish to make a few practical observations, such, we hope, as will be adapted to the farmers of this day. There is no art which is practiced by man which includes a greater variety of operations or involves a greater amount of scientific principles than farming. No tradesman or professional man, with one or two exceptions, requires more training or a larger amount of technical knowledge than the farmer. None possesses equal facilities to him to turn a liberal education to an excellent practical account. Agricultural operations present a wider field for inventive genius and scientific research than any occupation allotted to man. Farming stands at the head of human arts, both in its antiquity and usefulness. It is the source of wealth and existence. Every material thing except air comes from the earth. The farmer who does not realize the importance and greatness of his calling, who is unwilling to acquire the knowledge necessary to success as do professional men, artisans, etc., in fitting themselves for their profession, is out of his sphere and should seek another vocation. Farming is both a science and an art, demanding knowledge to successfully cope with its subtle and sublime, intricate and important problems.

The farmer should have a thorough acquaintance with the plants and animals capable of ministering to human comfort. He should have a fair knowledge of botany, that he may interpret the silent language of

the vegetable world around him; that he may become acquainted with each plant with which he deals, knowing its peculiar necessities, and the various methods employed to improve and care for it, thus obtaining the greatest returns from the smallest outlay of labor and money. In accomplishing this he deals largely, also, with chemistry, whether conscious of it or not. By this beautiful and interesting science the mysteries attending the transition of plant-life from inert matter to buds, leaves, stems, flowers and fruits are made intelligible. A farmer may raise corn and hogs with some profit, though ignorant of the why or the how.

Every business must be learned, and the more thoroughly the better. The earlier the farmer understands the manifold changes constantly occurring around him, the earlier will his granaries be filled. Some knowledge of chemistry and botany are as essential to him as arithmetic and writing, and pays in dollars and cents better than money at interest.

To be a good farmer now requires more than mere unenlightened, patient drudgery. The calling demands knowledge, constant study, patient experiment, and tireless industry. The farmer feeds the hungry of all classes. He deals in commodities which must be purchased. His income is not dependent upon the caprice of fashion. He is the independent man of the age.

As between the farmer and the importer, or jobber, or manufacturer, or merchant in specific lines of trade, the latter classes have but a few leading points to consider, such as the probable demand or supply, while the farmer must not only take these into account, but also all the variations of soil, adaptability of crops, vicissitudes of climate, weather, etc. Hence, to be a successful farmer requires a wider range of knowledge, better reasoning—in short, better trained mental faculties than any of the other callings named above.

This is literally true, and a popular fallacy to the contrary is responsible for the limited success of the mass of farmers, and the low estimate of their calling, not only by others but by themselves and by their sons and daughters.

We are not arguing that every farmer should necessarily be highly educated mentally, but we do claim that the more knowledge any farmer acquires by reading about his business, by study and observation, and the more he trains and develops his thinking and reasoning faculties, the better will he forecast and plan for the future, and the more successful will he be. In this view of the subject reading and study will pay the farmer even more largely than those in most other business pursuits.

Every book or journal he reads brings him something of the thoughts, experiences and observations of others. These are often of direct practical application to his own work; and if not, they at least increase his general knowledge, stimulate thought, and strengthen his ability to reason well, and indirectly at least, pay a hundredfold.

A formidable drawback on the comforts and attractions of country life exists in the drudgery to which farmers' wives and daughters are subjected in boarding and lodging a number of hired men. Farmers who are in comfortable circumstances as to property, often compel the women to work early and late in feeding these men, and many have been thus reduced to a condition but little better than slavery. To them rest never comes; through the week days and on Sunday the same ceaseless round of cooking, and the many labors connected with it, must be submitted to, and more than a thousand meals must be annually prepared for the men, who have their seasons of labor and of rest. The wife of a man who owned 700 acres of beautiful land told us, in her worn-down and premature old age, that she had cooked fifty tons of food, by careful estimate, for the hired men who performed the labor of the farm. But the labor alone is not the only drawback. The rooms of the house are occupied, and the privacy and repose which women ought to enjoy, at least part of the time, is not to be found. Farmers' daughters see the contrast between their condition and that of wives and daughters of mechanics and tradesmen, and they resolve not to continue in such a life of discomfort by marrying a young farmer. This is a silent but powerful influence operating all through the country to a greater or less degree, and effecting a wide-spread injury to agriculture.

The average Western farmer toils hard, early and late, often depriving himself and family of rest and sleep—for what? To raise corn. For what? To feed hogs. For what? To get money with which to buy more land. For what? To raise more corn. For what? To feed more hogs. For what? To buy more land. And what does he want with more land? Why, he wishes to raise more corn—to feed more hogs—to buy more land—to raise more corn—to feed more hogs—and in this circle he moves till the Almighty stops his hoggish proceedings.

Doing Farm Work Early. The soil must always be the first object of the farmer's attention. Any advantage of loss here will be felt, not only for the season, but through the farmer's life, as it is so much cumulating value made or lost. He must begin his work as early in the spring as possible, as he has no time to lose. Weeds begin their growth at once, and these can never be subdued so well as when they first appear, or earlier. Some even put forth before the soil is dry enough to work, on undrained clay, showing the advantage of a drained soil, where the work may be commenced with the starting of the weeds on land intended for grain by early sowing, harrowing well, and if need be, cultivating the land, which gives the grain the start of the weeds; and the land being good, the chances are it will keep the start, shading the ground and smothering the pest. It is also a safeguard to some extent against the drouth, which often occurs, and is sometimes hurtful. All this can be done only when the crop is put out early. The yield in general will then be better, the straw brighter and the berry sounder. All spring grains will bear early sowing,

which means early harvesting, thus distributing the work well, favoring also seeding down, which is always risky if delayed.

All land intended for spring sowing should have its surface worked early to keep down the weeds, the benefit to the soil in improved texture and fertility more than paying for the labor. Keep the harrow and cultivator going, and see that there is no lack of implements and that they are of the best kind. Money here is well laid out; only keep the implements in use.

Where manure is needed, it is always best to apply it in the fall or winter on plowed land intended to be sown in the spring. This makes the finest of seed beds. Or it may be applied in the spring if done early and spread at once, so the spring rains may wash the strength into the soil instead of losing it at the barn. It is well, as soon as the weather gets warm, to lay open the manure piles so as to get them thawed for early application. The manure made during snowy winters is better than usual, as the severe and continued cold weather largely saves the liquid portions from loss. Pains, therefore, should be taken with the manure to get it on the land as early and as evenly as possible. There will then be a good start of the grain, even if the weather is not so very favorable. Once well started in such soil, it will grow on. It is such soil, if quite mellow and even, that should be seeded latest and the smoothing harrow passed over to cover the seed and still further fine and even the soil. A drouth then will not much interfere with the seeding, as the young plant, once started, will be pushed by the manure, the growth of the root keeping the start of the drouth.

Corn ground, if plowed early in the fall, should have its surface worked occasionally to destroy weeds, beginning as soon as the season will allow. If, after planting, the smoothing harrow be used for a few weeks, and the cultivator as long as the corn will admit, there will be few weeds left; indeed, there need be none at all, if the rows are put well apart, as the work on the soil may then be continued as late as desired, or till no more weeds make their appearance. This is really one of the most important things in corn culture, as it not only favors the growth of the crop, aided by sun and air, which the wide space between the rows favors, but cleans, pulverizes and enriches the soil for the succeeding crop.

Thus we see the advantage of beginning an early war against the weeds; but the work must be kept up in all hoed crops, including especially hops, where it may be continued till picking time, stirring only the surface. Sometimes a wet season interferes with the work; but no season is so wet but there are occasional times when the cultivator can be used, when all other work should give way to this, else the weeds are sure to hurt if not ruin the crop, and fill the soil with seeds for future trouble. Carelessness allows land to become foul. A desperate warfare with the weeds is before you and you must engage in it with unremitting effort, beginning early in the season, continuing until no more foothold can be obtained. Fortunately this work is a highly paying one; all the soil is now occupied by the crop, which, whether of grass or grain, is a clean one as well as increased in yield; the manure is clean; the land by working is improved in texture and fertility, working therefore easier. Unless hoed crops are thus treated there will be little or no profit; consequently no more land should be set aside for them than can be properly attended to, and it should be remembered that the work occurs in haying.

There is another thing that should be done early, but is sadly neglected in general, and seldom well done. It is the use of the roller. As soon as the frost is well out of the ground, and there is no danger of any more heaving, and the soil is not too soft (it will be firm enough early if there is good drainage), apply the roller to all grass lands whether meadow or pasture, and also to winter grain which needs it even more than grass. This packs the roots which were loosed and exposed to the air by frost. Snowy winters are favorable to protection; but the spring does always more or less harm to grass and grain, and this cannot be better corrected than by the roller, which, in effect, is replanting. But it must be done before the early, sharp, drying winds hurt the plant. To do this effectually the roller must be heavier than those commonly in use,—as heavy, with the usual length, as a good pair of horses can draw, better if three horses have to be used. After the wheat has been rolled and the plant has made some growth, having become well fastened, go over once or twice with a light harrow. This is equivalent to hoeing the wheat and is destructive to young weeds, and it favors seeding down, if that has been deferred.

Our State and national departments of agriculture are engaged in systematically collecting facts, tabulating them and working up the results into shapes usable by the average intelligence; while farmers' clubs and institutes, the Grange, the weekly agricultural paper and compilers of agricultural and horticultural manuals complete the work, supplying all with the latest improvements and aids that are useful to the community; and the general results can be readily enough seen by the striking contrast between the prosperous farming communities of the Northern States and those further South, even where they were not devastated by the ravages of war.

"High farming," which means such manuring and cultivation as will raise the most on a given piece of ground, generally, but not always, pays. It is remunerative only up to a certain limit. Mr. Lawes, of England, who has been systematically experimenting for 30 years, has ascertained, for example, that such manuring and cultivation as will produce 30 to 35 bushels of wheat per acre, yields a greater net profit than either lower or higher farming. Everything, therefore, depends on circumstances, and it is just those circumstances which our agricultural colleges and other institutions are engaged in finding out, for the interests of the farmer, the horticulturist, the dairyman, etc. Nearly every piece of ground can be improved by manuring and fertilizers, but occasionally a

soil may be found that is so deficient in some mineral ingredient that no amount of manuring will render it good ground, unless one should haul also the mineral, yea, the whole soil from some other piece of ground to the spot, which of course would be too expensive. By such scientific study as is now made easy for the farmer by the manuals published, he will be able to ascertain what are the peculiarities of his land. Sometimes a very slight change in the management will make a remarkable difference in the results, and, on the other hand, a great change in the management sometimes yields no result.

Pasturing takes too much ground in a thoroughly settled country. The time will come, as Horace Greeley used to say, when all the feed will be raised and fed to stock.

During the winter the farmer and the gardener should plan for his next summer's campaign, deciding what he will do with this and that field, what implements he will buy, and what preparations to make, etc.; as to machines, and indeed, with reference to every other thing, he will endeavor to "read up," consult his neighbors and reason out his conclusions. The particular faults of machines and methods he should inquire into, so that in every step he makes he will get a little ahead of his neighbor. But beware of making too many radical changes in your line of business, as that causes a waste of machinery and material; for example, in changing from grain-raising to stock-raising, one loses much of his machinery and appurtenances which he had supplied himself with at great expense for the prosecution of raising grain crops.

"Co-operation" among farmers is a subject much talked of, and is a good thing for many purposes, as in the use of large machinery too expensive to be purchased by one man, in the arrangement of fences, roads and drains, the exchange of seeds, etc. It is true that many crops gradually run out if raised from seed grown on the same ground from year to year. Seed obtained from a distance will often do better. In the absence of co-operation, for example, in the employment of complicated machinery, where it requires the skill of experts to make them successful, it is best to let the particular machine remain as the property of one man, at least in the care of one man, and him be paid for his work by the piece. Where several farmers own a machine in common, it should be stipulated that the machine should have the same care in the hands of all; they all should have their ground in good condition, so that one would not wear out the machine much more than the others would.

The necessity and utility of co-operation afford a striking example of the pecuniary interest which every farmer has in keeping on good terms with his neighbors.

All tools and implements should be repaired in the fall, besides being stored away under good sheds. Small implements, as hammers, chisels, wrenches, etc., should be painted red, so that in hunting them up they will more readily catch the eye and be found.

In raising seed, it is best to go through the piece at the beginning of the flowering season and destroy all the imperfect plants, on the same principle that in breeding stock you would not breed to inferior strains or specimens. Much has heen gained by close watching in this respect. For example, many years ago the potato rot was almost universal; by improving the quality of the seeds, varieties, fructification, etc., we have patatoes now that are not subject to rot; so all good qualities are continually being sought after by scientific breeding. Florists and originators of varieties are ever on the alert looking out for "sports," or "freaks of nature," as they are called, in the shape of larger or better or more beautiful specimens, which they enthusiastically seize upon and nurse and care for, and thus succeed in improving our stock. It is by this method that we now have all our luscious fruits, derived originally from the sour, crabbed things which are still to be found wild. So with our grains and all our vegetables. The largest seeds are generally the best, but not always. For instance, medium-sized grains of wheat on long, vigorous heads are better than large grains on small heads. The smaller, too, are often of much better quality. In crossing, the selection of closely related varieties of the same country is not quite so good as plants of a foreign country of the same variety.

Some farmers run themselves out by selling the best and keeping the poorest at home. In the course of time their stock becomes poor, and they fail to compete successfully in the market. Bad economy that. He should keep only his best specimens for stock. Farmers generally would grow rich if they only would do their best. A farm properly managed will increase in productiveness from year to year. Every agriculturist can find manure and fertilizers if he will only look around and be willing to work in the fall to collect it. "There is a class," says Greeley, "of drinking, hunting, frolicking, rarely working frontiersmen who seem to have been created on purpose to erect log cabins and break paths in advance of a different class of settlers, who regularly come in to buy them out and start them along after a few years."

While many fine eulogies and glittering generalities characterize the speeches and writings on the farmer's calling, we will here emphasize the most settled and important, namely: 1. Farming is the most independent vocation. 2. Farming is the most healthful vocation. The cities are kept up to what they are by a constant influx of the sturdy country element. The city man who accomplishes the most good is the one who frequently runs out into the country to recruit his physical and mental powers. 3. Farming is the most honorable, honest and revered vocation. It requires the honor and virtue of the country residents to keep up the integrity of the State. Were it not for the virtuous and "temperance" (abstinent) character of the agricultural community our cities and towns would be worse than they are. Country people, with less ceremony and hypocrisy, average more genuine politeness than city people do. 4. The life of a farmer (that is, of a scientific one, not a mere drudger), is more spir-

itual, poetical and elevating than all other conditions of life combined. Scientific farming develops the normal man; city life effeminates. All the advantage the city has over the country is convenience of trade and show. Extremes of intellect and prodigies of talent flock to the cities to make money by their extraordinary performances; "level" heads remain in the country to be "monarchs of all they survey."

A glorious future awaits the farming community of America. It is not generally known, even in cultivated circles, that the amount of arable soil in this country is greater than in Europe, Asia and Africa put together, and can therefore sustain more lives. This is no rash conclusion. Our continent is narrow, and therefore the winds of the ocean water it well. The mountain chains on the east side of the American continent are low; on the east side of the old world, are high. From this it results that the trade winds, laden with the wetness of the sea, are attracted to our land. The breadth of the old world and its high eastern ranges cause the rainless interiors of Asia and Africa. Again, America is the land of fertile plains; the old world of scorched plains. Our plains run north and south, and so attract and receive the rains. America is high under the equator, the old world is wide; hence, with us a small surface is exposed to the scorching sun. The result is that the productive soil in the old world is 10,000,000 square miles, and in the new, 11,000,000. Thus bursts upon us all in the light of scientific truth the fact that America can sustain a greater population than the old world; and if she can, it is unquestionable that some day she will.

Farmers' Clubs, associations of farmers for mutual instruction and protection. Meetings for mutual instruction should be our highest social happiness; but in any one community a large proportion of near neighbors are more or less out with each other, so that they cannot co-operate very well, and this is perhaps the only reason why any organization does not flourish more in the country. Kindred minds are too far apart, and qualified teachers are too scarce. As this has been the case now for many thousands of years, it is scarcely probable that there will be any radical change for ages to come, if ever; therefore let us get what good we can in our own life-time, by reading and conversing with friends. Carried on properly, farmers' clubs are eminently important and should be made popular, if personal prejudices, as above alluded to, could be overthrown. Each district has important topics to be discussed, and from a financial point of view should adopt every means for the advancement of their calling. The farmers of the present enlightened age are beginning to realize the fact that by comparisons, discussions, mutual conferences, and a hearty co-operation, progressive agriculture is to become the rule instead of the exception.

It is not sufficient that an isolated individual should struggle on with his limited stock of knowledge and experience; life is not long enough to develop to its fullest extent any one principle of science or art; each cultivator of the soil needs to know all that the wisdom and experience of others may teach. It should be as much a part of the farmer's programme of living to become an active member of some club, or grange, or gathering, in the interests of agriculture, as to plow and cultivate and plant his broad acres. No cultivator of the soil can afford to shut himself out of the warming, stimulating and beneficial influence of association with his brother farmers and the friction of discussion and debate.

The objects of the club should be the acquisition and dissemination of agricultural knowledge; the promotion of acquaintance and friendship among neighbors; the improvement of its membership in conversation, composition and public speaking; the improvement of farms, farm implements, stock, buildings, and every department of agriculture. Provision should be made for judicious and careful experiments, each to be confided to a certain number of the members, who would subject every portion of the operation to the most careful test of weighing and measuring, and carefully record every step. At the conclusion of each experiment a full report should be made to the club, by each person engaged in making the same, embracing all particulars and details, of soil, season, weather, etc. Every farmer should not only join a club, but take his enthusiasm into it.

A club can not be maintained without effort. Any one can start a club as well as any two or twelve, but where are the men to maintain it? Plenty of people are willing to be part of a political ring because it pays. Let the farmers of every neighborhood form an agricultural ring, a club that shall look after their own interests, mental, physical and pecuniary. It will pay as well as politics.

Farmers' clubs will produce more good farmers, and stimulate the production of more grain and provisions than national associations or societies. The great flood-tide of agricultural prosperity now permeating and revivifying every channel of industry throughout the country is the result, not of buncombe speeches, eloquent periods or magnificent resolves, but rather of long-continued, persistent, energetic labor on the part of individual farmers, each working out the problems in an humble and unostentatious way. There is room for little faith in any grand schemes for the advancement of agriculture which do not include the attendance and co-operation of the practical working farmers themselves. Men of ability should be employed to deliver courses of lectures. Fifteen to twenty dollars per week, with expenses, will secure good talent.

Clubs for the transaction of some special business, for mutual insurance, social intercourse, secret work of the orders, etc., are kept alive without the aid of popular sentiment, and a consideration of such societies or organizations falls without the scope of this volume.

Farrier, a horse-shoer; also, one versed in the care and treatment of horses; a veterinary surgeon.

Farrow, not producing young in a given season or year; said only of cows. If a cow has had a calf,

but fails in a subsequent year, she is said to be "farrow," or "go farrow."

Farrowing, the parturition or the littering of the sow. She is said to farrow when she brings forth her pigs; and the number of her young ones produced at one farrowing are called a farrow or litter.

Fat, an unctuous, solid substance, or, more properly, a concrete oil, deposited in little membranous cells in various parts of animal bodies. It is generally white or yellowish, with little taste or smell, and varies in consistency according to the relative quantities of stearine and oleine which it contains. When examined under the microscope the cells are found to lie amidst the filaments of the areolar or cellular tissue, the most extensively diffused of all the tissues of the human body; and are found everywhere in the network of tissues composing the living body. Fat, however, is not a component part of the living organs, for the nerves and blood-vessels do not run through its cells. Therefore the fat itself is not susceptible to feeling, and if a pin could be passed into it without piercing the skin there would be no sensation to make the owner of it conscious of what had been done. Matter contained in the fat-cells has various names. When melted down it is called tallow. In another form it is known as lard. When it is the refuse of fat it is called grease, or kitchen stuff. When hard, we call it suet; when soft and separated from milk, it is called butter; when liquid, oil. Fat is composed of 11 parts of carbon, hydrogen 10 parts, and oxygen 1 part; and its use in the animal system is to give those beautiful gradations of contour possessed by the properly developed human figure, to keep in the heat, of which it is a bad conductor, to serve as a store of spare fuel for an emergency, for which reason it contains both carbon and hydrogen, which are the elements we employ for lighting and heating, and to secure the proper nourishment of the animal body. Fat cells surround every tissue, and where there is a deficiency of fat there also will be found a deficiency of other tissues. In a case of consumption, where the body wastes rapidly away, the daily administration of oil—usually cod-liver oil—is found to be very beneficial. As the fat is deposited the tendency to develop those tissues on which bodily strength depends is increased. An excessive accumulation of fat in certain parts of the body, generally induced by indolence and by the more extensive use of fat-producing food, interferes with the vital energies, and unfits the body for a proper degree of exertion.

Of the varieties of fat in quadrupeds, suet is the finest. The next in hardness is the fat of bones, and the next to that the fat in the muscles. The fat of the hog is the least solid. The fat of birds has little solidity, and in many species it is always fluid; this is usually distinguished by the term grease, as goose grease. The fat of fish is always in oil or fluid, except spermaceti.

Different kinds of fat liquefy at different temperatures; lard melts at 97°; tallow requires a heat somewhat greater; but the fat taken from suet by boiling requires 127° to liquefy it. The great inflammability and the bright white light it gives while burning renders the most solid kind, tallow, eminently serviceable for producing artificial light. Tallow itself will not inflame; it is only the vapor that inflames, and it does not boil until it is heated to 400°.

Marrow differs from other fat only in the fineness of the membranous texture in which it is contained, the fluidity of the oil and its situation within the bones. Fat, as well as all fixed oils, is difficult of digestion, particularly by weak stomachs, and therefore it is not proper for dyspeptics. It is apt to cause bile in the stomach. But fat is rendered still less digestible when subject to high temperatures in some culinary processes, as in frying. All meats and fish that contain much oil or fat are apt "to lie heavy at the stomach," as it is called, or, in other words, to be difficult of digestion; and then they are apt to occasion heartburn and other injurious effects. It is thought, however, that bacon and salt pork are more easily digested than fresh fat.

Fatness OF THE HUMAN BODY, to prevent: Abstain from starchy foods and work hard at manual labor. To obtain healthy fat in the body, live according to all the laws of health as noted under the head of Hygiene in this volume; to become fat more rapidly, but unhealthfully, remain inactive, drink beer or other liquors and diet on the grain foods.

Fattening OF FARM ANIMALS: see respective animals and Feeding. The general principle for producing healthy fat is, give the animal all the food he will eat up clean and no more. Of course it is understood that the food should consist of the proper article, clean, of sufficient variety, with the various natural condiments, as twigs, roots, etc., such as they have an avidity for when at large in their favorite clime; also, clean pasturage, freedom from disease and from molestation. For producing unhealthy fat (which can be done more rapidly), keep in close confinement and feed almost exclusively on starchy food, with such stimulants and appetizers as will make the animal overeat, contract a diseased liver and caul, etc. Some degree of darkness and filth will aid the process with most animals, but rather hinder it with some. Most diseases, of course, emaciate. In fattening swine for other purposes than food for man, it is probably more profitable to adopt the disease-producing method. See Feeding.

Faucets of wood are certainly more free from poisonous oxides than one of metal of any kind. To prevent wooden faucets from cracking, boil them in paraffine as long as bubbles of air escape from them; allow the paraffine to cool about 120°, when the faucets are taken out and rubbed clean with a dry piece of coarse cloth. In boiling them they should be put in when the paraffine is just melting, and the temperature kept at about 212°.

Feather, of a plow, is the thin cutting part of the share; also, the ridges of hair on the legs of a dog.

Feathers. To obtain feathers in their best condition they should be plucked from the fowls dry. A few days' airing then puts them in proper condition for use. Feathers which have been picked from scalded fowls require much care and work to restore the original buoyancy of the down. Strip the plumage from the quills of the larger feathers, and mix them with the small ones, putting the whole loosely into paper bags, which should be hung up in the kitchen or some other warm place for a few days, to dry and cure; then bake the bags three or four times, half an hour each time, in a lukewarm oven, drying them for two days between each baking. The work is then done. Kneading the bags aids and hastens the process.

Feather-beds that have become soiled and heavy, may be made clean and light by being treated in the following manner: Rub them well with a stiff brush, dipped in soft soap-suds. When clean lay them on a shed roof, or any place where they will be clean, and the rain will fall on them. When thoroughly soaked, let them dry in a hot sun for six or seven days, shaking them up well and turning them over each day. They should be covered over with a thick cloth during the night. If exposed to the night air, they will become damp and mildewed. This way of washing the bed-tick and feathers makes them very light, and is much easier than the old-fashioned way of emptying the beds and washing the feathers separately, while it answers quite as well. Care must be taken to dry the bed perfectly before sleeping on it.

Another method to cleanse goose feathers is to expose them to the sunshine or in a stove until perfectly dry, then beat to remove dust. When carelessly collected and dirty they may be cleansed with lime water; or, still better, with a weak solution of carbonate of soda, or with water containing a thin solution of chloride of lime; after which they are rinsed in clean water and dried as before.

To clean and curl feathers use white soap (or, better, curd) cut into small pieces; pour on boiling water, and dissolve. When cool, draw the feathers through the solution. Repeat this several times, press the feathers gently in the hand, or carefully pass through the fingers two or three times, to squeeze out the dirt. Use another lather in the same manner. Remove the feathers and rinse well in cold water; beat against the hand or a clean cloth, and wave around in the air a short distance from the fire. Before quite dry curl, with a penknife, each fiber separately, by drawing carefully over the blade's edge. Or, after heating, stroke them with the back of a knife. This can be used for all feathers but black; they may be cleaned with water, adding to it some gall, and following the above directions in all respects. Feathers of brighter colors cannot be cleaned, but must be redipped, as they usually fade by exposure to the sun.

To dye feathers, first steep them a few hours in warm water; then, to dye blue, boil them in a solution of extract of indigo, simmering over the fire a few minutes. To dye green, dip them in a solution of equal quantities of verdigris and verditer. To dye lilac, dip in a hot solution of cudbear. To dye red, boil together for half an hour Brazil-wood, a little vermillion, alum and vinegar; then dip the feathers. To dye yellow, use turmeric in a similar manner. For scarlet, take cochineal, cream of tartar and muriate of tin.

Feed, relative value of the different articles for domestic animals, equivalent to 100 pounds of hay:

	POUNDS.		POUNDS.
Clover	95	Peas	44
Rye Straw	355	Beans	46
Oat Straw	220	Rye	49
Potatoes	195	Barley	51
Carrots	280	Corn	56
Beets	346	Oats	59
Ruta-bagas	262	Buckwheat	64
Wheat	43	Oil Cake	64

The hay consumed by different animals does not vary greatly from three pounds daily for each hundred pounds weight of the animals. The following ratios have been determined, allowing the articles, of course, to be of good quality:

	POUNDS.		POUNDS.
Working Horses	3.08	Steers	2.84
Working Oxen	2.40	Dry Cows	2.42
Milk Cows	2.25	Pigs	about 3.00
Young Growing Cattle	3.08	Sheep	3.00

Feed Cutter, a machine for cutting straw, hay, cornstalks, etc., for stock feed. While a large one, to be run by horse or steam power, is justifiable only on large farms, a hand-power cutter, such as represented by the annexed engravings, should be in the possession of every farmer. A great deal of fodder, which would be otherwise wasted, can be saved by the use of the cutter.

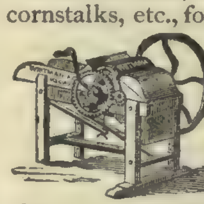


FIG. 1.—*St. Louis Feed Cutter.*

A feed cutter that would really cut hay, straw and corn-stalks equally well, to lengths suitable,

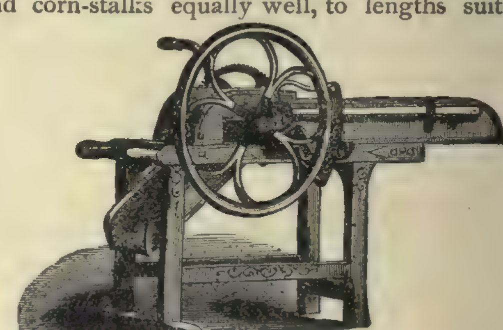


FIG. 2.—*Miller's Straw and Feed Cutter.*

and that would run easy, and stay in repair, has long been desired by the best of farmers, and many others who have stock or horses to feed. It is claimed

for the cutter shown by Fig. 1 that it does this work satisfactorily. Fig. 2 represents a machine made on the same principles, and used for the same purposes.

The machine shown by Fig. 3 is self-feeding, the fodder being taken by two notched iron rollers and held firmly until cut by the knives, which are fastened to a strong knife-wheel, and are adjusted by set screws, so that they will *always* cut clean, clear, and not drag straw through uncut.

Feeding Stock: see Stock.

Feed Mills, machines for crushing and grinding of grain to be fed to stock. That the crushing and grinding of grain insures more perfect mastication, and may be performed by machinery at much less expense than by the animals consuming it, no intelligent farmer will deny. Then the final step toward the easy and profitable assimilation of food is the steaming or cooking process, which we very fully treat under the head, "Feed, steaming and cooking," a little further on. As in all departments of agriculture where machinery is needed, inventors have not overlooked this branch, for there may be found in the market numerous makes of feed mills.

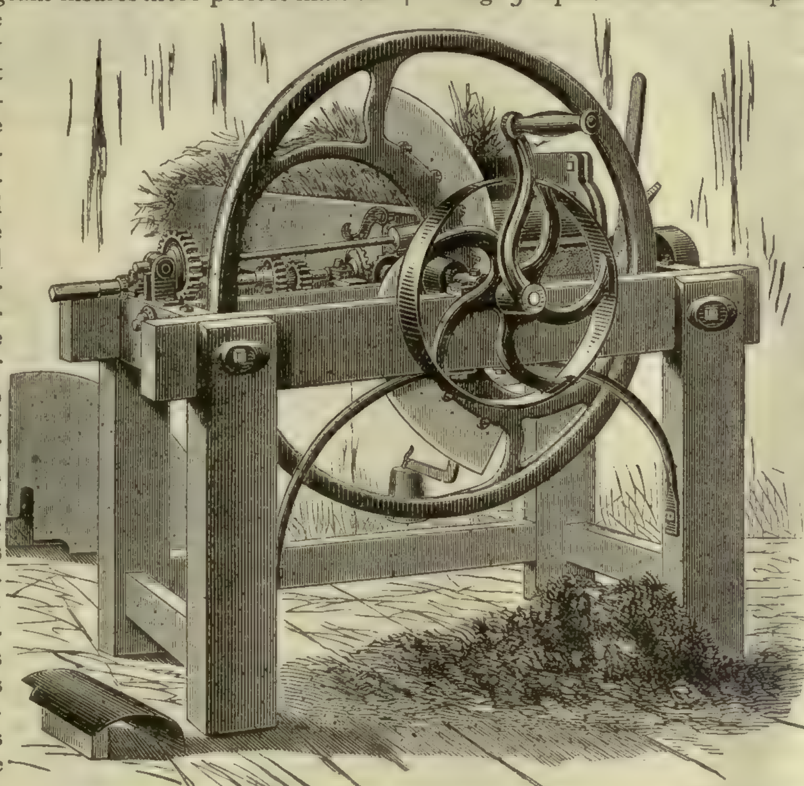


FIG. 3.—*The Belle City Feed Cutter.*

Some of these grind the ear, cob and all, and thereby save shelling.

Fig. 1 represents a corn and cob mill for grinding feed for stock. It can be geared either from above or below; will not choke, grinds fast, feeds regularly, and grinds fine.

Fig. 2 is the representation of another corn mill or crusher, placed on a platform, with legs. It is light running, has a large strong hopper, and will grind with the husk on as well as without; and the farmer who is able to own a mill as represented by Figs. 1 and 2, and will use it to advantage, will soon more than realize the amount expended, in the continued improvement of his farm-stock.

J. A. Field & Co., St Louis, Mo., manufacture a grinder and crusher, Figs. 3 and 4. It is made of "cast cast-steel." This mill will grind coarse or fine, for stock or for the table, and its capacity is extraordinay for its size. When the grinding plates are worn out, they are easily replaced with new ones. Iron grinders are also furnished with this mill. For grinding corn with the husks on, the breaker arms are so constructed as to form a cutter, which, with the blades on the mill, cut the husk. The tubes, Fig. 4, aid in forcing down the husk through the mill.

Fig. 5 represents a mill adapted to the grinding of corn and feed for stock and family purposes. It is simple in construction, and a boy can operate it, keep it in good order, and easily make good meal with it. It will make good meal, grind wheat, middlings or minerals, and all kinds of feed as fine as flour, or as coarse as may be desired.

One of the best standard farm grist-mills is made by Livingston & Co., Pittsburg, Pa., Fig. 6. It makes good meal for family use, has an improved automatic feed check, is reversible and self-sharpening. The grinding plates are made of chilled iron, will last for years, and when worn out can be replaced at a small cost. It can be run by hand or belt, will grind from six to ten bushels of feed per hour, and delivers the meal direct into the bag when desired.

On the two following pages we give the illustrations referred to above.

Few persons realize how palatable and rich is the taste of bread or mush made from fresh-ground corn meal, or even wheat and rye meal, as compared with the dusty, musty stuff they generally use. Grinding from day to day only what you use, you can commence with new corn in August or September, and have an article of food as different

from, and as superior to, common breadstuff as cultivated apples are compared with crab-apples. With the ordinary process of wholesale milling, new corn or other grain cannot be used, for the meal from it would keep sound and sweet but a few days. A hand mill, even if but a large coffee mill, is therefore the means of a great luxury in a household.

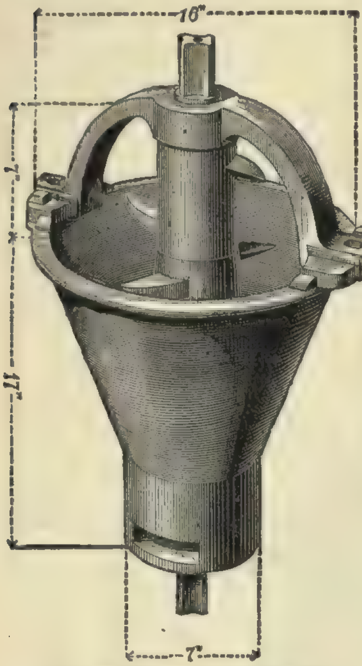


FIG. 1.—*Economic Corn-Crusher.*

Feed Rack. The farmer, with stock, should always provide himself with a feed rack. It may be of poles, rails or stakes held in place by laying a pole in the rack, or spiking each stake to the horizontal pole. A good rack may be provided by placing stakes between fence-boards, and nailing a two-inch strip between them.

Feed, STEAMING AND COOKING. Cooking food for live stock is no new experiment. It has been practiced in all countries for years, and the universal testimony is, it pays. It is estimated by all the best stock men of this country, after years of experience and observation, that at least one-third the feed is saved by steaming. Grain, hay, vegetables, corn-stalks, and, in fact, all substances used as food for stock are greatly improved in nutritive value by steaming.

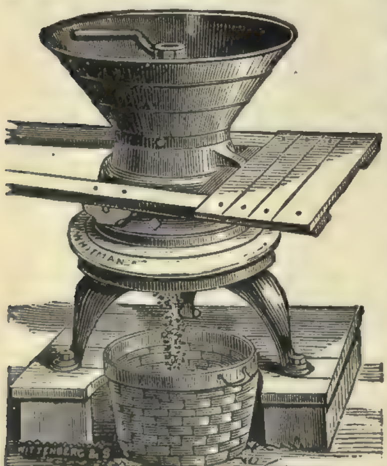


FIG. 2.—*Young American Corn and Cob Mill.*

The additional cost of cooking food for large lots of stock is only about one-seventh of the amount saved thereby. With the proper arrangements for performing as much as possible of the work by power, one man can cook for and feed 100 head of cattle.

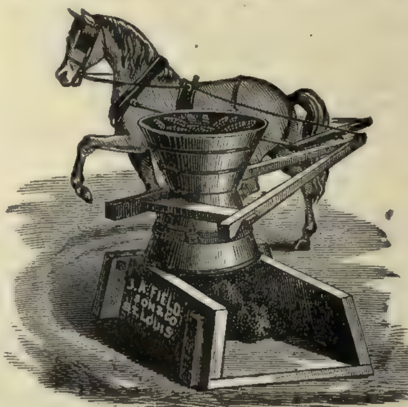


FIG. 3.—*Cast-Steel Grinder.*

The following advantages for cooking food have been deduced from years of trial and innumerable experiments:

It has a remarkable effect upon musty hay, straw and corn-stalks, rendering them sweet and palatable. Hay which animals will not touch, unless starved to it, will be greedily eaten after cooking.

This effect of steam in renewing the flavor of damaged food, suggested the mixing of different qualities to produce a proper balance—good hay with straw, sliced carrots, turnips and beets, with poor hay, etc., blending their qualities and sugar-coating the less palatable and coarser forage, so that a larger proportion of it may be eaten. Animals are much less liable to become clogged when the feed is thus mixed, than when the rich and palatable is fed separately, and thrive much better with a frequent change of food or mixing of different kinds.

FIG. 4.—*Grinding Corn with Husk on.*

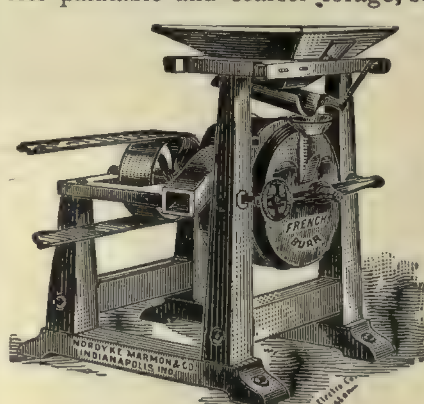


FIG. 5.—*Corn and Feed Mill.*

The purgative tendency of fruits and roots is

greatly diminished by cooking, and a larger quantity may be fed with impunity.

Peas and beans, rich in nitrogen, as well as pea and bean straw, usually wasted, are readily eaten by stock, when steamed. Bean straw, dry and unpalatable when uncooked, in steaming becomes soft and pulpy, and emits an agreeable odor. It is rich in albuminous matter, making it especially valuable for milk-cows. Bran undergoes a great improvement in the flavor in steaming.

This system is admirably adapted to the raising of young stock, making their food the year round as soft and easily masticated as the tender herbage of spring, and thus obviating all the troubles resulting from teething. With it, colts and calves are uniformly larger and stronger than those fed in the ordinary way. Heifers become cows at two years old, saving a year's time and care.

The manure made from cooked food decomposes more rapidly, and is therefore more valuable than when used in a fresh state.

Cooked food will cure incipient heaves and troublesome coughs in horses more effectually than any other remedy.

It enables fattening stock to eat their food with less labor, and saves one-third of the time required to fatten them.

It gives work-horses time to eat all that is necessary in the intervals of labor.

The season for making cheese and for butter dairies, dependent upon green pasturage, by cooked food might easily be extended from seven to ten months.

Cooking is a complete corrective of the unhealthfulness of mildew, rot, smut and other diseases of wheat, grass, corn, etc.

It enables the feeder to use everything he raises as food for stock, without lessening, but rather improving its value as a good manure. Steaming is found to be the most practical and economical way of cooking. Any arrangement by which steam may be generated under the slightest pressure required to make it permeate the mass to be cooked and conducted to the vessel in which the steaming is to be done, will answer the purpose.

We present views on the two following pages of four of the best feed-steamers now made.

The various operations it will facilitate makes the steamer especially desirable for farmers. For cooking feed it is superior to a kettle or cauldron, as it has much greater capacity, performs the work more quickly, never burns the feed, and requires but little fuel. Hay and corn-stalks should be wet, and most other kinds of feed thoroughly mixed with water, before steaming.

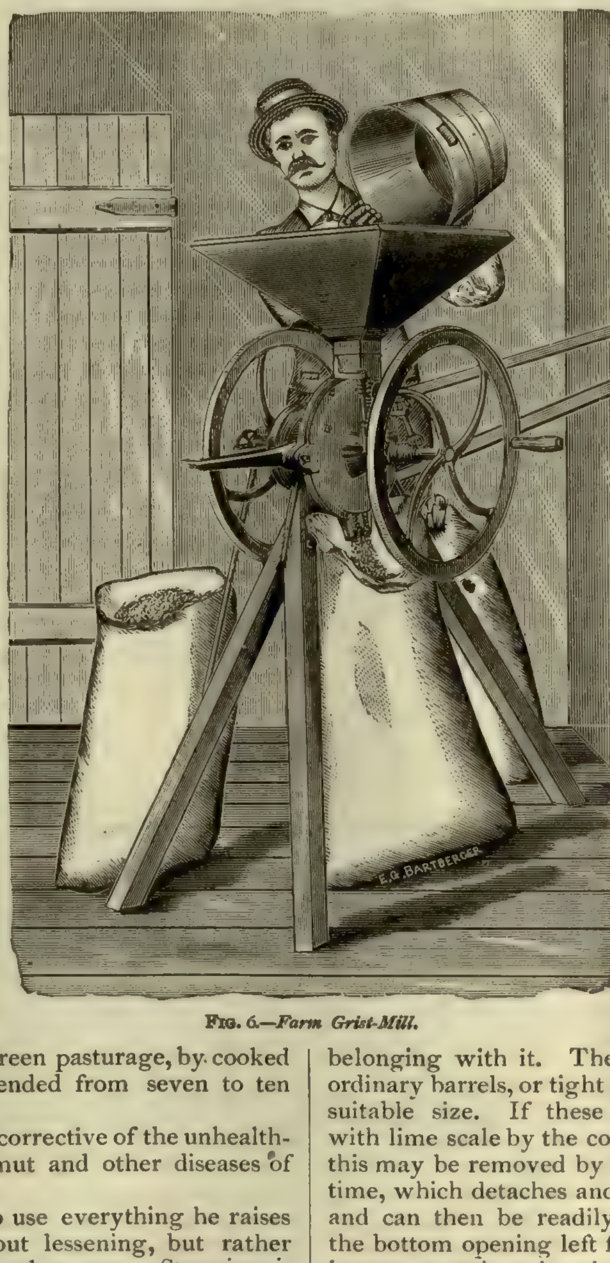


FIG. 6.—*Farm Grist-Mill.*

By protecting the cooking apparatus from frost or cold, using a tight heating vessel with cover, and not over-cooking, a waste of steam will be avoided, thus saving a large percentage of time and fuel.

The Anderson steamer, Fig. 1, is well adapted for cooking food for all kinds of stock; for heating milk or water in cheese factories or milk dairies; for heating water or rendering tallow for butchers' use; steaming cheese-box material; or for any purpose requiring a light, portable and economical boiler. The cut shows the steamer as set up and ready for use, and shows the form of float-box, with steam whistle and attachment belonging with it. The food may be cooked in ordinary barrels, or tight water vats or boxes of any suitable size. If these steamers become coated with lime scale by the continued use of hard water, this may be removed by using soft rain-water for a time, which detaches and dissolves the lime scale, and can then be readily rinsed or washed out of the bottom opening left for that purpose. This is important to bear in mind, not only for the preservation of the boiler, but as a saving of fuel.

Dalley's Steamer and Evaporator is portable, and is very simple in construction. It cooks stock feed, heats water for scalding hogs, evaporates cane juice, etc.

It consists of a cast-iron furnace, arranged to burn coal or wood, or any other kind of fuel. It is 6 feet

FIG. 1.—*The Anderson Steamer.*

long, 26 inches wide, and open flue, which gives a 12-foot heating surface. The steam-chest is 6 feet and 4 inches long, 28 inches wide at the face, 14 inches deep, and holds 10 bushels, but it can be enlarged to 30 bushels. This steamer is made of wood encased with galvanized iron; has a perforated bottom, which is placed inside the steam-chest, leaving space underneath for about six pails of water. Cornstalks, hay, straw, corn in the ear, shelled corn, or meals, or any class of food is placed in the chest above the perforated bottom, the cover closed and the fire started. The steam rises uniformly through the perforations in the false bottom and cooks the mass above it. The steam-chest can easily be removed, as it sits on the furnace as a boiler sits on a cook-stove, and in the place of the steam-chest, a pan for evaporating sugar water or sorghum can be used.

Feeding Animals. The dietetic treatment of animals, as to the kinds, the quantity, the frequency, the preparation, and the condition of their food, and the circumstances under which it is given, should receive the zealous attention of farmers, and especially those engaged in stock-raising to any extent. The sorts of food proper for man are noticed in our articles on Food and Hygiene· the dietetic treatment of the several classes of farm animals is noticed, in our articles on Cattle, Ox, Horse, Sheep, Hog, etc. Though the topics proper to the present article might be discussed at great length, and pursued through multitudes of ramifications, yet, to prevent wasteful repetition, they must be restricted within such limits as shall not invade those of any of the articles named.

THE GENERAL PRINCIPLES OF FEEDING. A prevailing law in all proper feeding of animals, but one which in several instances is grossly violated in the dietetic treatment of live stock of multitudes of farms, is the use of as large a proportion of nitrogenous principles as shall maintain the normal amount of nitrogen in the assimilations and secretions of the animal system. Nitrogen is emphatically the characteristic element of both animal organism and animal aliment, not only in the case of carnivorous animals, but in the case also of herbivorous, and especially of the granivorous; and whenever it is not present in due quantity in the food of any animal, they cease to acquire substance, begin to lose strength, and eventually lose constitutional vigor and healthiness, and sink into emaciation and death. The increase of the mass of the body, the development of its organs, and the supply of waste are all dependent on the blood, that is, on the ingredients of the blood; and those substances only can properly be called nutritious, or considered food, which are capable of conversion into blood. To determine, therefore, what substances are capable of affording nourishment, it is only necessary to ascertain the composition of the food, and to compare it with the ingredients of the blood. But the chief ingredients of the blood contain nearly 17 per cent. of nitrogen; and no part of any organ of the body contains less; and animals can not be fed on matters destitute of nitrogenized constituents. But vegetable fibrine, vegetable albumen, and caseine are

FIG. 2.—*New Triumph Steamer.*

the true nitrogenized constituents of the food of granivorous animals. These three principles contain the same elements in the same proportion by weight, and are identical in composition with animal fibrine and animal albumen, the nitrogenized and most im-

portant constituents of the blood. Vegetable fibrine and vegetable albumen, in fact, hardly differ from animal fibrine and animal albumen even in form; and the former are simply the latter in a state exterior to the animal system, and of an elaboration independently of it, and of thorough preparedness, under the benign arrangements of the Creator, to be taken into it for its appropriation and support. When, therefore, the nitrogenous principles are wanting in the stated food of animals, the very flesh and blood must die out for want of aliment; and when these principles are in deficient quantity, the flesh and blood will fail exactly in the proportion of the deficiency.

An important and familiar illustration of this rule, quite sufficient to show the necessity of attention to it in all the departments of feeding live-stock, is afforded by the alimenting of sheep or cattle upon turnips. The proportion of the nitrogenous principles in turnips is enough to prevent any perceptible diminution of strength, and even enough to promote a certain degree of growth and healthiness, but not near enough to produce a maximum or even a normal development of bulk and energy in the animal system; so that sheep fed on turnips can not duly thrive, and will not favorably fatten unless they receive also a portion of the cereal grasses.

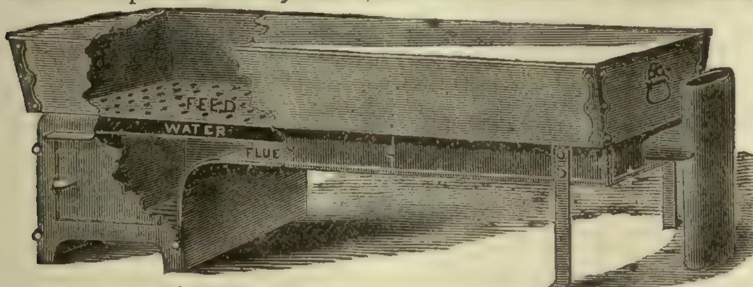


FIG. 3.—*Dalleys' Stock Food Steamer and Evaporator.*

Another pervading law in all proper feeding of animals, and one which has been grievously overlooked in almost all experiments for ascertaining the relative effects upon cattle of different kinds of food, is maintaining such a warmth by shelter during the cold season of the year as shall prevent a wasteful expenditure of animal heat by radiation into the atmosphere, and therefore a wasteful expenditure of aliment in producing volumes of heat in lieu of those lost by radiation. The living system of animals constantly accumulate large quantities of carbon and hydrogen from their food, the mutual action of oxygen and these elements of food is supposed to be the chemical accompaniment of their vital heat; and the dissipation of the carbon and part of the hydrogen from the blood by oxygenizement or the formation and expulsion of carbonic acid and aqueous vapor, are supposed to be the chemical accompaniment of respiration; so that the amount of nourishment required by the animal body, or at least of the carbonaceous and hydrogenous elements of nutrition, is theoretically assumed and has been practically tested, to be proportionate to the expenditure of heat generated within the system, whether that expenditure have the form of accelerated breathing and increased perspiration occasioned by the relative low temperature of the surrounding air. The clothes of the man and the shelter of the brutes, therefore, serve in winter as an equivalent for a certain amount of food. The more warmly men are clothed and brutes are sheltered, within certain limits, the less food will they consume; and the less protected they are from the colds of the winter, also within certain limits, the more food do they require. "If we were to go naked like certain savage tribes, or if in hunting or fishing we were exposed to the same degree of cold as the Samoyedes, we should be able with ease to consume ten pounds of flesh, and perhaps a dozen tallow candles into the bargain daily," as warmly clad travelers have related of these people. We should then be able to take the same quantity of brandy or train-oil without bad effects, because the carbon and the hydrogen of these substances would only suffice to keep up the equilibrium between the external temperature and that of our bodies.

As the fattening of animals has become a matter of dollars and cents to the farmer, and as economy is at the base of all success, it becomes important that he should make every pound of fat at the least possible cost. Much of the food the animal eats is consumed in warming the atmosphere which surrounds it, which would not be needed if the temperature of the atmosphere was 70° or 80°. Now, the question is, Can we not warm the atmosphere around our stock with cheaper material than corn? In 1859 corn was burned in Illinois instead of coal, to warm dwellings; but an equal vandalism is committed in feeding it to stock exposed to inclement weather. Of course all stock should be protected from severe winter winds and storms, yet this is not enough, for even a quiet atmosphere, if very cold, requires a vast amount of food to keep it warm around the animal.

The fact is, farmers do not stop to count the cost of raising corn, or what might be saved in money by intelligent feeding. They feed grain without calculation as to profit. If they think they have made money on the season's operation it is all right; otherwise "the season was bad," "the crops poor," or something was wrong. The result is charged to Providence, when it is only the indifference or ignorance of the farmer himself.

Our suggestion then, is, that animals be kept in warm, well-ventilated houses of such temperature as would be comfortable for human beings to live in. These buildings should be heated with coal or wood, to warm the atmosphere around the stock and prevent it from exhausting the heat from their bodies. All the heat extracted from an animal by a cold atmosphere costs money, and is a useless waste of food, for the heat can be supplied with fuel at a much less cost. A sheep or hog will consume about as much air as a man, hence would require about the same

facilities for ventilation, while a cow will consume at least as much.

If the following rules are observed by the farmer in feeding his stock, he will find they will thrive and fatten much quicker, and with less food, than did he ignore all the essential principles:

1. Very young animals require large quantities of phosphate of lime for bone formation. This is found more largely in milk than in any other food.

2. Growing animals require not only bone formation, but the production of muscle and a certain proportion of fat. The grasses, roots and grains supply these.

3. Horses, cattle and sheep should be given hay always, when fed with roots or grain.

4. Fattening animals should have an abundance of food abounding in vegetable oils or fat, starch and sugar. Corn, probably, contains the several ingredients in the best proportion for fattening purposes. The potato contains a large amount of starch, and the beet has large quantities of sugar, and both may be fed with hay.

5. A mixture of food is always desirable, especially in fattening animals. This will be a perpetual stimulant to the appetite.

6. Such a system of feeding and sheltering should be adopted as will keep the animals in a constantly improving condition. They should not be permitted to rise and fall in condition with the changes of the season.

Feeling, one of the five external senses, by which we obtain the idea of solid, hard, soft, rough, hot, cold, wet, dry and other tangible qualities. It is the most universal of all the senses. We see and hear with small portions of our bodies, but we feel with all. Nature has bestowed that general sensation wherever there are nerves, and they are everywhere where there is life. Were it otherwise, the parts divested of it might be destroyed without our knowledge. It seems that upon this account nature has provided that this sensation should not require a particular organization. The structure of the nervous papillæ is not absolutely necessary to it. The lips of a fresh wound, the periosteum, and the tendons, when uncovered, are extremely sensible without them. These nervous extremities serve only to the perfection of feeling, and to diversify sensation. Like every other sense, feeling is capable of the greatest improvement; thus we see that persons born without arms acquire the nicest feeling in their toes; and in blind people this sense becomes so much developed that persons born blind, and acquiring the faculty of sight in after life, for a long time depend rather on their feeling than their sight, because they receive clearer ideas through the former sense. A person in this condition, who could not remember the difference of things if he only saw them, as soon as he touched them distinguished them perfectly well. Feeling is the most common of all the senses, as it exists in all creatures which have any sense at all; even some plants show a sensibility to touch. Many animals have no sense but that of feeling.

Feet. The care of the feet is so important that a complete volume on the subject has recently been published. We will attempt here to give a condensed statement of the most important considerations. Wash them every night, especially if inclined to sweat. If abnormally given to sweating and coldness, wear cotton socks next to the skin, changing them, in severe cases, several times a day; or mix together 7 ounces carbonate of magnesia, 2 ounces calcined alum, powdered, 7 ounces orris root and ½ drachm powdered cloves, and cover the feet with this in the morning. An offensive smell may be corrected by bathing them in a weak solution of permanganate of potassa, 1 scruple to 8 ounces of water. Cold feet should have a great deal of friction, and it is unfortunate for such a person if he has a sedentary occupation. To cure slight frost-bites rub with a cold flannel or with the hands, avoiding fire heat, or even a warm room. To relieve the itching caused by frost-bites, wash the feet two or three times a day with a solution of 1 ounce hydrochloric acid to 7 ounces rain-water. To remedy blistered feet from long walking, rub them, on going to bed, with spirits mixed with tallow dropped from a lighted candle into the palm of the hand. Ingrowing toe-nails are caused, generally, by trimming around the corners too closely. When the case has become so bad that tender or proud flesh is formed, apply to the part a small quantity of perchloride of iron; this causes some pain, but it will be sure to kill the flesh, which, two or three weeks afterward, can be soaked soft and pared off. To prevent the nails from growing in, scrape the tops of them very thin with a piece of broken glass, and do not trim them close around the corners. To prevent all troubles generally, wear shoes two or three sizes larger than fashion would dictate, with soft uppers and thick soles. Leather is not so healthful for the feet as some vegetable material would be, but it seems the world has not yet thought of making vegetable shoes. See Bunions, Chilblains and Corns.

Feline Animals, carnivorous animals furnished with sharp incisor teeth and retractile claws, as the cat, lion, panther, tiger, etc.

Felloe, or **Felly,** one of the pieces of the rim of a wagon wheel into which the spokes are inserted.

Felling, the cutting down of trees. The common methods of felling are simply to hew with the ax, to cut with the cross-cutting saw, or to alternate or combine the action of these two instruments. But a superior method, in the case, at least, of all large, straight, and valuable trees, is to employ the saw, and to combine with its action the use of the wedge. In order to make the tree fall the way required, enter the cross-cut, say, on that side of the tree it is intended to fall, and cut it about a third part through; then enter the saw on the other side, and when it is cut so far as to admit a wedge, place the wedge exactly opposite to the way you want the tree to fall, and keep driving it closely until the tree is nearly cut through. Be sure the saw meets the opposite cut equally on

both sides; and do not imagine, as some have done, that by making the saw meet sooner through the one side than the other, the tree will fall to the side soonest met or first cut through; on the contrary, the side of the tree longest in being cut is that side to which the tree will naturally fall. Every tree, in being felled, ought, for the sake of the value of the timber, and also for other considerations, to be cut as near as possible to the ground. All young trees and all constitutionally soft trees, in fact, ought to be felled about midwinter, when little or no albumen exists; and all old and constitutionally hard trees may, generally speaking, be economically felled at almost any time of the year. A tree about to be felled ought to be carefully divested of any arm or branch which may be at all likely to occasion damage to it in its fall. Any very large bough should be chopped or nicked one-third through close to the junction with the trunk, by strokes of the ax below; and if then struck with a few downright strokes on the upper side, it will be severed without splitting. A clear place for the fall of the tree should be selected, such as will prevent it from damaging other trees, or from impairing shrubs, fences or other objects by its fall; and the felling process should be so performed as to make the tree descend through this space. Careless woodmen, in consequence of taking insufficient precaution to guide the fall or of hewing into the stem without due reference to the proper point of upsetting the equilibrium, often perpetrate very serious and costly damage. A common precaution in the case of any considerable tree in a somewhat crowded situation, is to attach ropes to its upper parts by means of climbing-boys or a ladder, and to have the ropes pulled by one or more assistants in the direction in which the tree is intended to fall.

The stump or stool of a tree is that part which remains in the ground after felling; and this, in some instances, dies away, in others makes shoots which can be coaxed up into new trees; and in others is grubbed up or otherwise artificially destroyed, to make way for the passage of the plow. The stools of some trees, such as those of many of the pine tribe, never send out shoots; and the shoots of others, such as those of oak and ash trees, readily send out each from ten to twenty shoots.

Felon (fel′on), or **Whitlow,** a very painful inflammation of the fingers or toes; usually of the last joint, commencing near the bone, and pressing out the flesh with more or less rupture. The following remedies are recommended: A small piece of calf's rennet soaked in milk, occasionally renewed; kerosene, thoroughly applied; salt roasted within a folded cabbage-leaf and pulverized; soap salve, or lye; poke-root roasted and put on hot; blister with cantharides for six hours, and then extract the core with a needle or lancet; poultice with a mixture of soft soap and yolk of egg in equal quantities, with a little salt and turpentine, and so on world without end. Perhaps the virtue of all these consist simply in producing the most comfortable temperature, which can be as well done with water. Anodyne ointments will mitigate the pain.

Felt, a cloth or stuff made of wool, or wool and fur, fulled or wrought into a compact substance by rolling and pressure, with lees or size. Hats, packing, lining, etc., are sometimes made of this kind of stuff.

Fence, the defensive work of an enclosure, or a protection of any kind around a garden, field, forest or any other defined and separated piece of land. Fencing is a cause of great cost and annoyance to the farmer. Besides the first cost they need yearly repairs. How to fence, what is the best and cheapest material, is always a vital question with the agriculturist. Farms should be encumbered with fence as little as possible, because it occupies valuable land that might be otherwise productive; they promote a selvage of weeds along the fields; they are an obstruction to plowing and other work requiring the turning about of teams; they bother about driving across the farm; they require the construction of gates or bars, both of which in the opening and shutting consume a great deal of time, besides constantly getting out of repair. A half mile of fence is a half acre lost for cultivating purposes. A good, lawful fence around the farm is, of course, indispensable. Pastures and barnyards must be fenced, though there has of late years sprung up an advocacy of the railing system of feeding stock, which, if fully adopted on a farm, would do away with the necessity of fences elsewhere than around the buildings for yards. In many sections of the Western States, especially west of the Missouri river, fencing is in great part superseded by tethering, herding and corraling; but as the country becomes older and more densely settled, farmers wish to pasture one part of their farm while cropping another; hence general fencing is adopted at last.

There are two general kinds of fences—those made of dead material, like wood, stone and wire, and live fences, or hedges.

The primitive fence in this country is the log and brush fence, which is constructed on timbered land by cutting down trees in line with the proposed barrier, forming a windrow, and lopping the limbs in such a manner as to make the fence complete against stock. Sometimes, where it is desired to use the bodies of the trees, brush only is used; then branches or undergrowth can be utilized.

In all rocky districts, stone fences have been used, and, besides being durable, they provide a profitable way to dispose of the obstructions upon the land.

Stump fences came into use in all timbered States when farmers began to pull the stumps by machines. They are an effectual barrier, and dispose of the stumps, but are uncouth, and occupy too much land, harboring too many weeds.

Rail Fences. "Snake" and straight, or post and rail, are the most common in all timbered countries. Of this kind the staked and ridered is the best. To

make this kind of fence, place foundation stones, or blocks, to keep the lower rail off the ground, and then be sure that each successive rail, at the bearing, lies solidly upon, and directly over, the one below, making a secure bearing by cutting a slight notch in the top of the rail, where the next rail above is to be laid on. The rails are laid at different angles; some deflecting six feet, some seven, and some eight feet from a right line. The more they deflect, or in other words, the "crookeder" they are laid, the firmer the fence will be, but more space will be taken up and more rails required.

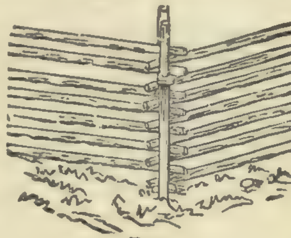


FIG. 1.

The deflection for a twelve-foot rail is usually six feet; for fourteen-foot and for a rail a rod long, eight feet. A foot is generally allowed at each end for the lap.

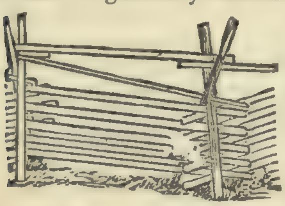


FIG. 2.

The rails of this kind of a fence are cut different lengths in different localities, even in the same neighborhood, farmers being governed by the timber they have, and the kind of ground upon which the fence is to be laid. Some cut them 12 feet, some 14 feet and others even 16½ feet or one rod in length. The ordinary lengths are 12 and 14 feet rails, and may be made of any kind of oak, black walnut, black and white oak, elm and hickory. Some fences are built 5 rails high, some 6, and some 7, the rider making an additional rail high.

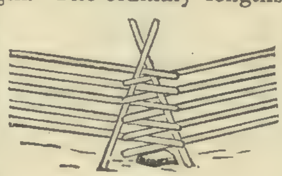


FIG. 3.

A rail fence 40 rods long, 8 rails high, requires 800 rails, the rails being reckoned at 10½ feet in length and 4 inches square, making the timber in that amount of fence equal to 10,700 feet of lumber. The number of rails, stakes and riders required to build a certain amount of fence has hitherto been pretty much guess-work; and often the farmer, before he can finish his fence, has to quit it, and go and split more rails, or gear up and haul a few more loads. The number of rails can be exactly calculated by constructing, either in fact or theoretically on paper, two such panels as are desired, and dividing the total distance, in feet, by the number of feet these panels occupy, and multiplying the quotient by the number of rails in the two panels. The following table enables one to tell within a few rails how many will be required to build a given amount of fence.

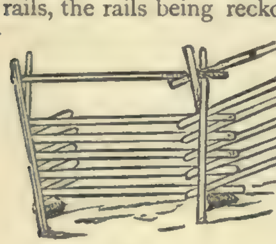


FIG. 4.

Table showing the number of rails, stakes and riders required for each ten rods of fence:

Length of rail.	Deflection from right line.	Length of panel.	Number of panels.	Number of rails for each 10 rods.			Number of stakes.	Number of riders (single).
Feet.	Feet.	Feet.	Feet.	5 rails high.	6 rails high.	7 rails high.		
12	6	8	20⅝	103	123	144	42	21
14	7	10	16½	83	99	116	34	17
16½	8	12	13¾	69	84	95	28	14

NOTE.—Should the number of rods exceed 10, the requisite number of rails, stakes and riders can be found by multiplying. For instance, should the length of fence be 100 rods, multiply the above number by 10; should it be 75 rods, multiply the above number by 7½; for 77 rods, multiply by 7 7-10, and so forth.

FIG. 5.

We illustrate by Fig. 1 an excellent mode of staking a rail fence. Staking the corners by projecting rails gives an unsightly appearance, and is particularly objectionable for plowing, as it considerably increases the waste of ground. More symmetry and neatness besides the saving of the ground is secured in this way. After the foundation has been put down the stakes should be driven. Holes to the depth of 20 inches should be made with a crowbar before beginning to drive the stakes.

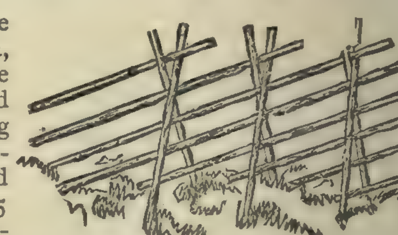


FIG. 6.

We illustrate by Figs. 2, 3, 4, 5, 6 and 7 the most approved ways of building zigzag, or stake-and-ridered fences. Fig. 5 represents an excellent plan for bracing a rail fence, whether it be staked and ridered, or staked and capped, locked and ridered, staked and wired, or wired and pinned, all of which kinds of fences are liable to be blown down by heavy winds. Place upon the inside leeward corner a piece of rail, one end resting upon the ground, the other placed underneath the third rail from the top. Fig. 6 illustrates the mode of building a rail fence upon a hillside.

FIG. 7.

POST AND RAIL FENCES. These are perhaps more economical in the long run than the zigzag fence. They cost more but waste less land and generally last longer. The rails for these fences are cut of different lengths. A foot at each end should be allowed for the lap. They are from five to eight rails high and the posts are set in the ground from two to three feet. We illustrate by Figs. 8 and 9 two of the best plans of building these fences.

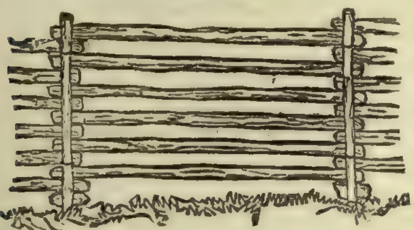


FIG 8.

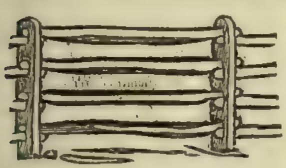


FIG. 9.

When well built they will be found to be both durable and neat: besides, they do not consume anything like the room of the zigzag fence.

Table showing the number of rails and posts required for each ten rods of post and rail fence.

Length of rail—feet.	Length of panel—feet.	Number of panels.	Number of posts.	Number of rails for each 10 rods.			
				5 rails high.	6 rails high.	7 rails high.	8 rails high.
10	8	20⅝	21	103	123	144	165
12	10	16½	17	83	99	116	133
14	12	13¾	14	69	84	95	109
16½	14½	11⅓	12	57	69	81	93

NOTE.—Should the length exceed 10 rods, multiply as for the preceding table.

BOARD FENCES. These are the most common fences used upon the prairies of the West. Where timber is plenty and saw mills abound, or where lumber is cheap, post and board fences are preferable to any other. The boards are usually sawed 16 feet fong and the posts set eight feet apart. They are generally made five boards high, the uppermost space being 10 inches wide, the second eight, the third six, and the fourth and fifth five inches wide. They may vary in width, however, as cost, taste, or use may dictate. The first, third and fifth boards are joined on one post and the second and fourth joined on the next. We show by Figs. 10 and 11 two excellent styles of a post and board fence.

FIG. 10.

The best timber for posts in the order of its durability is red cedar, catalpa, Osage orange, honey locust, black walnut, white oak and chestnut. The posts should be placed from two and a half to three feet below the surface, in the center of a large hole and surrounded by fine stone, which should be well pounded down by a heavy iron-shod rammer, as they are filled in. The posts will not stand as firmly at first as if surrounded by dirt, but they will last much longer. The lower end should be pointed, which prevents it heaving with the frost. If the post while in the tree be reversed, or the upper end of the split section of the trunk which is used for a post be placed in the earth it will be more durable. Charring or practically burning the part of the post which is buried, will add to its duration: so, also, will imbedding it in ashes, lime, charcoal, or clay. In charring, the posts should be thoroughly seasoned and dried, else the protective process will cause decay to go on faster than if nothing had been done. Poisoning the ends of the posts by dipping them in a solution of corrosive sublimate (1 part to 50 parts of water), or by boring a hole into them and plugging up arsenic, corrosive sublimate or other subtle poisons therein, prevents decay and the working of worms and grubs.

FIG. 11.

Sawed posts should be cut about the first of August and as soon as convenient and before the wood borer attacks it, taken to the sawmill and sawed into posts suitable for the fence to be built; and be sure and have some mark by which to determine which is the butt end of the post before it is treated and set. After being sawn they should be piled and thoroughly seasoned through before preparation. Then the portion to enter the ground, which is always that portion or end of the post opposite the butt of the tree, and four to six inches of the wood above the ground, should be treated as above directed or have a good thick coat of coal tar applied.

FIG. 12.—*Post Hole Digger.*

A post-hole digger, as illustrated by Fig. 12, is a very convenient tool to have on the farm, especially where any great amount of fence is to be built.

Fig 13 shows the post-hole digger in use. It works perfectly everywhere except in stony ground, where nothing but the spade and ladle will work. In clayey ground, free from boulders, the ground auger is in common use.

FIG. 13.—*Digger in Use.*

In order to find the number of feet of boards required for each rod of fence, add the different widths of the boards, in inches, together, and divide the sum by 12 for the width in feet; then multiply the width by 16½ and the product will be the number of feet, board measure, required for each rod of fence.

To find the number of posts required for a given length of this kind of fence, reduce the number of rods to feet by multiplying by 16½ and divide the

product by the number of feet the posts are set apart; the quotient will be the number of posts required.

From the following table any one can calculate the cost of a board fence for any given distance. The figures denotes the number of feet, board measure.

Number of boards high.	One Mile.	One-Half Mile.	One-Fourth Mile.
One	2640	1320	660
Two	5280	2640	1320
Three	7920	3960	1980
Four	10560	5280	2640
Five.	13200	6600	3300

PICKET FENCES, except to enclose the yard about the dwelling house and in making hen parks, are but little use upon the farm, because of the expense. Fig. 14 is an illustration of a picket fence, which, when painted, will make a neat and substantial one for the yard.

FIG. 14.—*Picket Fence.*

HEDGE FENCES. For centuries hedge fences have been used in Europe, but they occupy considerable ground and afford a harbor for vermin. For those disposed to try them, as a matter of taste or fancy there are many kinds of thorny native shrubs that are both beautiful and hardy, for the cultivation, care, etc., of which, see Hedge.

BARBED WIRE FENCE. Among the fundamental questions in farm economy, fences are the most important, because of their extent, protection, first cost, and rapid decay. Within 15 years, and more prominently within ten years, a new material, barbed wire, has demanded public favor, with very many arguments pro and con. In the Northwestern States it has rapidly become established in the confidence of the farmers and mainly supplanted all other fencing.

The following are some of the requisites for a perfect fence:—1st. It must form a reliable barrier to the passage of stock, and must be furnished at a moderate cost. 2nd. It must be simple, durable in all places and climates, easily transported, and immediately available for a fence. 3d. It should occupy the least space practicable, thereby wasting little land, affording no harbor for weeds, and not seriously defacing the landscape.

Barbed wire comes nearer meeting all these conditions, in the larger portion of the United States, than any other material. Compared with hedge, board, or rail fences, it can claim superiority in nearly every point for a valuable fence on the farm. The main objection urged to its use is that of cruelty. It is claimed that horses, in particular, are liable to run against it and be seriously injured, if not maimed for life. If this objection is valid, and cannot be removed, then the use of barbed wire will be limited. Careful observers, however, have noted that the injury to animals has arisen from the stock being unaccustomed to wire fence, or from its faulty construction. Horses and cattle have had little respect for the ordinary board and rail fences of the country, and only the well disposed have been restrained by them. The first thing is to teach animals to entertain a becoming respect for a fence, and one that looks like a skeleton. While they are learning this lesson, quite likely some of them may get hurt; but once learned they will always regard a line of posts as very significant. Injury to stock has more frequently arisen from faulty construction than from any other cause. A majority of prairie fences are made of three wires, which is a mistake, because the distance of the wires apart offers a constant temptation to the animal.

Experience has demonstrated the practical value of the following suggestions for constructing barbed-wire fence: Set substantial posts one rod apart; the post at the starting point should be braced by cutting a notch in it two and a half feet from the ground, and running a strong pole from the notch to the foot of the second post, where it is fitted to rest firmly, and is supported about three inches above the ground by means of a short block driven down beside the fence post. This method of bracing should be repeated once in forty rods. A faulty construction would be to cut the notch in the starting post four feet from the ground, make the brace shorter, and allow the lower end to rest upon the ground; for the moment the wire is tightened upon the fence, the short brace acts as a fulcrum to lift the initial post. When the posts are set a wire is wrapped firmly around the first post, four feet and two inches from the ground; then the coil is unrolled 40 rods and the wire drawn tight by means of a set of small pulleys with grapples. After this wire has been securely stapled, a second is similarly fastened one foot below it, and a third and fourth below this, bearing a foot apart between the respective wires. Four wires thus arranged, make a perfect cattle fence. For horses, the lower wire should be without barbs to prevent cutting the knee, and a fifth wire should be blaced upon the posts five feet from the ground. The upper wire prevents accident by attempting to reach over the fence. Instead of the upper wire, a galvanized steel barbed ribbon is used, as more sightly for horses.

For swine, the fourth wire of a cattle fence is raised four inches, and two barbed wires placed at equal distances below it. For sheep, the three lower wires, as in a fence for swine, are smooth. Thus constructed, barbed wire, while uniting all the conditions of a perfect fence, is comparatively harmless. Upon the Iowa Agricultural College farm, there are nine miles of barbed wire fence, enclosing pastures upon which graze 170 horses and cattle; during the season of 1881 not an animal has been scratched to draw blood, except in one instance, and that was slight and due to a faulty construction of the fence. Barbed wire will not answer for fencing in narrow lanes and yards or any place where animals are liable to be crowded against it. Yards and lots for sheep can be made practically dog-proof by placing one barbed wire near the ground, three fence boards above, and three wires above the boards; the lower wire prevents digging, and the upper wires suggest that the dog better not

climb. Within such an enclosure the grateful sheep rest in perfect security.

Barbed wire is valuable for adding to the efficiency of the older fences and hedges. We will point out how this wire may be advantageously employed in this way.

The common post-and-board fence, as commonly made, is not strong enough to resist bulls and unruly horses, which frequently tear off the upper boards. Additional strength is given by nailing a stout top board on each side of the post, and surmounting both with a strong cap-board on the top of the sawed ends of the posts. But a much simpler, cheaper, and more efficient protection is to stretch a single line of barbed wire along the top of the fence. It may rest on the top board, or run along the tips of the posts, or the top board may be omitted and the barbed wire take its place.

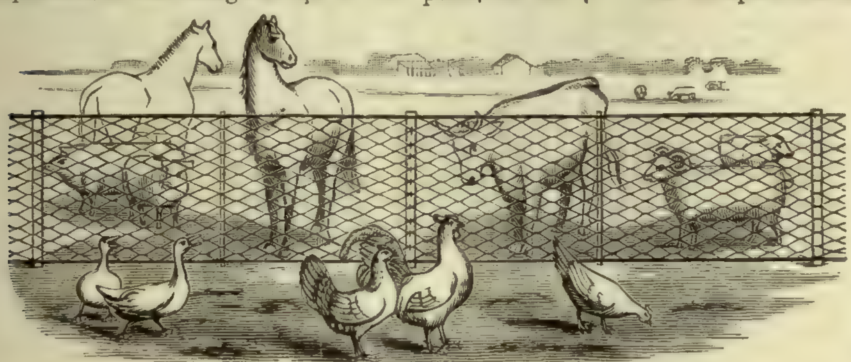


FIG. 15.—*Wire Fence.*

It is only in neighborhoods where civilization has made but partial progress that swine are permitted to run in the streets, and where tight fences below are required. In such cases a single wire just below the bottom board will be sufficient to exclude them, and such a fence will answer a good purpose for the boundaries of small hog pastures.

Many serious accidents to horses, and occasionally to other animals, have occurred where barbed wires have been wholly employed in the construction of fences. Being nearly invisible, animals have heedlessly dashed against them and become badly lacerated, and the damage has been greatly increased when they have been caught between, or been entangled in, the wires. Some additional and more visible barrier should therefore always accompany the wires. In regions where small stones are common, a ridge of these placed along under the wires and between the posts, will answer a good purpose. The adjacent fields will be improved by the removal of these stones. This line of stones need not be a regularly built wall, but they may be placed loosely, evenly and regularly. Animals dislike setting their feet on them. As the wind obtains no purchase on such a fence, and as little pressure is even exerted against it, the posts need not be deeply set, the stones about them affording additional support. This line of stones may be two feet high and three or four feet wide.

Where stones do not exist, a cheap substitute is a bank of earth. A few furrows are plowed on each side, and the earth thrown up into a smooth embankment, about two feet above the bottoms of the ditches on each side. Such a fence as this, with two barbed wires for cattle and horses, or three for sheep, is one of the cheapest and most durable that can be constructed. The posts need not be heavy; they may be placed at least a rod apart; they may be cheaply set, as deep holes are not required; the embanking is done readily with the plow; and lastly, the wires are stretched rapidly on the posts. The bank becomes sodded with grass, and, together with the ditch, will prevent animals from blindly striking the barbs.

The cheapest form of the barbed fence is where a line of trees may be used for supporting the wires. A line of maple or other shade or timber trees will answer the purpose, and the fence may be completed (with the ridge or bank of earth) when they are two or three inches in diameter.

The cost of such fences may be readily estimated by counting one post to every rod, and 50 cents a rod for the three barbed wires. The labor of construction may be reckoned at about 20 cents a rod, making the whole expense less than $1, or about 80 cents for two wires. An important item of saving is in avoiding all necessity for repairs for many years. The cost will vary with the price of posts, and with the ease or difficulty of forming the embankment of soil.

In all barbed-wire fences the wires should not extend for a distance of more than 20 or 25 rods, that the expansion by heat and contraction by cold may not be too great—the ends being secured to stout posts set at these distances apart. Galvanized wire is better and more durable than wire covered with paint.

SMOOTH-WIRE FENCE. The common smooth wire is very popular in some sections of the country. They make a neat and durable fence. A good wire fence, especially for garden and lawn purposes, is shown by Fig. 15. It is made by Sedgwick Bros., Richmond, Indiana. It is made of the best steel wire. The margin wire, i. e., top and bottom wires, run nearly straight, and are No. 9, which is common-sized telegraph wire. The body wires are No. 13. The breaking strain of No. 9 is about 2,500 pounds, and of No. 13 about 800 pounds.

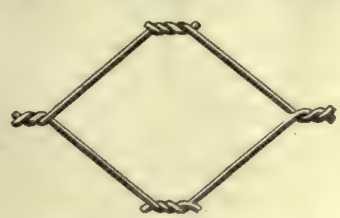


FIG. 16.—*Mesh of Wire Fence.*

Fig. 16 illustrates the general shape of the mesh and shows the twist correctly.

In making a wire fence observe the following: First, use nothing but the best material. The best galvanized wire and well-seasoned oak or cedar posts should be employed. With this material properly put up, a wire fence will last 30 years. The posts should be set from 30 to 36 inches in the ground. It will pay in the end to make a fence good. Whether barbed or smooth wire should be used we will not pretend to say positively. To make a fence hog-proof it will require one more strand of the smooth wire than of the barbed, but then the smooth wire costs less per foot, and probably the cost per rod would be about the same in either case. Horses sometimes run against the barbs, not being able to see the wires. Cut triangular pieces of tin, each side of the pieces being about two inches, and fasten them every few feet to the top strand of wire by bending the corner of the tin around the wire. The horses can easily see these pieces of tin, and these will give warning of the obstruction in their way.

To stretch the wire, bore holes in the end posts for the wire to pass through, then, having stretched the strands out along the fence, securely fasten them at one end. An easy way to stretch the wire then is to hitch a team to it. You need not be afraid of breaking it. But a better way is to drive your wagon up to the end post. Brace it so it cannot move. Then wrap the free end of the wire around the hub of the hind wheel and with the spokes or levers you can easily stretch the wire. It acts on the same priciple as the sailor's capstan. The end posts should be securely braced back from the next posts.

As any wire will lengthen and shorten with the varying temperature of the atmosphere, at one end it should pass over a pulley or smooth surface, with a 50-pound weight attached at the extremity; and this should be watched, that it be not allowed to rest upon the ground and cease its function upon the wire. If any wire is found not to be kept straight with the weight attached, increase the latter until it is sufficient.

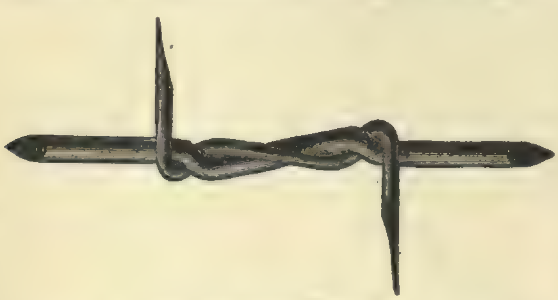


FIG. 17.—*Barbed Fence Wire.*

Within the past few years over 50 patents have been issued to inventors of the barbed wire for fences. We cannot describe them, but illustrate by Fig. 17 one among the best.

PORTABLE FENCE. Fig. 18 shows an improved portable fence, recently invented and patented by Daniel T. Hazen, of East Milan, Monroe county, Michigan. The construction of the fence is simple, being composed of panels which are interlocked on the well-known principle of a zigzag fence, but taking up much less room, and consuming much less material than the ordinary rail fence. The panels referred to are each composed of four rails or slabs, two posts, shaped triangularly and set vertically, fitting into the intersection of the panel rails, so as to make a firm and neat structure. Besides these parts, there are two vertical end pieces, one attached to the top and bottom rails, the other attached to the ends of the central rails which project for this purpose. In putting up the fence, these united projecting ends of the central rails in the one panel fit into the opening between the top and bottom rails of the next panel, and so on, interlocking the ends and forming a continuous fence. The holding together is done by means of wooden turn buttons, which are held by screws, and the turning of which makes the fence entirely portable with the exception of the short posts which are driven into the ground. For farm uses, this fence possesses peculiar advantages, especially in the division of fields from season to season. It has a full measure of strength, and combines durability with economy in material and use.

FIG. 18.—*Portable Fence.*

FLOOD FENCE. A practical and inexpensive plan for constructing a fence across the bed of a stream, especially that of a rocky one through which the water runs only after heavy rains, is illustrated by Fig. 19. The logs are the trunks of straight trees about 18 inches in diameter, which are hewed on two sides; posts are mortised in each of these logs, and on them planks are firmly nailed. The logs are then linked together with inch iron rods, and the first

one connected by means of a long link to a tree, or post firmly set in the ground upon the banks of the stream. The links must all work freely. When high water occurs, the fence is washed around and left on the bank; after the water has subsided sufficiently, the logs may be dragged back to their places, as shown in the engraving, Fig. 19, by means of a horse hitched to a staple in the end of the log.

Fig. 20 illustrates a good flood fence to put across sloughs when they are too wide for a flood gate. The posts are driven or otherwise put down three to four feet, with the tops about one foot above ground; the other posts, that the planks are nailed to, are bolted to the top of the inserted posts, and a wire is placed over the tops. The ends of the panel that connect with the post on the bank are slightly nailed with cross strips near the top, so as to be easily broken loose when the flood comes. There are also temporary braces bearing up-stream, put in to prevent the fence from falling, but are easily washed out, when the fence falls down stream, and logs and other obstructions pass by readily. As soon as the flood goes down, the fence is easily raised, a panel at a time, to its proper place.

FIG. 19.—*A Fence for a small Stream.*

Fence Law. In almost every State in the Union there are laws defining what legal fences shall be. In some States the law leaves it for towns, villages and counties to define what the fence shall be, or whether there be no fences. In most of the Western States stock is permitted to run at large, and owners of land who desire to cultivate it must protect it with suitable fences of a prescribed height, five feet being the usual height. When parties have lands adjoining others they desire fenced, the law provides what is known as partition fences, each person being required to erect and maintain an equal distance of such fence. The several States have different statutes and regulations concerning them. Most of them have officials known as fence-viewers, whose offices are not sufficiently uniform to be stated generally. In all the States, however, if the parties agree about the partition fence, it is like any other contract, easily adjusted and can be enforced. It is only when the owners of adjoining lands can not agree that the law steps in for the public good and provides how persons may be compelled to build. Outside fences are required to be built and maintained by the owner or occupant of the land, if he would recover damages for loss or injury to crops or soil, except in some portions of the country, where stock is required to be kept up. This is known as a stock law. Where such a law is in force, if stock is not permitted to run at large, and it escape from the owner, he is liable for all damages. Should you be driving your stock along the public highway, and, without your fault or negligence, they break away from your control and run upon adjoining land, and you drive them out as soon as you reasonably can, you are not responsible for the damages, for you have a right to drive them along the highway, with proper care and attention. If, under such a law, persons entering your fields hunting, fishing, or berrying, and leave your bars or fence down, or gate open, and your cattle escape, you will be liable for all damages they may do to your neighbor, because the stock law requires you to keep them up, and you have a right to exclude all persons from entering. Your negligence in allowing such persons to enter makes you liable to your neighbor for the carelessness of such persons as you permit to enter your fields. This law, however, is in force only in certain localities. The genral rule is that land-owners must have and maintain a lawful fence around their premises. Partition fences can only be compelled to be built when both the adjoining owners desire to improve their lands. Therefore, if one desires to let his land lie idle and open he can not, under any statute, be compelled to contribute towards the erection of a partition fence. After such fence has been erected each person must keep his portion in repair, and if either neglects to do so, the other, after giving reasonable notice to repair, may repair the fence and recover the expense from the person whose duty it was to maintain such partition.

FIG. 20.—*A Flood Fence in Position.*

Ferret, an animal of the weasel family, so nearly allied to the polecat that many regard it as a mere domesticated variety. It is of rather smaller size, the head and body being about fourteen inches long, the

tail five inches and a half, the muzzle rather longer and more pointed, the head rather narrower; and the color is very different, being yellowish, with more or less of white in some parts, there being two kinds of hair, the longer partly white, the shorter yellow. The eyes are pink. It is, however, much more susceptible of cold than the polecat, and requires careful protection from it in climates where the polecat is a hardy native. It was imported into Europe from Africa, and was well known to the Romans, being anciently employed, as it still is, in catching rabbits, for which purpose it is often sent into their burrows muzzled, or "coped," by means of a piece of string, to drive them out into nets, or, with a string attached to it, it is allowed to seize a rabbit in the burrows, and is then drawn out, holding it fast. The usual plan, however, is to let the ferret have free range of all rabbit holes unmuzzled. Ferrets are generally kept in boxes, and attention to warmth and cleanliness is essential to their health. They are capable only of partial domestication, acquiring a kind of familiarity with man, and submitting with perfect quietness to his handling, but apparently never forming any very decided attachment; and they never cease to be dangerous if not carefully watched, especially where infants are within their reach. If allowed any measure of freedom, they are ready to attack poultry, and kill far more than they can devour, merely sucking the blood. They generally breed twice a year, each brood consisting of six or nine. The female sometimes devours the young ones, in which case another brood is speedily produced.

Ferrule, in mechanics, a ring or band on the end of a wooden rod or bar, to prevent splitting.

Fertilization, the act or process of rendering fertile. In flowering plants this is done by the pollen of the stamen falling upon the pistil. Most plants are self-fertilizing, the stamens and pistils being in the same flower or in separate flowers upon the same plant. A few plants, as hops and hemp, have these organs upon separate individuals. Some strawberries, as Russell's Prolific, are "pistillate" (non-staminate), and cannot fertilize themselves. Other sorts, as Wilson's Albany, have hermaphrodite (or perfect) flowers, and not only fertilize themselves, but also the pistillate varieties near them. Plant fertilization is greatly aided by bees and other insects, which undesignedly carry the pollen from one flower to another, or even from the stamens to the pistil in the same flower. Some plants, indeed, are entirely dependent upon insects for fertilization. When a horticulturist desires to "cross" fertilize, he protects by a covering a flower on each of the two plants against the introduction of pollen by insects or the wind, and, at the proper time, by his own hand, he transfers the pollen of the one to the pistil of the other. In the meantime he had plucked out the stamens from the flower he wished to fertilize to prevent self-fertilization. The product expected is, of course, a combination of two or more good qualities in one plant. The subsequent propagation of such new variety must be by cuttings, graftings, etc.,—any other method than by seed. See Varieties.

"Fertilization" of the soil consists in supplying it with such chemicals as disintegrate and render available sundry mineral and vegetable materials of plant nutriment. See next article.

Fertilizers. These are chemical and semi-organic substances which dissolve the plant-food in the soil and render it available by the growing plants. They also add to the soil a little of the ash element of plant food. They have a tendency, in the long run, to exhaust the soil. They comprise ashes, lime, marl, gas lime, gypsum, bones, common salt, many of the basic salts, guano and soot.

The quantity of ashes which should be applied to the acre depends upon their strength, on the soil, and on the character of the crops cultivated. Clover, lucern, peas, beans, the grasses, and all the root crops are great exhausters of the soil. For them, ashes and bone dust are the best fertilizers; and, for clover, peas and roots, their effects are much enhanced when mixed with gypsum. Rich lands require a heavier dressing than light soils. For the former, 30 bushels of unleached ashes per acre is not too much; if leached, apply 45 bushels to the acre; light soils require about half as much. Of course, unless vegetable and mineral manures are correspondingly supplied to the soil, the fertilizers will cause it to be entirely exhausted. Ashes may be applied to meadow lands for a longer time than to any other crops. Coal ashes are of some value, especially to aid in the mechanical division of heavy soils. Peat ashes are more valuable.

Lime, next to ashes, whether simple or as a carbonate (chalk) or sulphate (gypsum), is the most valuable among the saline manures; and, like ashes, too, its application is beneficial to every soil not already sufficiently charged with it. It makes heavy land lighter, and light land heavier; it gives adhesiveness to creeping sands or leachy gravel, and comparative openness and porosity to tenacious clays; in short, it is chiefly a mechanical agent, and has the remarkable office of catching and holding the more volatile elements of plant-food until they are wanted by the crops of the farmer. It may be carried to the field immediately after burning and placed in small heaps, where it may be left to slack by the rains and the air; but it is better to reduce it at once with water, if convenient, and then spread it preparatory to plowing. A good practice is to place it in large piles and cover it thickly with earth, which gradually reduces it to powder. It may then be carried where it is wanted and spread from the cart. When small quantities only are wanted, the best plan is to air-slack it thoroughly and add it to the compost; but in this case the heap must be spread upon the field before fermentation commences, or covered with a thick coating of earth to retain the ammonia, as this element is rapidly expelled by the action of lime in fermentation. Fresh-burnt lime does not act on the crops during the first year, and it may be prepared for action as well by mixing it with three or four times its bulk of earth as by spreading it

directly upon the ground. Magnesian limestone may be applied with benefit in large quantities, the average for first dressing being from 50 to 120 bushels per acre, which may be renewed every four or six years at the rate of 20 to 40 bushels. If too much is applied, putrescent or green manures are the only correctives.

To give lime its fullest effect, it should be kept as near the surface as possible; therefore, apply it after plowing, harrow it in, and then allow the ground to remain in grass as long as possible; or, if the land is not devoted to grass, apply the lime as soon as possible after a crop is taken off, so as to allow plenty of time for its action before the next planting. Lime is useful to meadows in destroying the mosses and decomposing the accumulated vegetable decay or the surface. For this purpose it may be spread on them unmixed, after having first passed into the state of carbonate or effete lime, to prevent injury to the grass; but if no such necessity requires its use in this form, it may be combined advantageously with the muck and scattered broadcast over the meadow. Land producing sorrel or dock is said to be "sour," and should have lime added, but not gypsum.

The marls derive their principal value from the lime which they yield, a portion of which is sometimes in the form of a phosphate. They are adapted to the improvement of all soils not already filled with lime, and they are generally more useful to meadows than the pure carbonate. From 20 to 400 cart-loads of marl per acre have been applied, according to its quality and the character of the land to be benefited. It should be carried out and exposed in small heaps to the sun, and especially to the frosts of winter, before it is spread upon the land.

Gas lime is the spent lime of gas-works, and is a useful top-dressing for soils requiring lime or gypsum. It may be drawn out in the fall or winter season, and if not intended for composts, dumped in small heaps, and especially, if fresh, it should at once be spread upon the surface so as to be well exposed to the air. It may be applied either to grass or plowed crops with equal benefit, operating in much the same way as gypsum, although it should be spread in several times the quantity per acre. Caution must always attend its use, for without several months' exposure it exercises a poisonous influence upon vegetation.

Gypsum, or "land-plaster," as it is sometimes called, is the sulphate of lime, and a very popular fertilizer, its best effects being on sandy, loamy and clay soils, the latter requiring more than the others. Some soils, especially the prairies of the West, do not seem to need it. The following is a good summary of its qualities: It acts best in dry soils and in moderately dry seasons; it is inactive, or at least fails to give the best results in soils deficient in vegetable mold; it tends to dissipate the vegetable matter in soils by promoting oxidation; it benefits plants by directly supplying sulphur and lime, and by indirectly supplying potash and magnesia; it fixes or converts the volatile carbonate of ammonia into the non-volatile sulphate of ammonia; its office in preventing the waste of carbonate of ammonia in the stable and in fermenting manure is much more important than in fixing the ammonia of the atmosphere; it increases the development of leaves and stalks, without a corresponding increase of seed; it is markedly beneficial to clovers and all leguminous crops; as plaster is of sparing solubility in water, a comparatively small dressing is as beneficial as a very large one; a hundred weight is as good as a ton, so far as the crop is concerned to which it is applied; since plaster is rapidly washed out of the soil by the heavy rains of fall and spring, it is best to apply the plaster to the crop we wish to benefit in the quantity which that crop requires, and at the time it is found to do the most good, viz.: in the early spring growth. There is great diversity of views among farmers in regard to the influence of plaster on Indian corn. Although corn ranks second or third as a market crop, yet for use upon the farm it stands first in importance among our grains. All doubts in regard to the influence of so important a manural substance on a leading crop should be solved by accurate, careful, and repeated experiments by farmers in all parts of the country.

Two pecks may be applied per acre of sandy soil, and 15 bushels per acre of clay soil; but the usual quantity applied is two to four bushels. The crops upon which it produces the greatest effects are the red and white clovers, lucern, sainfoin, and other leguminous plants, as peas, beans, etc. On natural meadows and on cereal grains it has no perceptible influence. It should be sown broadcast as soon as the leaves of the earliest trees have expanded in the spring. It requires an abundance of rain to properly dissolve it and incorporate it into the soil. For corn, potatoes, turnips, etc., it is usually put in with the seed, or sprinkled upon them after the first hoeing. It is a great exhauster of the soil, and one should first try his land carefully with it on a small scale. At Dowagiac, Mich., and possibly other places, a "plaster-sower" is made, at a cost of $40, which will do the work of a whole neighborhood in good style.

One part of Paris green to 60 of gypsum makes a good protection against the potato-beetle.

Bones, to be of the greatest value, should be crushed or ground, without having been previously burned. Before their manipulation for this purpose, however, they are generally boiled for the oil and glue in them. This does not lessen their agricultural value very perceptibly. Bone-dust is particularly applicable to pastures. It is sown broadcast upon the surface at the rate of 50 to 100 pounds to the acre.

Old lime plaster from the walls of buildings is often worth twice its weight in hay, as it, when sown broadcast upon a meadow, increases its fertility for years without any further treatment.

Guano is the hardened remains of the dung, feathers, eggs, food, and carcasses of innumerable flocks of marine birds, which refuse has been collecting for ages on some of the islands of the sea. It is a valu-

able fertilizer, especially near the seaports, where it can be obtained more cheaply than inland. It is applied to all kinds of crops; for grass it is used as a top-dressing. It is first mixed with twice its bulk of fine earth, ashes, plaster or charcoal dust, and the proper quantity is 200 to 400 pounds per acre, sown broadcast and harrowed in, or supplied in two dressings, the first soon after the plants appear, but not in contact with them; the last, 10 or 14 days after and immediately before moist or wet weather. Rich lands have in some cases been injured by it. For hot-houses and many minor purposes it is a desirable manure, and in solution it is very convenient as an occasional dressing. It is thus prepared by dissolving one pound in three gallons of water 24 hours before using. It is somewhat volatile, and therefore should be kept closely covered until used.

Soot is valuable in wet seasons. It is applied at the rate of 50 to 300 bushels per acre, sown broadcast and harrowed in. Salt increases its value. Its use, however, has been so limited in the West that the few contradictory reports which reach us do not justify us in being very positive concerning its value.

The salt should always be applied as a top-dressing, for wheat and rye either alone, or mixed with guano or nitrate of soda; for barley, oats, clover and the grasses, apply in May or June in dry seasons; in gardens and orchards, sprinkle a strong solution when there is mildew; for the root crops, hops, and flax, use in dry seasons after the plant is fairly up, alone or with guano. For all the grains, root crops, beans, peas, flax and hops, apply either a month before or a month after seed time; for gardens, orchards, and meadows, in the fall; for clover and the grasses, a month before seed time, and for fallows, at the time of breaking up. According to some, the chief value of salt as a "fertilizer" is to draw moisture during dry seasons. It is said also to aid in destroying worms. Salt should be applied to fruit trees in trenches on each side of the tree, at the rate of four pounds to the tree. It is applied to hay at the rate of 10 to 20 pounds to the ton at the stacking. It should never be applied with the seed, or on very cold, wet, undrained land. In composts, at the rate of 100 pounds per load.

The phosphates are generally insoluble in the water of the soil, and hence many manufacturers add sulphuric acid to it, forming a "superphosphate," in order to render it soluble; but eminent authorities declare that this is unnecessary, and is only an excuse for throwing into the market a high-priced article. The phosphates furnish phosphoric acid to the crops, on an average about one pound to 13 of potash. The grains are pre-eminently phosphoric-acid crops, while forest trees and the coarse grasses are potash. The only three essential elements of a fertilizer are phosphoric acid, potash and ammonia. A grain of wheat, for example, contains, in 1,000 of its mineral parts, 298 of phosphoric acid, 137 potash, 120 of magnesia, 91 soda, 28 lime, 15 silica, 7 of peroxide of iron, and 3 of sulphuric acid. It stands the farmer in hand, when he buys a fertilizer, to get these in the cheapest manner, and not pay out enormous sums for material he has already in his soil. For instance, the selling price of one brand of silicated superphosphate is $45 a ton, while its actual value is only $17.50; the price of double refined poudrette is $25 a ton, while its actual value is $8.50 a ton. Price of ammoniated bone, $48 a ton, actual value $13.26; Russell Coe's superphosphate $60, actual value $33.50 to $34.50; Wilson's superphosphate, price $55, real worth $23 to $25. The high-priced fertilizers do not pay the farmer, especially in the Northwestern States.

To apply superphosphate, for corn or potatoes, put one or two tablespoonfuls to the hill, mixing thoroughly with the soil; or it can be drilled in with the corn at the rate of 200 pounds to the acre; for wheat, 150 to 200 pounds to the acre; for oats and barley, 100 pounds to the acre; for grass, 100 pounds, either late in the fall or spring. But different soils, of course, require different variations from the foregoing.

Superphosphates can be manufactured at home by getting up a sufficient quantity of dry bones, making a large heap, mixed with dry pine wood, and burning the whole mass to ashes. Pound and sift till the ash is reduced to a powdered mass. Now have ready a box, water tight, of suitable dimensions, into which put the bone ash and add sufficient water to wet the mass thoroughly. Then take the brown acid of commerce, and to every gallon add about four gallons of water. Pour on the moistened bone ash this diluted acid, slowly, keeping several hands stirring with wooden paddles. Continue to pour on the acid until the contents of the box becomes a semi-fluid mass, and all effervescence ceases. One carboy of acid might be used on 300 pounds of bone ash. But it would not pay a Western farmer to resort to this proceeding. There are mills for the purpose of grinding bones, but no one farmer would likely have enough bones to warrant the purchase of machinery, and it is hardly probable that an entire community would have. In absence of a mill, bones can be reduced by making a compost with good wood ashes, although it requires considerable time to do it. The process is to place a layer of bones in the bottom of a barrel, and then over them place a layer of ashes, and so on, until the barrel is filled or the bones are exhausted. This should then be kept wet all the time. The mixture will be ready for use in about a years time. When softened, take the bones out and crush them before applying to the land.

As a general rule concerning the application of fertilizers, top-dressing is better; but all volatile fertilizers and manures should be plowed or harrowed under immediately. The stronger the smell, the more rapidly are the virtues of a manure or fertilizer wasting away.

It is useless for a farmer to go to an agricultural chemist for a prescription of fertilizers for his farm; he must feel his way along by careful experimenting.

The various manures are also spoken of as fertilizers, especially clover. See Manure. Red clover is

the best, of which about 12 bushels of the unhulled seed is sown to the acre. Summer fallowing should be done the second year, taking the first crop off and turning under the second.

Directions as to the quantities of salt and the time to be applied to different grain, roots and other crops:

Crops.	Cwt. Per Acre.		
	Light sandy soil.	Middling loamy soil.	Heavy rich loam or drained clay.
Wheat	4½- 5	4 - 4½	3 -4
Rye	5 - 6	4½- 5	3 -4
Barley	6 - 7½	6 - 6	4 -5
Oats	6½- 7½	6 - 6½	4½-5
Beans and peas	6 - 6½	4½- 5	3½-4
Rape seed	6 - 7	5 - 6	4 -5
Flax	4 - 5	3½- 4	2½-3
Hops	6 - 6½	5 - 6	4 -5
Potatoes	6 - 7	4 - 5	3 -3½
Turnips, mangolds, beets and carrots	5 - 6	4 - 5	3½-4
Gardens	7½-10	7 - 8	6 -6½
Fruit trees	....	....	....
Fallows	9 -10	8 - 9	7½-8
Clover and grasses (artificial)	6½- 7½	5 - 6½	4 -5
Meadows and grasses (natural)	6½- 7½	5 - 6	4 -5

These quantities are calculated for soils in which there is an insufficiency of the elements of salt; but in such soils where an analysis would already show considerable quantities of soda and chlorides or muriates in various forms, smaller quantities than the above should be used, as also in the cases where salt has already been used in compost and with stable dung, or where cattle are regularly fed salt.

Fescue (fes′-cu), the name of a genus of grasses, of which there are several well known useful species, as meadow fescue, hard fescue, sheep's fescue, etc.

Fetlock, the part of the horse's leg where the tuft of hair grows, behind the pastern. The joint of this part is called the fetlock-joint, and is the principal seat of motion below the knee. Four bones belong to it, the cannon, the long pastern bone, and the two sesamoids; an extraordinary provision exists in its configuration and accompaniments to obviate concussions. Inflammation in the ligaments of this joint attends most cases of sprains of the back sinew; and inflammatory action in these ligaments or in the parts immediately connected with them is frequently mistaken for sprain in some higher part of the leg.

Fever, a general inflammation, which may arise from various causes, affecting persons of different constitutions more or less violently. This should prompt every one to look well into the constitution of the patient before giving remedies. Should the same active treatment be employed for a weak and delicate person that would be used for a healthy, robust one, the result would doubtless be disastrous. The cause of the fever should be known, if possible, as the treatment may be more intelligibly prescribed. Fevers are often aggravated in their virulence or protracted in their duration by wrong medication.

As to the particular form of fever, whether bilious, nervous, typhoid, remittent, intermittent, rheumatic, malarial, scarlet, spotted, erysipelas, small-pox, or something else, it is generally difficult to tell for the first day or two, but this makes no difference with the home treatment prescribed below. These fevers, with their treatment, are treated under their respective heads. The symptoms of fever are lassitude and weakness of muscular power, accompanied with an expression indicative of some inward distress; and an aversion and inability to every exertion, either of mind or body, usually denote the approach of fevers. Irregular chills and heats, with great restlessness, and a general sensation of soreness, succeed; while flushing of the face, increased heat of the skin, especially of the hands and feet, quick pulse, headache, or a disturbed condition of the mental faculties, demonstrate that the fever is already formed, and that medical assistance should be rendered to the patient.

All fevers have a tendency to be higher in the latter part of the day and reduced in the morning. Those which entirely remit (that is, cease) on alternate days, are called "intermittent." Some intermittents, however, have both their quickening and cessation daily, and some, very rare, every three days. "Ague," "chills and fever," etc., are other names of this form of fever, and it is always more or less bilious. Those fevers which only partially cease, daily or on alternate days, are denominated "remittent." Sometimes this form of fever is also bilious, and sometimes nervous. Both the intermittent and remittent are "malarial," as is also typhoid. In times of small-pox, if one feels chilly, with pain in the back and head, he should suspect that dreaded epidemic and act accordingly. Very few persons, not doctors, are willing to take the responsibility of treating fevers, except the intermittent form, termed ague, when the favorite quinine, or hot bathing, or hot herb teas will be called into requisition.

For treatment in the early stages of fever, or until the particular type is developed, it is generally recommended by the profession to keep the head cool by bathing and fresh air; the feet warm, if they are not already hot. Give injections to clean out the bowels. If there is nausea, give an emetic. Give no food, but give drinks of pure water of such temperature as is least nauseous to the patient, which may be a little flavored with cream, sugar, juice of sour fruit, or some innocent aromatic. Further than this, let him rest, or even sleep, all he wants to.

Field, a division or a subdivision of a farm. Each field on a farm ought to have a distinctive name and the different fields of a farm should be in succession managed in a strict and regular adaptation to a systematic course of cropping.

Field Mouse: see Mole.

Fig. This celebrated fruit-tree, whose history is as ancient as that of the world, belongs properly to a warm climate, though it may be raised in the open

air in the southern portion of the Northern States, with proper care. In its native countries, Asia and Africa, near the sea-coast, it forms a low tree 20 feet in height, with spreading branches and large, deeply lobed and rough leaves. The blossoms are scarcely visible, being concealed in a fleshy receptacle which finally becomes the fruit which is eaten. This is very sweet, and of such peculiar richness and flavor that some persons do not like it at first; but it is nevertheless a very nutritious article of diet.

CULTIVATION. This tree is very rapidly increased by cuttings taken off in March and planted in a light soil in a hot-bed; or they may be planted in a shady border in the open air quite early in April, with tolerable success. The cuttings should be eight or ten inches long of the last year's shoots, with about half an inch of the previous year's wood left at the base. The best soil is one moderately deep, neither very moist nor very dry. In very moist ground the tree will run to coarse wood, and in dry ground the fruit will drop before fully ripe. In this climate a loamy, chalky or limy soil is the best, with marl or mild lime in compost as a suitable manure. In the Northern States the tree is kept as a kind of dwarf, in order that it may be carried in-doors or otherwise protected during cold weather. One good method is to set open boxes or barrels over them, filling in with straw or any other litter. In order to prevent a too luxurious growth of the branches under this process of dwarfing, "root-pruning" has to be resorted to. Short-jointed wood and only moderate vigor of growth are well known accompaniments of fruitfulness in this tree; and there is no means by which firm, well ripened, short-jointed wood is so easily obtained as by an annual pruning of the roots, cutting off all that projects more than half the length of the branches. This work is done in autumn by digging a trench around the tree, cutting off all the roots with a sharp spade; then but little pruning of the branches is necessary beyond that of keeping the tree somewhat low and in regular shape, shortening in the branches occasionally and taking out old and decaying wood. In winter the branches of the fig should be bent down to the ground and fastened with hooked pegs, and covered with three or four inches of soil as in protecting the foreign grape. This covering, of course, should be removed as soon as the spring is well settled.

Two crops in a year are usually produced by the fig, the first, which ripens here in mid-summer, and the second, which is yielded by the young shoots of the same season, but rarely ripens well in the Middle States. It is therefore advisable to rub off all the young fruit of this season's crop after mid-summer as they are formed. In an unfavorable soil or climate the ripening of the fig is undoubtedly rendered more certain and speedy by touching the eye of the fruit with a little oil; the fruit is also larger.

VARIETIES. Of the red, brown or purple figs the most hardy varieties are the Black Ischia, Brown Ischia, Brown Turkey, Brunswick, Small Brown Ischia and Violette; and of the white, green and yellow kinds, they are the Angelique, White Ischia and Pregussata. The very hardiest is the Brown Turkey, and the most luscious varieties are too tender for culture in the Northern States.

Fig, IN FARRIERY, an excrescence on the frog of a horse's foot resulting from a bruise.

Filbert, a large, thin-shelled hazelnut, raised in England and on the continent of Europe, and in California. The climate of the northern portion of the United States is hardly adapted to their culture.

File. In using a file, it saves its surface to draw it back lightly. In filing a flat surface, great care must be taken if you would avoid filing the edges more than the middle. Applying another perfectly level-faced iron which has been evenly coated with red lead, will show up the places not sufficiently filed down. Files can be re-cut with acids, in the following manner: First cleanse them in warm water in which is a little potash; rinse with warm water and dry by artificial heat. Put them in warm water, just enough to cover them, and to each pint of the water add 2 ounces of blue vitriol finely pulverized, 2 ounces of borax, well mixed, taking care to turn the files over, so that each may come in uniform contact with the mixture; then add 7 ounces of sulphuric acid and 1/4 ounce vinegar, which will cause the files to look red, at first, but they will in a short time resume their natural color. Then take them out and wash them in cold water, and dry them by artificial heat. Sponge them with olive oil, wrap them in porous paper and lay them aside for use. To clean a file, oil and heat it, and rub it off with a wire brush. To temper a file, grind out the cuttings on one side until a bright surface is obtained; then damp the surface with a little oil, and lay the file on a piece of red-hot iron, bright side upwards; in about a minute the bright surface will begin to turn yellow, and when this color has deepened about the color of straw, plunge the file into cold water, and the work is done.

Fillet, OF VEAL, is the fleshy part of the thigh. To cook, see Veal.

Filly, a female colt, or young mare.

Filter, an apparatus for purifying water. To make an exceedingly cheap and simple filter take an oak or maple tub or cask, put into the bottom 3 or 4 inches of soft brick, pounded up about as fine as coarse salt; over this put as much fresh-burned charcoal, pounded up to the same grade, and over this another layer of the brick, and on the surface a good, clean cloth strainer, so arranged that no coarse matter will waste around it and get through; or it may be tied over the top of the vessel. Have a wooden faucet as near the bottom of the tub as possible, and a jug underneath to catch the water. Clean, fresh-burned soft brick, pounded up, is far more efficient than pebbles or sand. Old charcoal will leave a rank or bitter taste in the water.

A filter for a cistern might be made on the same principle, but on a larger scale, and placed at one

side near the top of the cistern, just under the surface of the ground and in the course of the rain-water, so that all the latter will have to go through it to reach the cistern. A cistern filter made in this way cannot be used in freezing weather, unless it is under the house, which is a bad place for a cistern. A cistern filter which is not subject to freezing, and is cheaper, although not so efficient, is made as follows: Build a four-inch brick wall across the cistern from bottom to top. This is laid in cement, and curves to the side which is to receive the water, which should be about two-thirds the capacity of the entire cistern. The water will filter through the brick of the partition, and may be drawn pure from the smaller compartment. A good method is to make a small cistern, adjoining the main one, five feet wide by six feet deep, connected, about a foot above the bottom, with the large one by a pipe. Fill the small cistern two-thirds full with sand and gravel, charcoal or brick dust, and let the water from the roof be discharged into it, and filter through into the main cistern. The advantage of this method is that when the filtering materials get old or too impure, they may be taken out and renewed, without disturbing or losing the water in the main reservoir. A common method is to place a bisecting, single brick wall in the cistern, from bottom to top, laid without mortar.

Every filter ought to be renewed every few weeks, whether it cleans much water or not for the reason that the brick and charcoal gathers foul gases and insects when not in use, and when in use it gathers the foul matter of the water.

Fin, the cutting plate on the colter of a plow.

Finger Bar, that portion of the cutting bar of a mowing or reaping machine in which the knife bar works.

Finger Glass, a glass to hold water for the use of the fingers at the dinner table.

Finger-Nails. Keep them clean by the use of the brush and soap-suds, and trim then once a week with a knife or scissors; don't bite them off, nor scrape them. Do not trim the corners very close, lest they grow inward and make trouble.

Finger-Plate, a strip of metal or porcelain on the edge of a door to prevent the fingers from soiling the paint.

Finger-Rings. When on a little too tight a finger-ring may be slipped off comfortably by soaking the finger in a strong lather of soap-suds from the ring down to the next joint. If on too tight for this process, the next thing to do is to wind on a thread from the same joint up to the ring, as carefully as on a spool, and pass the end under the ring with a needle; then unwind by passing this end around the finger underneath the ring, and the latter will very gradually be worked off. If too tight to be slipped off by either of these processes, corrode it in two with aqua regia, to be had at the drug-stores.

Fining (fi'ning), a process of refining, as liquors with isinglass or gelatin. See Ale, Beer and Cider.

Fir (fur), a tree of the spruce genus. The Scotch fir is a pine. See Evergreens.

Fire. In the first place there should be a permanent and definite understanding in the family what to do in case of fire, both as to each one's own person and as to the care of the property, so that in case of a sudden emergency there will be some wisdom of action. Flues and ash-barrels are the most common sources of fire about the premises in the country. They are very deceivingly treacherous. You cannot take too much pains with them. When a chimney takes fire within, throw some sulphur on the fire below and close up the chimney way with a wet blanket so that the flames cannot come out into the room. Salt is also a good extinguisher. To pass through a room of dense smoke and heat, crawl along on the floor, and, if possible, have at the same time a woolen cloth over the mouth, which will serve as a filter to the air you breathe. When clothes take fire, smothering the burning place with a woolen cloth or blanket is by far the best method; the next is to do anything else that may smother the fire. When children's clothes take fire they should be taught not to run, as that would increase the flame, but immediately snuff it out, or smother it in some way. The cotton and linen clothes of children should always receive their last rinsing in water which has two or three ounces of alum dissolved in it; that will render the garments almost incombustible. When any kind of oil or grease is on fire do not throw water upon it, but smother it if practicable, —otherwise, protect the things around until the oil has burned out. The rooms in which a fire is under way should be closed, so that the fire will not have much ventilation. When one is in an upper room during a fire and cannot get down by the stairway, he should tie sheets together, if he can get them, and tying one end to a bed-post climb down by the sheets from a window. All paper and cloths in places exposed to fire, may be protected by a solution of alum or salt. In extinguishing a fire which is under full headway, it is best to advance ahead of it and wet the places it is about to attack, rather than spending all the force on the middle of the conflagration, where it is too late to do any good.

Fire-Blight, a disease of apple and pear trees. See Apple, page 28.

Fire-Board, a chimney board used to close a fireplace in summer.

Fire-Brick, a brick capable of sustaining an intense heat without fusion. It is usually made of fire-clay.

Fire-Clay, a kind of clay, chiefly pure silicate of alumina, capable of sustaining an intense heat, and hence used in making fire-brick.

Fire-Damp: see Choke Damp.

Fire-Dog, andiron; a support for wood in a fire-place.

Fire-Irons, utensils for a fire-place or grate, as tongs, poker and shovel.

Firing, the application of the firing-iron to the diseased parts of the bodies of domestic animals, particularly the horse. It is a severe and very painful practice, and in consequence of its having been much abused or unnecessarily resorted to by bungling and cruel veterinarians, it has fallen into great disrepute. The Arabs use the firing-iron as a sort of panacea for horse diseases, and only those that are akin to them in moral nature will follow their barbarous example in its indiscriminate use. In some cases good veterinarians claim that it really exerts great therapeutic power, while others claim it does no good whatever. When Prof. A. Liautard, of the American Veterinary College, was queried in reference to firing he gave the following reply: The operation of "firing" is one to which Americans often object in the treatment of diseases, and owners of horses very often refuse to have their animals submitted to it. The objections are made both on account of the blemishes which may follow, and for the failures which have often followed the treatment. Marks cannot be avoided; in fact they are a necessary consequence of the operation, if it is properly done, unless the firing is very light. The failures are not necessarily due to the inefficiency of the operation, but more frequently to the incomplete manner of its performance. Of course we would not convey the impression that all cases will be followed by certain recovery after the application of the actual cautery, but our long experience justifies us in saying that in the immense majority of cases it has either brought cure, or at least great relief; and we know many cases of lameness, for instance, where all other treatment had failed, in which "firing" was followed by the most satisfactory results.

"Firing" consists in the proper application to living surfaces of a high degree of heat, which will irritate or even destroy those surfaces, either superficially or deeply.

According to Prof. Bouley, the cases in which "firing" may be used are quite numerous. He recommends it in diseases of the joints, when bony deposits are developed on the borders; in injuries of ligaments; in diseases of bones, of tendons, of muscles; and in some nervous affections. Still farther, he advises its use as an auxiliary in pneumonia, pleurisy, etc.

The reader will see from this that "firing" is employed with very different objects. Several modes of "firing," are used; that known as the "Objective Firing" is where the caloric is transmitted to the living parts by radiation, and not by direct contact of the heated instrument. It is a dangerous mode of operation, which requires a great deal of care, else it may be followed by ugly wounds, which may leave bad blemishes.

"Transcurent Firing" is the one most commonly used, and is performed with special-shaped instruments called "irons," or "cauteries." Some are knife-shaped, and others pointed. Hence the cauterization in one case is in lines, and in the other in points and dots. The lines are used principally for large surfaces, while the dots or points are used upon limited spaces. These are preferable, as they leave fewer marks afterwards.

A third mode of "firing" has recently been introduced into veterinary surgery, known as "Needle Firing." This is different from the second mode of operation, as the instruments are fine needles, which are introduced while hot, through the skin, and sometimes through the tissues underneath. In cases of large bony growths most advantageous results have been obtained from this method. The operation, when properly applied, requires no other application than that of the red iron; it is, however, customary in America to join to it blistering. This, however, could be well dispensed with, if the "firing" was properly done. The following are the unfavorable results which may follow "firing," and are of so little importance that they will by themselves show how little risk there is in the operation:

1. Section of the skin, if the iron is applied too hot and heavily, healing rapidly.
2. Bleeding, when the instrument used is rough and sharp, and pressed too hard on the skin; this is generally harmless and stops of itself.
3. Tearing of the scabs by carelessness in the attendance after the operation.
4. Sloughing off of large pieces of skin, when the "firing" has been too deep, or when greasy substances are used in connection with the operation.
5. Irregular blemishes or cicatrix, results of the above accidents, which it is impossible to remove; and which ought not to take place at the hands of a skillful operator.

Firkin (fur'-kin), a measure of capacity, being the fourth part of a barrel, or about eight gallons; also, a small vessel or cask of indeterminate size, used chiefly for butter or lard.

Fiscal, pertaining to the period of accounts; as, "fiscal year," the year of opening and closing an account or report, which is made by the year.

Fish, one of the four great classes or primary divisions of vertebrated animals; and although the lowest form of vertebrates, their varied forms and colors, which often rival those of precious stones and burnished gold, the wonderful power and velocity of some, the wholesome food furnished by many, and the exciting sport of their capture combine to render fish subjects of greatest interest to the casual observer, as well as to the amateur and professional naturalist.

Of all vertebrates the fish is the simplest in its structure, and the great geologic book of nature shows us, on opening its rock leaves, that it is the oldest. The organs of fishes are adapted to living under water. In place of lungs they have gills. Instead of four legs like animals, or two legs and a pair of arms, they have two pairs of fins, called branchial and ventral. (Toes

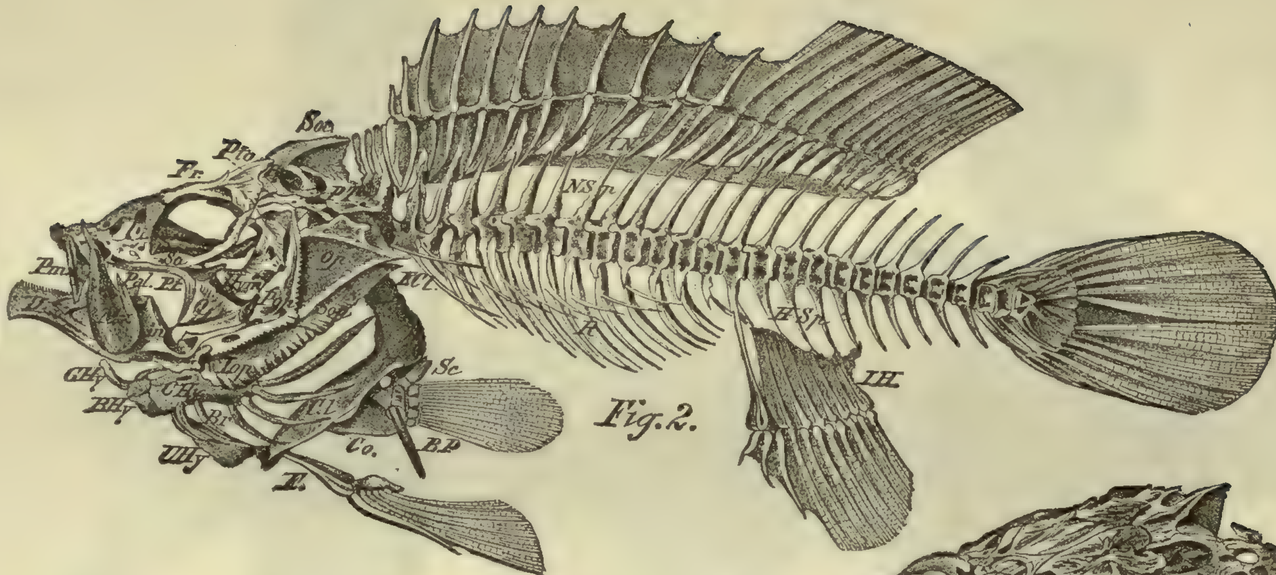


Fig.2.

Fig.3.

FIG. 1.—*Skeleton and Skull of a Percoid Fish. The Letters are Abbreviations of the Names of the Bones Given.*

NSp, Neural spines; IN, internal bones; HSp, hæmal spines; IH, interhæmal bones; R, ribs; Soc, superoccipital; PT, plerotic; ECl, epiclavicle; Cl, clavicle; Sc, scapula; Ba, Pectoral basilars; Co, coracoid; the bone behind it is post-coracoid; Op, operculum; Sop, sub-operculum; Iop, interoperculum; Pa, parietal; Hym, hyomandibular; Q, quadrate; at the right-hand upper corner is situated the symplectic; CHy, ceratohyal; Br, branchiostegal rays; BHy, basihyal; GHy, glossohyal; UHy, urohyal; Fr, frontal; So, suborbital; An, angular; D, dentary; Pmx, premaxillary; Mx, maxillary; Pal, palatine; Pt, pterygoid; F, femur. Fig. 3. Oblique vertical view of the skull represented in Fig. 2

and fingers are represented in fish by the rays and membranes of fins.) Besides these two pairs of fins, they have dorsal, sub-dorsal, caudal and anal fins—varying with different families and greatly modified. They breathe or oxygenate their blood by taking water into their mouths, passing it through the gills and out at the opening of the gill-cover. The eyes of fishes cannot be closed. Whether they sleep or not is a mooted question. Their eyesight is very acute, making up in sensitiveness for the lack of some of the other senses—except in some of the cave fishes, in many of which the eye is only rudimentary and not observable from the outside. The skeletons of fishes vary. Some are very bony, with bones as tough and nearly as hard as horn; while others have, instead of bone, only cartilage. Most fishes have scales and some of the scaly fishes, known as ganoids, have a glutinous substance covering the body, called ganoine. Ctenoid scales have their posterior edges pectinated or saw-shaped, while the cycloids have smooth-edged scales.

The tail or caudal fin is the propelling power, principally—the side, or paired fins being used for balancing. Most fishes can swim very rapidly and some of the migratory fish make long journeys in an incredibly short space of time. Most fishes are furnished with a membranous bag filled with air and called the swimming bladder. This enables them to increase or diminish their specific gravity, and so float or sink as they desire.

The life of a fish is devoted to procuring food and escaping from its enemies, at which they become expert or careless as dangers are more or less numerous about them. Their growth depends on the quantity of food taken and the amount of exercise required to procure it, and the temperature of the water in which they live. The warmer the water the more rapid their respiration, or in other words, the faster they live the more rapidly they will digest the food they take.

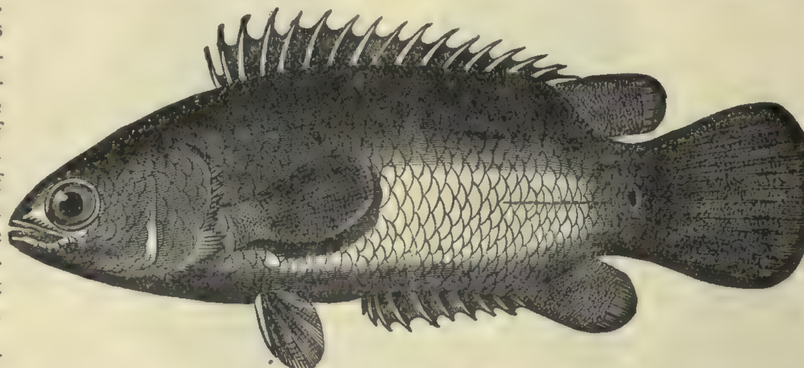


FIG. 2.—*The Climbing Fish, of India.*

Such fishes as spend a portion of their lives in fresh and part in salt water are called migratory. Those that, like the salmon and shad, make their growth in the sea and migrate up our streams to deposit and mature their eggs, are called anadromous. Those that, like the eel, procure their food and growth in fresh water and return in the fall of the year to the ocean to hibernate and breed, are called catanadromous fishes.

The shape or position of the opening of the fish's mouth tells whether he is a top, bottom, or middle feeder. The sucker, buffalo, sturgeon and others of their class have the mouth opening downward and feed upon the bottom. The bass, croppie and many of the percoids have the mouth opening upward, thus saying to us that they approach their food from below; while the trout, pickerel, and most of the cyprinoids, with their mouth opening directly in front, go straight for their food. Some have no teeth; but generally there are large numbers in different parts of the mouth and throat, which vary widely in form, number and position. The horrid set which the shark carries is regularly shed and replaced by new.

As to whether fishes hear or not is an undecided question. Some ichthyologists do not believe that fishes have an organ so sensitive as to feel the vibration of air caused by talking or any ordinary sound above the water; and that they can be called by the voice or by whistling, they think are mythical assertions. To such concussions as cause the ground or water to vibrate they are extremely sensitive. For instance, thunder, the firing of a cannon, etc., in the air and entirely away from the water, and anything that directly causes a vibration of the water, like the striking of an oar against the side or bottom of the boat ever so lightly, will cause the fish almost instant alarm. Some think that the scales are connected by small nerves with the nerve centers, and that hearing

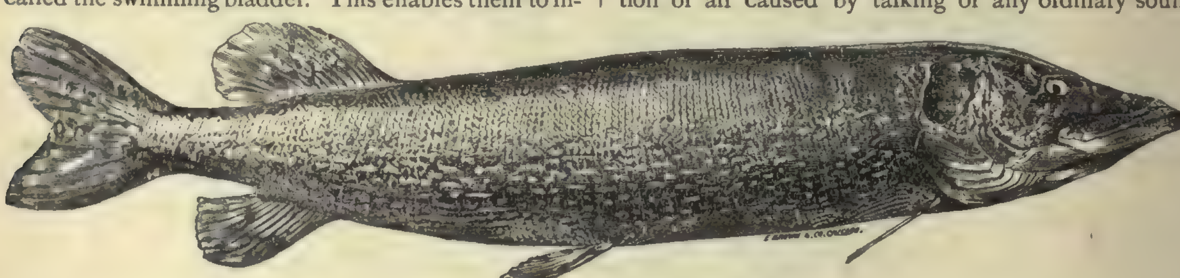


FIG. 3—*Pike.*

with the fish is sensitiveness to the vibrations of the water only—conveyed to the senses through the medium of the scales. All fishes have scales, even the brook trout, eel, etc., that to the naked eye appear scaleless.

Most fishes are oviparous in their manner of reproduction; but some species bring forth living young. They produce a far greater number of eggs than any other vertebrates. A salmon sometimes contains as many as 20,000 eggs; a perch, 28,320; a herring, 36,960; a mackerel, 546,000; a flounder, 1,357,400; a sturgeon, 7,635,200; a cod, 9,344,000; and a species of Upeneus, 13,000,000.

Fresh-water fish of many species are everywhere regarded as delicious food, and sought after with avidity, and in many districts they constantly form an article of luxury to some classes and of commercial profit to others. Fish from the seas as well as fresh, and in great variety, enter largely into human diet. Catching fish, for pleasure and profit, is one of the absorbing employments of men, and has been from the remotest time of which we have any knowledge till the present. Until quite recently the native wildness of fishes was supreme and undisputed; but now the art of man has contrived a system by which fish can be domesticated and cultivated for profit. It is true that the subject of securing from the waters a larger supply of fish than they would spontaneously afford, has attracted the attention of various nations from a very remote period, one of the first and simplest methods consisting in the collection of fish into natural or artificial ponds or reservoirs and allowing them to prey upon each other, or by supplying food to them artificially. This plan was in vogue among the Romans especially, and it is asserted that not infrequently the food thus supplied consisted of the flesh of slaves, which, it was claimed, imparted to the fish a rich and delicate flavor. The claim has been raised in behalf of China as having earliest practiced pisciculture. But if by this is meant the artificial fecundation of the eggs of fishes and raising them in limited spaces, the assertion can hardly be sustained. It is true, however, that very great ingenuity has been expended in China in securing the fertilized eggs of fishes after they have been already deposited, in rearing the young fish, and in stocking the waters with the best adapted varieties. In this respect they may be said to have practiced the art of aqua-culture from a period far antedating the prosecution of the same art by any other nation. As far as the eggs of fishes were concerned, their efforts were confined to finding the localities where they had already been deposited, and taking them from the water by means of fine nets, or by having the eggs deposited on fine mats or gratings, and then hatching them on the spot, or carrying them to other desirable places, sometimes to great distances. The histories of many of our older countries give us information in regard to the culture of fishes by similar methods for long ages past. The introduction of the carp into Germany dates back to the twelfth century, and their cultivation in the German states has developed into a permanent industry; but these old methods can be called fish culture only in a very restricted sense. But not until recently in this country has anything been done toward fish culture worthy of mentioning; now, however, the term "fish farming" has become quite common.

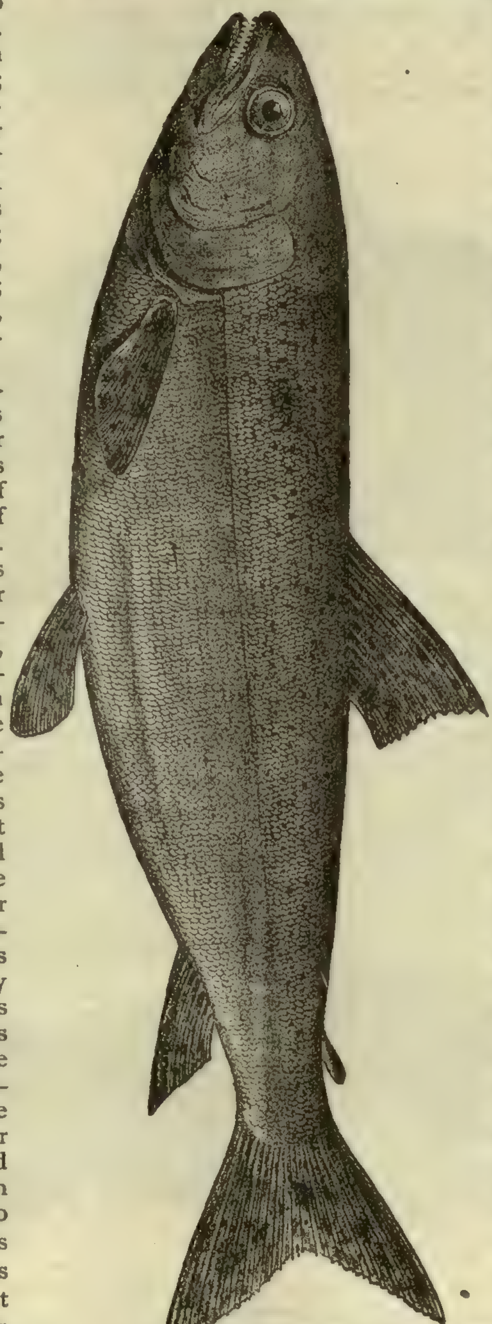


FIG. 4.—*California Trout.*

FISH CULTURE. There are few subjects of more importance to the material welfare of our country, or that a persistent and willful disregard of the laws of nature has rendered more necessary, than the culture of the various tribes of fish that were once so abundant in our rivers and lakes, and along our coasts. One peculiarity of the American people is, that they attack, overturn, annihilate, and then laboriously reconstruct. The pioneer farmers chopped down the forests and shade trees and took crop after crop of the same kind from the land, exhausting the soil and making bare the country; they hunted and fished, de-

stroying first the wild animals, then the birds, and finally the fish, until in many places scarcely a specimen was to be found. Then, when they had finished their work of destruction, the restorer came and began to manure the land, left it fallow, put in practice the rotation of crops, planted shade and fruit trees, discovered that birds were useful in destroying insects and worms and passed laws to protect them, and now they are turning their attention to re-stocking streams, rivers and ponds with fish. Experiments in fish culture, except that above referred to, were begun in the salmon streams of Scotland in 1833, and in 1837 a few fish were artificially hatched and reared to the age of two years. But we are indebted to two Frenchmen, Remy and Gehen, for what we know of practical fish culture. Being fishers for a livelihood, they saw and deplored the steady diminution of fish in the streams they frequented, and, seeing how myriads of eggs were spawned and came to nothing, about 1832 they studied out a means for preserving them and making them fruitful. Their efforts were rewarded with success, and out of their work has sprung the rising industry of fish farming.

The methods of fish culture are the same in all properly conducted establishments in Europe and the United States. In the spawning season the female ascends the stream, digs down into the gravel and deposits her eggs. The male goes over the eggs to "milt," or impregnate, them, and the milt and spawn are deposited at the same time. The female then returns and covers the eggs with gravel, and they are left to become the prey of other fish, fowls, or reptiles, or, perchance, to hatch. The fish farmer simply secures the eggs, sees that they are impregnated, watches their hatching, protects the fish from their natural enemies and unnatural parents, feeds them and brings them to maturity. There is nothing elaborate or intricate in it. The more important part of the business is to provide impregnated eggs and young fish for transportation, to re-stock rivers, to sup-

FIG. 5.—*Carp.*

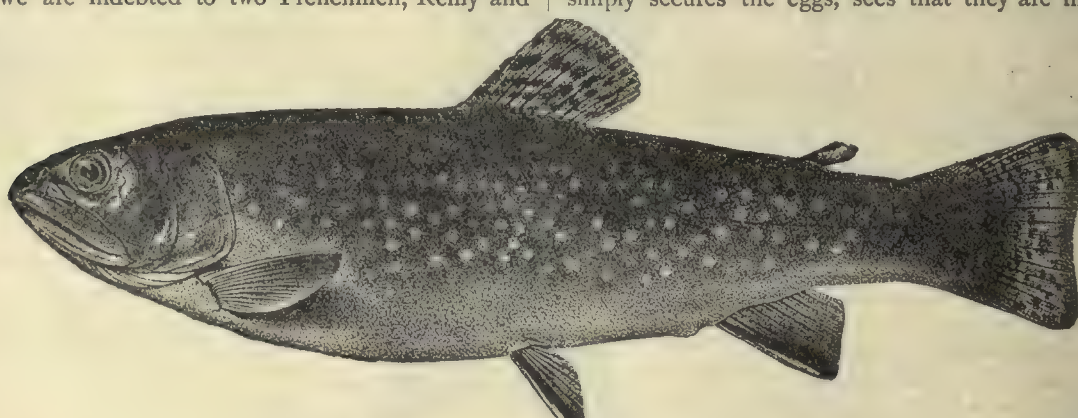


FIG. 6.—*Brook Trout.*

ply the numerous private ponds, and to raise sufficient fish for further breeding.

The essentials for a fish farm are clear spring water ponds for fish of different ages, and a hatching house.

The necessary implements are a bucket, tin pans, a ladle, a small net, a syringe for feeding, nippers and a siphon to remove dead ones. A stove to warm the house, troughs, divided into boxes, for conveniently distributing the eggs, and the young fish, when hatched, complete the establishment.

When the breeding fish are "ripe," that is, ready to spawn, the farmer fills a tin pan with pure spring water, over which he holds the male fish in his left hand, keeping the fish's belly under water, while with his right hand he compresses the fish, and with his fore-finger gently presses out the milt. The female is then taken in hand and her eggs pressed out in the same way. This process, even under the most skillful handling, and the speediest return of the fish to the water, is quite exhausting and is fatal to about three per cent. of the parent trout. Experiments have accordingly been made to arrange wire screens in the ponds, on which the trout may naturally spawn, when the ova thus impregnated may be removed to the house. This has been done with success in New York and elsewhere.

The above directions are according to Seth Green, the pioneer fish culturist of this country. Others instruct to use as a receiver of the extruded spawn and milt a perfectly dry porcelain, or other non-corroding dish, and immerse the hands in water to prevent the glutinous covering of the fish adhering to the hands, which injures the fish. By this procedure the milt of the male is dropped directly from the body of the fish upon the ova of the female. As soon as the milt is dropped pour water on to cover the eggs, and stir with a quill, glass rod, or tail of a fish. It is thought that greater success is secured by dropping the eggs dry.

The eggs, after 40 minutes' contact with the milt, are transferred from the pan to the hatching boxes, and evenly spread over the clean bed. Over this bed flows a stream of filtered water. The boxes should be watched in regard to cleanliness and temperature of the water, and for the immediate removal of any dead ova (eggs). The death of the eggs may be known by change of color. According to temperature, in from 40 to 125 days, the eggs will hatch. For 45 days the young fish is fed by the yolk-sack attached to it, which is gradually absorbed. The young fish is now an inch and a half in length, and must be fed with beef liver and sweet cream (all cream is better), finely chopped and sifted, mixed with water, and supplied to the boxes through a small syringe, taking care to furnish enough, but not too much, as the food not eaten will foul the boxes and kill the fish. In six months the fish is three inches long, and must be fed with sifted curd. In a year it is six inches long, and is removed to a pond, where he and his fellows will be safe from larger fish, to make room for fresh ova in the hatching boxes.

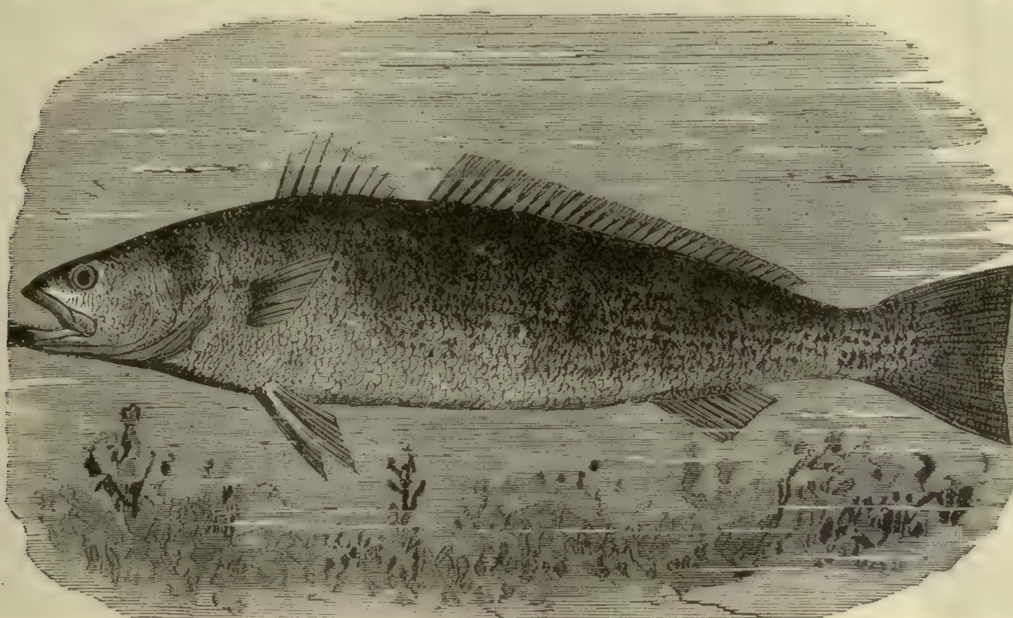


Fig. 7.—*Weak Fish.*

The fish may now be fed with finely cut liver, with curds, grasshoppers, and with small, chopped fish, on which they will thrive. At the end of the second year they will be ten or fifteen inches in length.

The spawning season for shad is from February to June. The spawn of these fishes is put in hatching boxes, and immersed in the river to be stocked, and

with water at 75° the eggs will hatch in eighty hours. The young fish subsist for three days on the yolk-sac. The female shad at two years old will weigh two pounds; at three years, three and a half pounds; at four, six pounds. The wonderful fecundity of shad, the ease with which they can be bred, and the fact that they need no subsequent feeding or care, make them peculiarly profitable for pisciculture.

Trout, according to age, will yield from 200 to 4,000 eggs. The annual yield of salmon is estimated at 10,000; shad, according to size, yield from 50,000 to 100,000 eggs. The work of the fish culturist is to preserve this spawn, to make it productive, and so to supply unlimited quantities of the best kinds of fish for market.

Filters for the hatching house are provided by means of one or more flannel screens laid under the spigot which supplies the trough.

In selecting a site for a fish pond be sure that the supply of water is unfailing. It would be convenient, though not absolutely necessary, to have such a fall that every pond could be drained, and the pond should be so situated that overflow from freshets is impossible. For this reason it is better to make ponds at one side of the stream instead of damming it. Ponds for fattening purposes are made 12 x 24 feet, either square or oval. In preparing ponds it is better to enclose the water with stone or wood, because embankments are liable to be punctured by muskrats, which liberates the water. If stone is used cement the sides and grout the bottom. There should be 30 or 40 inches of water in the pond constantly.

Adult fish should be fed regularly once a day, and they should be fed till they will eat no more. It is good economy to cut the feed finely and feed slowly.

The preceding directions pertain mostly to the propagation and culture of trout. White-fish, salmon trout, and other fish can be similarly propagated, but require deeper water for growth, according to their various habits.

In rearing fish the greatest difficulty is in protecting the eggs. B. F. Shaw, Fish Commissioner of Iowa, in some very practical observations on fish culture before the Farmers' Institute of that State, says: "It is well known that there is no more attractive food for fishes than the roe or eggs of fish; even the parent fishes devour them greedily. It is generally granted that at least 60 per cent. of all the eggs are devoured before the fish are hatched, while of the 40 per cent. hatched probably at least three-fourths are eaten while in a helpless condition with the yolk-sac attachment, and before they are able to feed themselves, or take any measures for their own safety—in fact, with just enough vitality and motion to attract their enemies.

"Again, a serious loss is occasioned under natural conditions by the failure to vitalize the eggs. Probably less than 20 per cent. are ever vitalized. These estimates reduce the numbers of fish produced from a given number of eggs to two per cent. that live to a point in their lives where they are able to take their own food under natural conditions; while by artificial methods 95 per cent. is not an unusual result, and 40 per cent. loss would be considered very bad work indeed. From this point on, the fish would be subject to the same dangers in both cases.

"Fish culture is but just in its infancy, and, while much has been already accomplished, very much more remains to be done. We have yet more fully to

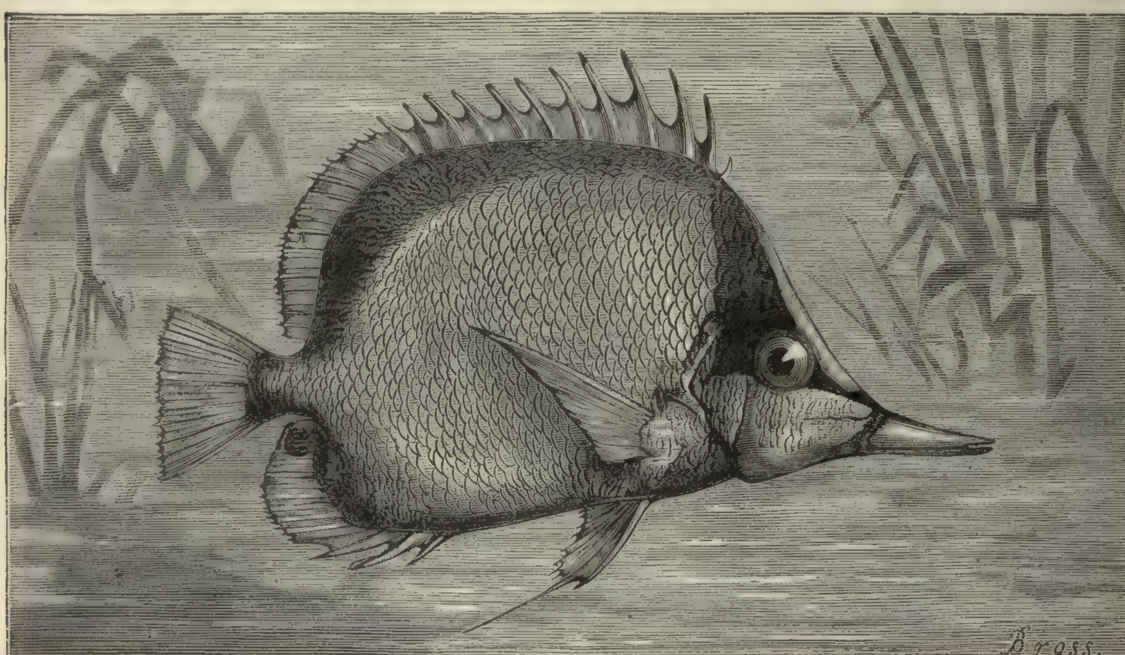


FIG. 8.—*Long Nosed Chelmon.*

study the character of every lake, pond, river, reservoir or other waters, in regard to its character and capacity to produce fish. What is its temperature, what does it now produce in the way of fish, and what would be better suited to it? What are its present productions—vegetables, infusorial or insect life—that will furnish food for fishes, and what of these that, if introduced, would find a suitable home? To illustrate, let us examine one of our smaller lakes. We find a few bass and wall-eyed pike, but we find them in small numbers, of small size, lank, lean, and with a ravenous look. These facts give us evidence that, while the water is suited to produce these valuable fish, the food on which they live and thrive is wanting in their haunts. They are carnivorous. They live almost wholly upon minnows, and these we will find almost if not entirely wanting. In our explorations we find a bed of water plants. We pull one up, and find it covered from end to end with small insect life—too small to be of any use to the carnivorous fishes, but precisely what would delight the stomach of a smelt, and make him a fish paradise. We introduce the smelt. He lives, thrives and grows, and in a short time the water will be swarming with young smelts. We dip up a paddle full of mud from the bottom of the lake, and we find it filled with small red worms, and other forms of infusorial life. We know that this is the food of the buffalo, red horse and sucker. We at once introduce a few large buffaloes. He finds these rich banks of mud and infusoria much sooner than we could, and turning his tail to the surface of the water, he soon fills himself with the portions of the bank richest in that nourishment on which he lives and thrives. Soon we shall have added to the lake millions of young and many large buffaloes. Again, we find varieties of tender water vegetation. We know that upon these the carp and other vegetable-feeding fish live and thrive. We at once introduce the carp. He finds a happy home. He grows and rears his millions of young carp fry—estimated as high as 300,000 for a five-pound fish.

"So we can go on to almost indefinite length and utilize the various conditions we may find, but we are now turning the insects into smelts and minnows, the infusoria into buffalo, red horse and suckers, and the water vegetation into carp and other valuable varieties of vegetable-feeding fish. But I think I hear some one say, 'I do not like suckers or red-horse; they are poor food, and the buffalo is but little if any better, and the carp and smelt are too much in the future, and so are only speculative.' Very well, my friend. I shall tell you that these fish are much better than the insects, infusoria mud, or water vegetation for human food; but these are not the results we were aiming at; they are still to follow. Some day one of the lank, lean bass which has been living upon his own young until there are no more to live upon, pressed by a voracious appetite, determines to change his diet. He catches a young smelt. In place of the hard, scaly armor of the young bass he finds the soft body of the smelt; instead of the stiff, sharp-pointed spine rays of bass fins that so often have very nearly taken his life as he has gorged his old food, he finds only the soft, velvet fins of the new. He needs no further argument to cause him to henceforth forswear the bass and take to the new food. He took the old, obnoxious, unnatural food sparingly, for the labor and pain of taking it made him do so. This caused his for-

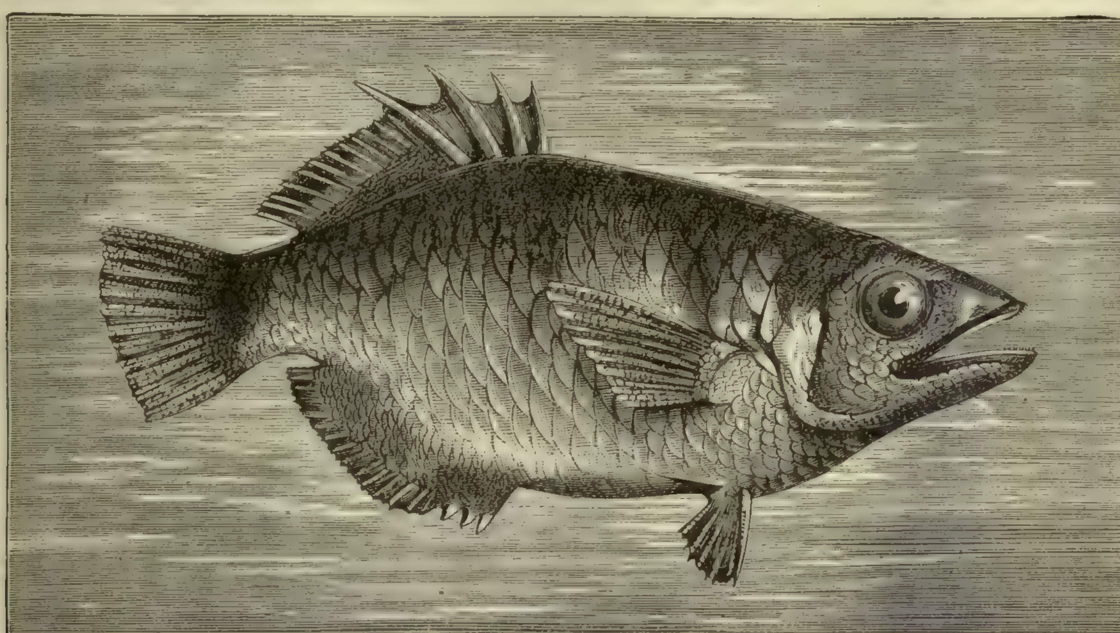


Fig. 9.—*The Archer Fish.*

mer small, lank, and lean condition; and because he took the young bass for food, you have a reason for their former scarcity. The eating of the new soft-rayed, finned fishes is a luxury, and their plentifulness insures him a full meal with but little labor, and with these conditions he will soon grow in size and fatness, while the immunity given to the young bass will soon cause the water to teem with them. So we can evolve our bass, wall-eyed pike, salmon, brook-trout and other valuable fish from the insect, the infusoria, the vegetation and other sources of food by simply furnishing missing links. Is there anything further we may do upon the ground, or rather water, we have just gone over? Let us see. Suppose when we pulled the weed we found no insect life, but we knew that in an adjoining water the same weed were alive with insects. How easy to carry a stem of the weed with its insects from the one to the other; and where is the housewife that has seen the one solitary fly of spring-time grow into millions before the frost of winter, that could not foretell what the transplanting would soon accomplish; or, again, if when we dip our paddle of mud, we find, instead of a soil full of infusoria, a rich but barren muck or marl, in which the insect-bearing weed thrives, how easy to transplant an insect-covered weed and thus furnish a source of supply for both weeds and insects; or if, instead of the proper soil, we found only sand or gravel, we could still introduce the proper soil itself. Thus, if we found only barren water, with a sand or gravel bottom, we could introduce the proper soil, the weed, the insect, the smelt and the bass, successively."

The above are not barren theories but are facts that may abound in practical results to the farmer. He may make the barren water abound with princely fish, by a little care and labor, which when once entered upon will afford him a vast deal of pleasure and satisfaction in prosecuting. The cultivation of fish in private ponds is carried on only to a limited extent, but the success met with where properly conducted and the comparative profits realized upon labor and food used in raising fish, and the future demands of our rapidly increasing population will conduce to turn the attention of our people more in the future than in the past to a subject so big with the health, wealth and prosperity of coming generations. The famous brook trout, the lake or salmon trout, the California or McCloud River trout, the mountain trout, and grayling for ponds fed by springs, and the scale, leather or mirror carp for other ponds, are a few of the better fish for domestication. The results reached already in their cultivation have been a surprise to those who have cultivated them and studied their habits

VARIETIES OF FISH.

The subject of preserving and propagating fish leads to the consideration of varieties. We give a list of many of the more common fresh-water fish arranged alphabetically, with short observations on each. The list is far from complete, but comprises most of those worthy of mention. We give only the common names by which they are known, and where the same fish is known by different names in different sections we give the several names.

Bass. We mention the two most important species.

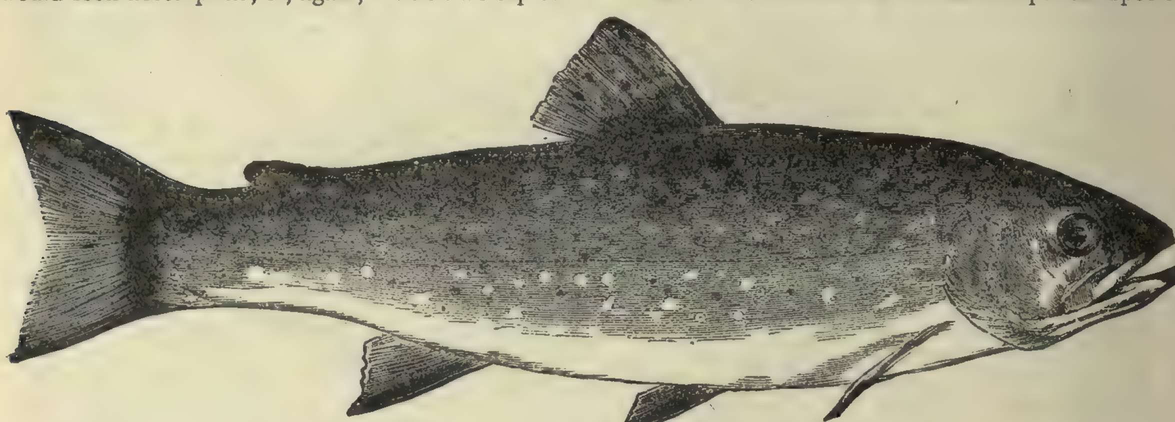


Fig. 10.— *Trout.*

Black Bass. This is eminently the game-fish *par excellence* of western waters. It is not so particular in its habitat as trout. If the waters are very clear, any brown or black fly will answer in baiting them. For trolling the necessary tackle consists of a strong hand-line of linen or cotton from 25 to 75 yards long, a medium-sized swivel, and a spoon hook, and the usual accompaniment of red and white feathers and a group of hooks. The ordinary tin or brass spoon with a single hook, soldered on with a swivel, will be found equal if not superior to the late inventions. Still fishing is generally done from an anchored boat. This is a very popular method, and the one generally practiced in the Northwest. The finer and more delicate the tackle employed, the greater will be the sport; but, as a rule, still fishers use clumsy tackle. When the bass takes the bait, let him have it for a a short time, say from five to ten seconds, according to his mood, whether he is on or off his feed, whether eager or shy; and by using the thumb as a drag, give him line as he needs it, but not too freely, always

keeping it taut enough to give a slight bend to the rod, so as to be able to feel every motion of the fish. At the proper time the angler must check him by pressing the thumb a little harder upon the reel, and if he gives a succession of short tugs or slight jerks, let him go for a few moments; but if he seems to feel the steel, or if he pulls steadily and strongly, hook him by a "slight twist of the wrist," not by jerking or "yanking" the rod, for in the latter case there is a stronger probability of breaking the rod, or at least of tearing out the hook, than of hooking the fish. When the bass is hooked, the angler must never, under any circumstances, give him slack line. If he breaks water, merely let the rod straighten as he falls back; and never, under any circumstances, must he grasp his rod above the reel, at most not more than several inches above, for by so doing he destroys the spring and balance of the rod, and it is liable to become broken by any sudden movement of the fish. The bass must be killed "on the rod," then reeled in and taken into the landing net.

In trolling or casting with the minnow, when a fish is hooked let the oarsman pull out at once to deep water, so as to give the fish better play and more room, and also to prevent his taking to the weeds.

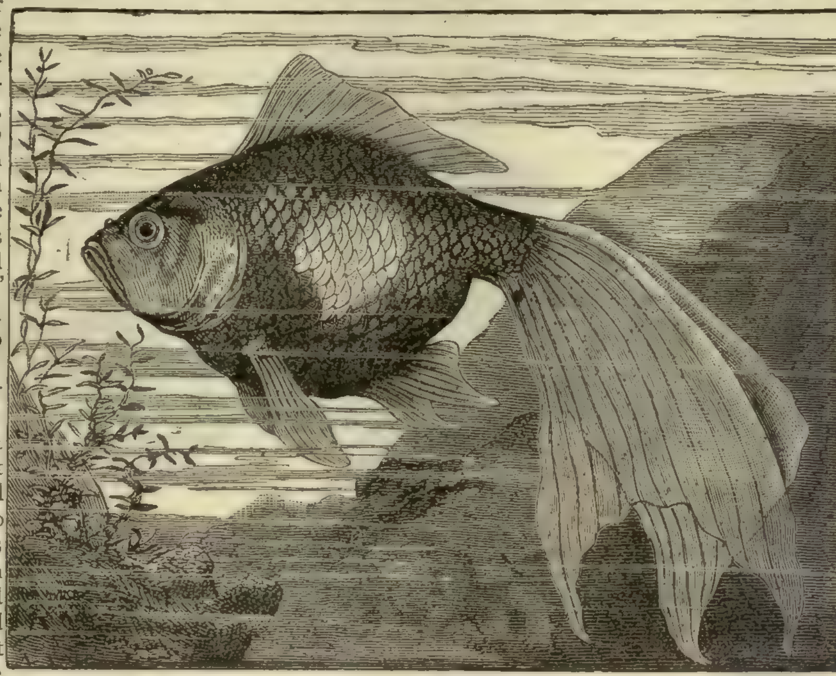


Fig. 11.—*The Kingo Fish.*

The angler should never be in too great a hurry to land his fish, for if he is well hooked he cannot get away; but if he is hooked in a thin or weak part of the mouth, there is a greater necessity that he should be gingerly played and tenderly handled, until he is completely "tuckered out" and turns up his belly to the sun. There is never anything gained by too great a hurry in bass fishing. On the contrary, "the more haste the less speed," is a maxim particularly applicable to this case.

In landing a bass the oarsman should, at the proper time, hold the net just under the surface of the water, and hold it perfectly still while the angler brings the fish into or immediately over the net, when the oarsman should lift it quickly and with one motion. He should never be suffered to follow the fish with the net, or by sudden lunges attempt to secure him; for this only serves to frighten the fish and put your tackle in jeopardy. Remember that the largest bass always escapes when nearest the boat, about to be landed.

Straw, *Rock*, or *Calico Bass; Goggle-eye;* or *Croppie*. This fish is a good pan-fish, and a free biter, but destitute of game. Spawn on gravelly bottoms, in April; are taken in great numbers with minnow bait early in the season; weight from one to two and a half pounds.

Buffalo. This is one of the largest of the suckers found in western waters. Is generally caught with the spear or "gig," and with the seine. Can be caught with a hook, by a bait of corn-meal dough and cotton. As soon as he begins to nibble or suck, throw the pole suddenly to his rear, so as to make the hook catch a thin hold of the lip; give him line until he is worried down, then draw him near and harpoon him, or secure him with a gaff-hook. His flesh has rather a muddy flavor, but it is popular among the western people.

Carp. This fish is now attracting the attention of practical pisciculturists in this country. It was first introduced into this country from France in the year 1832. They were first placed in a pond near Newburgh, on the Hudson, and afterward introduced into the Hudson, where they multiplied very rapidly, and have since been introduced into the Southern States, over which they have spread quite generally. There are three kinds which are profitable,—the common scale carp, with scales regularly and normally distributed over the body; the mirror carp, with scales limited to the regions of the bases of the fins and the hinder parts of the lateral line and thus enlarged; the leather carp, with scales entirely or almost entirely lost, leaving the soft, naked skin. The growth differs according as the fish inhabits cold or warm water, a river, lake, or pond, finding plenty of food therein, or being fed. An additional factor is the quality of the soil, whether muddy or stony. In cold water or such as has a stony ground, it will not flourish so well. In the culture of trout they must be fed, while the carp, if it

be cultivated judiciously in ponds, needs no feeding. The normal weight which a carp may attain in three years, whether it be scale, mirror or leather carp, is an average of three to three and one-quarter pounds; that is, a fish that has lived two summers will weigh two and three-quarters to three and one-half pounds the year following. They live to a very advanced age. Specimens are found in Austria over 140 years old. It increases in length only up to a certain age, but in circumference till its 35th year. As for food supply, carp will eat almost anything, either vegetable or animal, though the former is the preferable. It has been said that they will eat anything that a hog will. Wild rice is an excellent food for them, and where pond lilies or other aquatic plants do not already exist, the sowing of wild rice will furnish them all the food they need. Many farmers can make more on an acre of water in raising carp than they can on an acre of land, and the Government stands prepared to furnish them, without cost, the necessary material for planting.

The CATFISH, or Cat Family, comprises a dozen or more varieties, most of which are not worth mentioning in their relations to the angler.

The *Great Lake Catfish* grows to a great weight, often reaching 80 pounds. Its general color is olive brown. It is not generally esteemed as food, although it is much eaten, and by some persons well recommended. Like most of its congeners, it prefers the mud.

The *Common Cat*, the *Bullhead*, *Horn Pout*, *Bull Pout*, or *Minister*, has a wide range, and too great a notoriety for his worth. Its color is dusky. Is caught from first of April throughout the summer, with almost any kind of meat or worm bait, in ponds or lakes where the bottom is muddy. Many people eat them and like them.

The *Channel Catfish* is the best of his tribe, and is generally found in clear, pure streams in the Middle and Southern States. He is of a clean greyish blue color, and makes some sport on the hook. A good table fish.

There are but two species of catfish found in the West—the Mud Cat and the Lake or Channel Cat. The former is worthless, but the latter, which is common in the waters of the Upper Mississippi, is universally regarded as a fine and healthy food fish, and is much sought for by many. It is of a dark brown color. sometimes nearly black; attains a large size, occasionally weighing as much as 100 pounds, taken with hook and line, with any kind of bait from a piece of wheat dough to any piece of meat. Beef's liver is a favorite bait. On the hook they are strong and most obstinate, and will often carry away the strongest tackle.

Night fishing with a lantern or torch is the most successful for all kinds of catfish.

GRAYLING, MICHIGAN GRAYLING. There is no species sought for by anglers that surpasses the grayling in beauty. They are more elegantly formed than the trout, and their great dorsal fin is a superb mark of beauty. When the well-lids were lifted, and the sun-rays admitted, lighting up the delicate olive-brown tints of the back and sides, the bluish white of the abdomen, and the mingling of tints of rose, pale blue and purplish pink on the fins, is displayed a combination of living colors that is equalled by no fish outside of the tropics.

FIG. 12.—*Grayling.*

In shape the fish is like a trout,—a trifle slimmer, perhaps, and not so thick near the tail; but the fin on the back of a trout looks so small and square, so deficient in outline and color, after beholding the graceful curve of a grayling's dorsal. The scale is large, silvery, with sometimes a copper tinge; near the shoulders there are black spots, sometimes triangular, and at others V-shaped; in some fish these extend nearly to the tail near the back; they are in lines which gradually shorten towards the belly; the mouth is small (nearly square when opened), and the teeth are merely a slight roughness on the lips: none on the tongue.

This tribe of fish bears marked relationship in many respects to the salmon. It inhabits the cold streams of many portions of the United States, Canada, Europe and Asia. It is a game fish of the first quality, takes the fly with avidity, and carries on a brave and spirited contest with its captor. Its flesh is white, or faintly straw color, and excellent in flavor.

Its habitat is the center of the lower peninsula of Michigan, among three rivers of note, where it most abounds,—the Muskegon, the Manistee, emptying into Lake Michigan, and the Au Sable, emptying into Lake Huron. Among the minor streams are the Cheboygan, Thunder Bay, and Rifle, tributary to Lake Huron and the Jordan, emptying through Pine Lake into the Traverse Bay of Lake Michigan.

The grayling is a spring spawner—spawns in April, and is in best condition and fighting trim in September. They take the artificial fly as greedily as trout do, are angled for in precisely the same spots where trout would be sought. He certainly affords as much sport as the trout, and his tender mouth requires more careful handling.

GOLDFISH; GOLDEN CARP. A well known species much fancied for globes and aquaria, often growing to the length of a foot. Body generally brilliant red or orange above and silvery beneath, although they are found grey, silvery, golden, mottled with black, olive, or almost black even. Their colors vary as much as those of litters of cats or dogs.

LAKE HERRING. These fish are very numerous in the shoaler waters of Lake Erie and the western lakes, and very much resemble the salt-water herring in size, form and color. They seldom attain a weight of two pounds. They are not especially sought by the angler. Insects are the best bait, however. They are found in more or less abundance at all seasons of the year, though they swarm in greatest numbers about the middle of November, which is their spawning season. They are not a favorite fish in the market, being rather deficient in qualities as a fresh or salted fish; but when slightly pickled in brine, and exposed to the smoke of a hot fire for a short time, make most delicious food.

HOGFISH; SPECKLED RED-MOUTH; SAILOR'S CHOICE. One of the best Southern food fishes, and is angled for from boats by still baiting with shedder or soft-shell crab. It is excellent when boiled or stuffed and baked. It should be skinned with a sharp knife, as its scales are very tenacious. Body above pale brown, belly silvery; sides marked with numerous orange-colored spots—those above the lateral line in oblique rows, those below it in horizontal rows; fins yellowish, marked in the same way; sides of the head pale blue, with yellow spots. This fish appears in April, and continues until November. It is very common in Bermuda and is caught as far north as Chesapeake Bay.

MASCALONGE. Common in the lakes, and in the larger tributaries of the Mississippi. In seasons of low water, mascalonge fishing is as good in this region as in the Northeastern States. The fish are usually of large size, from 10 to 40 pounds in weight. The manner of taking them does not differ materially from that practiced in other waters, except, perhaps in the fact that trolling from a boat is not generally successful. For excitement no angling can compare with taking mascalonge on rod and line from the shore, or by wading out on the bars. To kill in this manner a 30-pounder and tow him 10 or 30 rods to shore requires nerve and strength, great skill, and very strong tackle. Many of the very largest are frequently lost by weak tackle and unskillful playing.

PERCH. There are several good varieties of fish under this general name.

Yellow Ring Perch. Sides yellow; six to eight dark vertical bands over the back; fins orange.

The yellow perch is one of the most widely distributed of our fluviatile fishes. They are sometimes caught weighing three or four pounds, and even more. Take bait freely, and are often taken with a fly, preferring the red ibis. They swim deep, and are usually found in company with the sunfish, and frequently with the black bass.

Black Perch is a deep brownish black fish, with a yellowish tinge, found in various deep fresh-water ponds on Long Island, New York, and takes the fly readily, affording much amusement to the angler. Weighs one or two pounds, and is esteemed as food. It has the general form of the yellow perch.

Pike Perch; Wall-eyed Pike; Ohio Salmon; White Salmon; Glass-eyed Pike; Western Salmon. This splendid fish is found in great abundance in all the tributaries of the Ohio River, in Lakes Pepin and Huron, in Kentucky and Tennessee, and indeed throughout the western waters generally, as far west as the Mississippi. Tons of them are taken through the ice in Lake Pepin in March, just when they are making their spawning beds. Color, yellowish olive above the lateral line, lighter on the sides; silvery beneath; head and gill covers mottled with green; dorsal fin light yellowish, spotted with brown; pectoral fins yellowish olive. It is a true perch, although its form and habits suggest very naturally the idea of a pike. Its scales are hard, close and difficult to detach. The mandibles are wider, and the jaws stronger than those of the pike, while its teeth are shorter and closer set. It is exceedingly voracious, and is highly prized as food. It is caught readily with the hook, baited with minnow or crayfish. The best time for fishing is in the dusk of the evening. The foot of rapids, or beneath milldams appear to be its favorite haunts. In the heat of summer it seeks the deepest part of lakes or the coolest part of streams, concealed under weeds or grass. Use regular brass rod and reel, and fish with a float. Anchor your boat at the side or above a rapid, and let your bait run down the rapid, for they sometimes lie behind huge rocks in the rapid. They average perhaps six or seven pounds, but are often much larger.

Goggle-eyed Perch: Strawberry Perch; Chub (South Carolina); *Croppie* (St. Louis); *Grass Bass* (Ohio); *Chinkapin Perch* (Louisiana); *Sac-a-lai* (New Orleans Creoles). This fish of many names and extended habitat has a dusky bluish-green back; sides and belly silvery, and marked with irregular, oblong greenish-black blotches that resemble "chinkapins." Fins yellowish; length 12 inches, and weighs up to three pounds. Inhabits ponds and streams of running water, though it prefers the former. It ranges from Lakes Huron and Erie to the Southwestern States. It feeds on insects, and takes bait freely, and also minnow, go-

ing at it with a rush. It is a pretty fish, and much esteemed.

PICKEREL. Body above olive brown, often with a greenish tint; belly silvery; sides pale silver gray with dusky bars more or less oblique; fins red. In some waters its general color is quite dark. It is found in small streams of fresh water, and in canals about rice fields; seldom in larger or more rapid waters; and seldom grows to the length of a foot. It is a great nuisance everywhere, as it is an inveterate eater of spawn and small fry. This fish is everywhere confounded with the pike, which, although of the same origin, is of a far nobler race.

Pond Pickerel; Doree (Canada). The common pond pickerel thrives wherever he can get a foot-hold, and is found in nearly all the ponds and streams of the north that have not been jealously guarded against his intrusion. He seldom attains the weight of a pound, and is caught very readily with a red ibis fly on a light rod, affording a very fair amount of sport; but he is so bony and so small that he is hardly worth cooking when caught. His back is of a greenish grey, sides yellowish green, reticulated with oblong, irregular markings, fins of a deep yellow or red color. Spawns in March and April.

PIKE. This, with the trout, may be considered the universal fish of the world. It appears to inhabit the inland waters of all northern countries. We read of them as far back as the days of ancient Rome. The pike is called the "tyrant of the waters," the wolf fish and the fresh-water shark, and certainly from his ravenous disposition he deserves all these names. Many stories are told of the wonderful powers of this fish to devour all others smaller than it, and it is even claimed when one was put in a pond with an abundance of fish, in one year devoured all but one, which was a carp weighing nine pounds, and he had taken a piece out of him.

RED HORSE OR LAKE SUCKER. A large red-finned sucker weighing from one to six pounds. Often eaten fresh, but much better corned; very bony. They are quite a handsome fish, like many of the family. It is taken only with spear, seine and snare—the latter method being the best. On very hot, sultry days they swarm by the acre, playing, jumping and tumbling on or so near the surface as to be plainly seen. In Lake Pepin they are described as so numerous that not a foot of water for acres in extent is undisturbed. They spawn early in spring. The young are much valued for bait, and are well adapted for the aquarium.

SALMON. The salmon is the finest game fish in the world, without doubt, and few are the anglers who will not readily yield him precedence. It was known to the world as early as the ancient Romans. The interest taken in him for this reason, has caused much attention to be paid to his propagation, and stimulated a careful study of his habits, which were comparatively unknown until within the present century. The opportunities which the culture of this fish has afforded for investigation have now made the subject familiar to every one interested in ichthyology. The salmon's existence, like man's, is divided into four periods—infancy, youth, manhood, and ripe old age, and these several stages of fish-life are designated by the names of Parr, Smolt, Grilse, and Salmon. One portion of this existence is passed in salt water, and the remainder in fresh; in salt water he feeds and grows fat, and in the fresh expends his strength and vital forces. The salmon is a leaper. Leaping is his favorite expedient to detach the fly from his jaws; so, when he leaps, deferentially lower the tip of your rod and save your fish. In gaffing, coolness and dexterity are required; never jerk your gaff violently, but lift it sharply upward and inward, endeavoring to fix the point abaft the shoulders. No anathemas will compensate for the loss of a fish by the clumsy handling of the gaff after a persistent battle of an hour's duration. They love to haunt the rapid rivers or large lakes with sandy or pebbly bottoms, that run into the sea. They will best take the bait early in the morning or late in the evening, and when there is a light breeze on the water.

SHEEPSHEAD. This fish is of a semi-oval form, head large, body a silver grey color, marked by seven transverse bluish-black bars. The old fish become more dusky. They weigh as high as 17 pounds, and are found in all Florida waters, and as far north as Massachusetts.

SHINER, SHINY DACE, FALL FISH. Colors very brilliant, having as ground a very pure silvery white; back is often steel blue, and sides of head bright rose color. In spring and summer the adult males have rosy shades, and the dorsal and pectoral fins are crimson. Length 12 inches. Specimens have been caught weighing five pounds. Much esteemed as food, and affords good sport for the angler.

SISCOWET, or SISKOWITZ. Head large, nearly one-fourth total length. Snout obtuse and rounded. Two rows of teeth on the tongue. Depth of body at first dorsal equal to one-fifth total length. Scales small, larger on lower region of the body. Color resembles somewhat the Mackinaw trout, from which it may be recognized by its different opercular apparatus. The Siscowet spawns in August and September, and always in deep water; in fact, the fish is never taken in much less than 40 fathoms. The fattest of all known fish, it has no unpleasant or oily odor, and for the table is much valued. This fish has been extensively maligned as unfit for eating in a fresh state, as being insufferably oily and rank, though all united in its praise when salted. It inhabits Lake Superior.

SMELTS. The fresh water smelts are identical with the sea smelts, having been introduced into fresh waters and acclimated there. They take the hook freely in February and March, and afford lively play for light tackle.

SUCKERS. Some of the suckers, of which there are many varieties, afford much sport when snared. The snare is a running loop of fine brass wire attached to the end of a pole, and the method employed to capture the fish is to beat the water with long sticks, turning up logs and large stones, tossing stones into

the holes, etc., so as to drive the fish from under the banks and other hiding places into the mid-stream, where they can be readily seen. They will lie quietly on the bottom for awhile after being disturbed, and then the snarer passes the wire loop cautiously over their heads, and dextrously jerks them out to *terra firma.* Sometimes the suckers will take the baited hook, though very seldom. No less than 12 varieties of suckers are enumerated as belonging to northern waters, averaging a foot in length; the most prominent of which—

The *Mullet Sucker*, grows to a length of 18 inches. It is very common in Lake Erie, where it is severally called the Mullet, Golden Mullet and Red Horse. There is also a common species in Lake Erie, very black in color, which is called the Black Sucker, and the Shoemaker.

The *Chub Sucker*. Color olivaceous; smoky above; a blackish band from pectoral to superior extremity of gill opening. Length eighth inches. Lives in the rocky parts of running streams, and feeds on Physalis and other small fish.

The *Long-finned Chub Sucker*. Scales variegated with blue, yellow and green; all the fins are grey-blue. Length 20 inches. A good edible fish.

Horned Sucker is common in most of the fresh-water streams of the Middle States and New England, where it is known as barbel, dace, and horned dace. It takes a hook readily, and begins to bite in April. Some suckers seem to be peculiar to certain localities, showing quite distinctive characteristics as to color and size. The Oneida Lake sucker is a bluish brown fish on the back; lighter beneath; a much lighter colored fish is very abundant around Peekskill on the Hudson; and others in the Mohawk and Susquehanna rivers show like variations in color. The dace or shiner is quite common also. It is a large-scaled fish, silvery white, and is taken with hook very often in New England trout streams. Another species of horned sucker is a small fish reaching nine or ten inches in length. Head dark olive green; back and sides of body green; sides tinged with yellow; anal fin blackish brown, caudal lighter, and the remaining fins light olive green. Sometimes called mullet.

Fig. 13.—*View of the Weirs at Fulton, N. Y., Below the Upper Dam, from the Bridge.*

Sun-Fish. Common everywhere, and known to every school-boy from Maine to Florida. A very beautiful fish, olive brown black with a light shade of green, marked with irregular spots of reddish-brown; sides and belly yellow with brazen spots. Fins yellow. The opercle or gill cover has a bright vermilion spot like sealing-wax on its edge. Inhabits still, clear waters, regardless of temperature, spawns in spring, fashions her nest in the sand or gravel, in shallow water near the margin of ponds, and jealously guards it from every intruder. It takes bait, and sometimes a fly or troll, though seldom. It sometimes reaches a pound in weight, and is then very good for the table. There are several closely-related species found in the Southern States, in company with the above, and with the same habits. Color greenish-yellow, dark on back.

Trout. Fishes of quite different genera go under this name, all of which are very popular as food for man.

Mackinaw or *Lake Trout*. Prof. Milner says that "this fish may be readily taken with the hook baited with a piece of fish, but as they are ravenous feeders, almost any kind of bait will serve the angler's purpose, who will however derive little sport from their capture, as they are excessively dull and sluggish." Professional fishermen capture them with lay-out lines and nets. His great size and immense strength alone give him value as a fish of game; but when hooked, he pulls strongly and fights hard, though he is a boring, deep fighter, and seldom, if ever, leaps out of the water like the true salmon or the brook trout.

Nevertheless, trolling for trout is a favorite pastime of the residents and tourists of Northern Michigan. It is said that the Mackinaw trout bites best when it is fullest. Large and solitary specimens are frequently taken—sometimes with the gaff alone—while swimming at the surface of the water. These are known as "racers," and are always thin. The average weight is about five pounds, but monsters weighing from 60 to 100 are heard of. The spawning

season begins in October and ends early in November. But very little seems to be known of their habits at this season. Rock bottoms are usually, but not always, preferred. A clay bottom near St. Joseph, Mich., is said to be frequented by trout for this purpose.

Color, dusky brownish grey; chin and under parts light ash or cream color. Back and sides speckled with numerous irregularly shaped spots of lighter grey, brown, or soiled white. Lower fins faint yellow. Resembles Siskowet, but has more pointed chin and snout, more deeply forked tail and larger head.

Habitat, Lake Superior, Lake Michigan, Lake Huron, and probably in all the great lakes which lie between the United States and the Arctic Sea.

Common Speckled Trout or *Brook Trout.* Symmetrical, oblong body; back broad, with dark markings on horn-colored ground, with metallic bluish and greenish reflections in fresh specimens; sides lighter, merging into white on abdomen, which shows reddish in the spawning season. Upper part of head dark greenish brown, with somewhat obscure mottlings; red vermilion dots and large yellow spots in the vicinity of lateral line. The pectoral or breast fins have the first ray yellow or the second black, the rest orange. The caudal or tail fin is slightly forked in the adult; more so in the young; is reddish, with parallel dark bands.

FIG. 14.—*View of the Eel Wiers at Fulton, N. Y., Above the Upper Dam, East Side.*

The range of this well known and much valued fish is strictly between the parallels of latidude 36° and 50° north. Its northwestern limit is Northern Minnesota, and it is not caught west of the Mississippi river except in a few of its Minnesota tributaries. Specimens have been taken that weighed seventeen pounds. The largest are found in Maine and in the Nepigon river, on the north shore of Lake Superior, where the specimen referred to was caught. It inhabits large lakes and the smallest ponds, the tiniest brooks and the largest rivers. Although a bold biter, it is a wary fish, and often requires much skill to capture it. It can be caught with artificial or natural flies, minnows, crickets, grasshoppers, grubs, the spawn of other fishes, or even the eyes or cut pieces of other trout. It spawns in the fall, and its period of spawning ranges from September to late in November. The older they grow the more wary they become, and therefore it requires considerable skill to catch a very old trout. A worm is, generally speaking, the best bait for them; but in the spring, after the rains that usually prevail at that season, which wash a great many worms and insects into the water, very few of which escape their observation, they bite better at the more tempting bait of a fly.

Pacific Brook Trout; Mountain Trout. This species may be taken with almost any kind of bait. It will rise readily and greedily to the fly or the grasshopper; raw meat is good, the eye of a fish excellent; grubs, larvæ, and worms, all seem to be eagerly desired. Suckley has taken them by trolling with a "belly fin of a fresh-killed fish." There is a peculiarity of this fish and its western congeners regarding location, which is worthy of mention. Unlike the eastern trout it seems rather to prefer moderate currents of water, or indeed pools which are absolutely still, and this fact should be remembered by those who fish. This specimen attains a weight of from four to six pounds, and is in good condition for the table from spring until near Christmas, at which time they begin to spawn. In the large mountain streams of Kern river, California, where the trout reach a weight of seven pounds, a spoon bait often proves very taking. Early in the season any or all baits suffice, but later, when the trout get thinned out, they are very shy and difficult to tempt with anything.

Pacific Red Spotted Salmon Trout; the *Dolly Varden.* This species inhabits chiefly glacial waters; is found in the northern streams of California and as far north as Alaska. They have whitish yellow spots just below the back, and red spots above the belly. Tail forked. It takes the bait greedily, and rises readily to the fly.

WHITEFISH. The *Lake Whitefish* is among the best of lake fish, being second to the Siscowet, and by many pronounced equal to the great trout. The spawning begins in November, terminating in Decem-

ber, and is indicated by the fish leaving deep water and appearing in immense numbers on rocky shoals.

The average whitefish is of two or three pounds weight; a large one six or seven; rare specimens are caught, however, of much greater weight, sometimes turning the scales at 20 pounds. Those of Lake Superior and the Straits are larger, fatter and finer in flavor than those of the lower lakes. In the rapids of Sault Ste. Marie they are taken in large quantities by the Chippewa Indians in dip nets, and are of a very superior flavor. The fish of Lake Huron and Upper Lake Michigan are very fair, but those of Lake Erie are decidedly inferior, which is probably due to the difference in temperature of these waters.

Whitefish do not take the hook readily, and the opinion has been entertained that they could not be caught in this fashion. Nevertheless, they have afforded good sport to the angler with a fly-rod baited with the May-fly, and worms have also been used with success. The whitefish of the Rocky Mountains take flies as readily as trout, and so do some of the eastern whitefish at certain seasons of the year.

MISCELLANEOUS. *Archer Fish.* The chelmons are a species of fish indigenous to the Indian Ocean. This fish has a scrupulous way of obaining its food, which has earned for it the name of archer fish, or fish pump. It frequents the mouths of rivers and especially shallow places, in search of insects which exist on the marine plants the stalks of which rise a little above the surface of the water. As soon as the fish spies its prey, it approaches cautiously as near as possible, and then, raising its snout above the surface, squirts out a fine stream of water with considerable force and unerring aim. The jet is often projected over a distance of six feet. The insect struck is stunned and falls into the water, and then is easily captured by the chelmon.

The representative of another group of Archer fishes, and to which the name is more specifically applied, is shown by Fig. 2. Although the mouth of this fish is entirely different in formation from that of the chelmon, it takes its prey in a precisely similar manner.

The *Kingo*, one of the most beautiful varieties of the golden carp probably ever bred, was imported by Mr. Gill, of Baltimore, from Japan, at a cost of $500. Too much can hardly be said of the wonderful beauty and grace of this fish. Its sides are resplendent with delicate pearly and golden tints, which, as it moves through the water with great dignity, are constantly changed in degrees of color under the varying angles of light.

Climbing Fish, of India. The famed "climbing fish" is the type of the family of Anabantids, a family distinguished by some remarkable peculiarities, such as the mode of respiration and the strange modifications therefor; the singular nest which they make for their eggs; the care they take of their young, and their wonderful ability for climbing, etc.

EEL. The eel has long figured as one of the most mysterious of animals. For 2,282 years it has been the object of more or less discussion. Aristotle maintained that it "is born of worms produced by mud;" Pliny, "that it rubbed itself against rocks, from the fragments of which young eels are born." Thus, from the fourth century before Christ to the year 1873, the eel has been the afflicted object of all manner of absurd theories. The eel industries of the Oswego river, New York, are nearly 100 years old. Toward the close of the eighteenth century John Van Buren erected a log hut in the woods along the Oswego river. This region was then in its native wildness. People came in and made homes around him, when he started a fishery. There are five great fisheries on the Oswego river and its tributaries, situated at Battle Island, Fulton, Horse-Shoe Dam, Jack's Rifts, and Caughdenoy. Battle Island, where the fisheries originated, has been continuously fished for over 80 years. At Fulton the river has been fished for 50 years. The largest catch ever made was 1,150 pounds in one night, an equivalent of 800 live eels. The Northern and Western cities are supplied with eels from this point.

Fishing. Angling for fish, whether for pleasure or profit, is so ancient that the knowledge of man is too short to reach the first angler. In modern times the art has been made captivating and gracious by the musings of the pensive and philosophical Walton, and now, in all sportsmen's circles, fishing is a polite and dextrous pastime. It has of late years been so nearly reduced to a science that the true angler will condescend to fish only with the artificial fly. Several particulars must be observed if one would be a skillful and successful angler.

ANGLING AND TROLLING. In fly-fishing the object is to throw the fly well out, and dropping it on the water as gently and naturally as possible, to keep it playing in the eddies like a drowning insect, till it attracts the attention of a lurking trout, and tempts him to strike at it. He is then hooked by an indescribable motion of the wrist—not the arm—only to be learned by practice. As an attempt to land him at once would break the line, he must be played till exhausted, when he can be gently brought to the shore. Besides the trout and salmon, the fish most valued in this country by the angler, are the several varieties of pike and bass, the pike-perch (glass-eye or Ohio salmon), the common perch, the carp, and many other varieties, ranging in size and excellence down to the little many-colored pond-fish. Bait fishing is suited to sluggish water rather than to swift-running streams. To bait the hook, take it in the right hand, the bait in the left, entering the hook at the head of the worm, and carrying it through to near the tail, so as to cover both the entire hook and its fastening. The worm should appear as life-like as possible, and all breaking and bruising should therefore be guarded against. There must not, however, be too much spare worm left at the end of the hook for the fish to nibble at without taking all in. When throwing the baited line, do it forward and upward, so as not to splash, and allow the bait to fall gently on the surface, and sink

slowly in the water to the required depth. Watch the cork carefully as the line floats slowly down stream. When you barely feel a nibble do not be too ready to jerk; let the fish have time to take in the bait, hook and all; then a slight, quick motion will hook the fish, and you can land him at your leisure. Trolling and spinning are generally practiced with dead fish for bait, to which a motion is given as if the fish were swimming. There are several methods of trolling, namely, with the lead hook, formed of two single hooks tied back to back, with a little bead of lead fixed to a link or two of chain depending from the lower part; the snap-hook, spring or plain, made of three hooks fastened together; and the gorge hook, which is loaded in the shank with lead. Spinning swivels are a series of small hooks, tied on fine gut, and applied to the bait externally, fastened to the line head upward, with a slight curve given to the tail, so that the action of the swivel and the force of the current revolve it in the water, increasing its naturalness and making it more tempting. Trolling is chiefly used in still waters for pike; spinning in swift running streams, where it is equally luring to salmon, trout, pike, or large perch. Spinning requires the greater skill and delicacy of touch, and is the finer sport of the two.

In trolling the shiner is the best lure. In arranging it, put the single hook through the lip, the middle hook in the belly, and the end hook in the tail. Loop on the leader about 36 inches from the fish; loop a large fly to the leader; some loop on a smaller one 30 inches from the other. For a leader, use twisted gut, with a small swivel attached to one end. The other end is fastened to a reel-line either by loop or knot; but a knot is preferable. The leader should be two yards long; some use three yards. The train of hooks is attached to the eye of the swivel at the end of the leader. It is made with fine hooks, and of the best gut. The strand on which the hooks are tied are fastened by a knot to another equally strong strand, and this is fastened by a loop to the swivel at the end of the leader. Trolling is done solely by boat. The troller sits with his face to the stern, the oarsman in the middle or near the bow. The rowing must be done slowly, one to two miles an hour. Row out 45 or 50 yards. When the fish is felt, tip the rod and cast off so that the fish shall have time to take hold. Then give a good surge, and you will rarely miss him. If you have two rods, when you feel the fish, pass the other rod to the oarsman. Never give an inch to the fish if you can help it, but be easy and gentle after you have fastened him, and let him play till he is exhausted; then pass the gaff under the fish, point downward, turn up the inside, and strike as near the shoulders as possible. Use no sinkers in trolling.

For fishing with set-lines, in the lake, bait with pieces of shiners or lake herring. Anchor one end of the line near the shore, in 15 feet of water. Run it out into the lake one-fourth to two miles. For the line use strong hempen cord, and whip-cord for bait lines. The hooks are attached every sixteen feet. For baiting pike, use roach, dace, gudgeon, small chub, trout, skegger or brandling. Go out each morning, pull up the lines, take off the fish that have been caught, re-bait the hooks, and drop back into the water. The position of the lines is marked by buoys.

In baiting for fish, the following hints will be useful: In fishing for trout, use any small fish, especially its own fry. For perch, use minnows, shiners and small trout. For carp, taken by deep-bottom fishing, use a bright red worm. For black bass, fished with the fly, the gorge-hook, and trolling tackle, shiners are the best bait. For small rock bass, use minnows and small shiners.

For catching eels use a strong gut line, a light float and a No. 9 hook. Bait with a large, red worm. Let the bait touch the bottom. The most alluring bait is salmon-roe. When fishing for eels with night-lines, lay in streams, or still deep holes in rivers.

In the winter, when the water is covered with ice so clear that fish are plainly visible beneath, they may be stunned and caught by striking on the ice with a mallet immediately above them. Winter fishing through holes in the ice is also rare sport, when it is not too cold.

Rods. There is perhaps no article of tackle upon which the angler looks with so much pride and pleasure as a good rod; like the fowler's gun, or the jockey's horse, next to his wife, they are always the best. Rods are made of various kinds of wood and of various length. There are three requisites for a good rod, viz.: strength, lightness and uniform flexibility from the butt to the top. They should vary in length and flexibility to suit the habits of different kinds of fish. A 16 or 18 foot rod, strong and rather stiff, is best for salmon; while one 10 to 14 feet long, light and springy, and finely tapering, is sufficient for trout. The Cruttenden fly rod, Fig. 15, has a solid reel plate, nickel-plated, patented ferrules, allowing the wood to be used full size, thus preventing rod-breaking where wood and ferrules join. It is well ringed throughout, wound with silk, and finely polished. Length 10½ feet, and weight about 10 ounces. A rod for trolling with minnow, and a rod for worm-fishing, should be about the same length as above, but the trolling-rod should be stronger. A bamboo rod, with changeable top, joints of various degrees of length, strength and elasticity, that can be adapted to the various purposes of fly-fishing, trolling, and bottom-fishing, is very convenient. The reel or "pirn" at the bottom end of the rod, on which the line is wound, should be simple, and made so as to wind and unwind handily.

Fig. 15.—Cruttenden Fly Rod.

Lines. These are made of silk, silk and hair, gut, India grass, flax, hemp, and cotton. They are made of various sizes

and lengths, from the size of a hair to that of a quarter of an inch, and from 12 to 200 yards in length. The size and length of the line should vary in proportion to the sport anticipated. A line for trout should be either of silk, silk and hair, India grass, or fine flax, and from 12 to 20 yards long. For salmon, lake pickerel, black or striped bass, the lines generally used are made of flax, hemp, silk, or hair from 50 to 200 yards. For "trolling" for blue fish, bass, pickerel, or any kind of sea-fish, the cotton and hemp lines are used. One had better choose a heavy line, for the sake of its casting superiority and advantages in windy weather.

HOOKS. This article is of the greatest importance to the angler, and about no part of the sportsman's or fisherman's outfit is there such a variety of opinion as the hook. In selecting a hook, bear in mind that a large portion of your success depends upon the quality, and therefore take particular pains and see that they are well tempered. Test every hook before attaching it to the line, and see that the barb and point are perfect and sharp. A small file will be found handy for sharpening. Hooks range in size from No. 1, several inches in length, down to No. 14, about a quarter of an inch long. Limerick, Dublin 2 F's, and 2 B's, Clark's patent, Kindal or Redditch hooks are good.

BAIT. The most common bait used in this country for ensnaring almost all species of the finny family that inhabit fresh water, is the common earth-worm, or, as it is called, dew-worm, dug-worm, and the angle or fish-worm. The common white grub-worm is also good bait, and will often take trout when all others have failed. These may be procured in the spring of the year in decaying trees, stumps, foliage, etc., and sometimes in fresh ploughed ground. The grasshopper is an excellent bait for trout. Wasps, beetles, flies, caterpillars and many other insects make good trout bait. The hind legs of the frog, when skinned, makes excellent bait for pickerel.

For bait, minnows are good enough for many species of fish, even for trout, pickerel or salmon. The best vessel for carrying them is a pail made for the purpose, Fig. 16. It is made of heavy tin, with detachable cover, and is 10 inches by 10 inches. The inner pail is 9x9, with tinned wire bail and brass wire spring catch. Artificial flies are the most important lures used by the angler. They are made to somewhat resemble an actual live fly, and are made from cocks' hackles or other feathers to form wings. The fur of a rabbit's ear, or some other animal, to form the body, and waxed silk thread to tie the whole in an artful, neat manner to the shank of the hook, and the lure is complete.

FIG. 16.—*Minnow Pail.*

SINKERS, DIPSIES OR LEADS, and SWIVELS, etc. There are three kinds of sinkers in use, the plain, slide and swivel. The first is made of lead, with brass wire loop at each end, and of various sizes and weights. The slide sinker is nothing more than a lead tube, slightly rounded at each end. It is used principally in bottom fishing, the object of the tube being to allow the line to pass through it at the least motion of the fish, which is thus immediately felt. The swivel sinker is the best for any kind of fishing. It is made similar to the plain, with the exception of the swivel at each end instead of the stationary loops. Split shot are used almost universally for trout fishing. They should be quite small, and where great weight is required, a larger number should be used rather than those of a larger size. Swivels are used for "spinning" bait and for preventing entanglement of the line.

FLOATS. These are made of cork, quills, and red cedar, of various sizes, adapted to the current of water or the peculiar description of angling. They are of two shapes, egg and oblong.

REEL. Many old-fashioned anglers think that this is a superfluous article in the equipment of a sportsman, but to those who have used it, it is almost as indispensable as the rod itself. The main object of the reel is to give the fish a sufficient quantity of line to tire itself, and consequently affords more sport than could be obtained by the rod alone. By means also of the reel, fish of greater weight may be captured than could possibly be with the rod.

Fig. 17 is a representation of the Orvis reel. It is extra heavily nickel-plated and finely finished. Is perforated to make it light, and keep it free from sand and dirt also that the line may dry without removing it from the reel after use. Has a perfect click, is very light, very strong and holds from 40 to 50 yards of line. It is more compact and less cumbersome than ordinary 20-yard reels. It is quite narrow and takes up line rapidly.

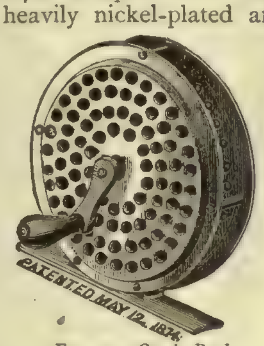


FIG. 17.—*Orvis Reel.*

The reel of Fig. 18 supplies a want that has long been felt by fishermen. In size, weight and general appearance it does not differ from the reels in ordinary use. The line is withdrawn from it as from the common reel to any desired length for fly casting or bait fishing. It is when a game fish is "struck" that the advantages of the automatic reel become more appar-

FIG. 18.—*Fisherman's Automatic Reel.*

ent. By a movement of the finger an instantaneous tension of the line is produced, so delicate that if the angler chooses to allow it, and the fish be obstinate, he can run out the whole length of the line; but it will be against a continually increasing resistance, more or less augmented as may be desired. If, when at any distance, the fish makes a charge in the direction of its captor, no matter what his rate of speed may be, the reel takes up the line so rapidly that no slack can possibly be obtained. All this is accomplished without the use of a crank. The reel designed for fresh water bass or pickerel fishing, carrying from 100 to 110 feet of line, works equally well in capturing brook out.

PRESERVING FISH. Besides the well-known ways of preserving fish by salting, drying, smoking and canning, here is one that anybody can try who wishes to preserve fish in its fresh state: Open the fish, sprinkle sugar over the interior, keeping the body in a horizontal position so that the sugar may penetrate as much as possible. It is said that fish preserved in this way can be kept completely fresh for a long time, the savor being as perfect as if recently caught. Salmon thus treated before salting and smoking possesses a much more agreeable taste. A tablespoonful of sugar is sufficient for a five-pound fish.

Fish, TO COOK. All fish should be thoroughly cleansed and well cooked; nothing can be more unwholesome and more unpalatable than fresh fish not sufficiently cooked. Fresh fish, when boiled, should be placed in cold, and shell-fish in boiling water. To keep oysters after washing them, lay them in a tub in a cool cellar, with the deep part of the shell undermost. Sprinkle them with salt and Indian meal, then fill the tub with cold water. Change the water every day and the oysters will keep fresh a fortnight. Fish should be garnished with horse-radish or parsley. The only vegetable served with fish is potatoes. It is customary to eat fish only at the commencement of the dinner. Fish and soup are generally served up alone, the soup first, before any of the other dishes appear. Let great care be taken to well clean the fish before it is dressed. Fresh-water fish have often a muddy taste and smell, which may be got rid of by soaking them in strong salt and water before they are cooked. Salt fish should be soaked in water before boiling, according to the time it has been in salt. When it is hard and dry, it will require 36 hours in soaking before it is dressed, and the water must be changed three or four times. When fish is not very salt, 24 hours, or even one night, will suffice. Baked fish is apt to be dry, and can be improved by basting it with a little good fat or olive-oil, or by laying a slice of salt pork over it, or strips of pork in slashes cut in its upper surface. Blue fish, bass, shad, carp, red snappers, and other fish from three to six pounds in weight, are good for baking; brown gravy or sauce should be served with baked fish, and a highly seasoned bread stuffing increases their palatability. The best of fried fish are those cooked in oil; small fish should be rolled in flour, seasoned with salt and cayenne, and quickly fried; medium-sized or sliced fish are good for frying when rolled in Indian meal or cracker-dust, seasoned with salt and pepper, and fried.

The general method of BOILING fish is to put it in the saucepan, and a little more than half cover it with boiling water. Cover the lid closely and boil gently until done. To determine when a fish is sufficiently boiled, draw it up upon the fish-plate, and if the thickest part of the fish can be easily divided from the bone with a knife, it should be at once taken from the water. A little saltpeter or a few spoonfuls of vinegar may be added to the water to render the boiled fish firm. Some cooks prefer to steep the fish in salt and water from five to ten minutes before putting it in the kettle to cook, instead of putting salt in the water in which it is to boil. By this means less scum rises.

TO BROIL FISH. Let one day expire after it has been caught and killed, then lay the inside on the gridiron, and not turn it till it is nearly done.

TO FRY FISH, cleanse them thoroughly, dry them on a folded cloth, dredge flour lightly over them, brush them with a well-beaten egg, then dip them in fine bread-crumbs. Have ready enough fine oil, or melted lard or beef dripping (clarified), to entirely cover the fish. Place the frying-pan over a clear fire. Let the lard reach boiling point, and then immerse the fish in it. You may try whether the fat is hot enough by letting a drop of cold water fall into it from the end of your spoon. If the hot fat spits it is ready for use. Then fry, turning the fish when one side is browned to the other. When it is done, serve it extremely dry on a white cloth or embossed fish paper.

To prepare very bony fish for children to eat, cut out the large bones or slip them out after boiling a while, then fry the flesh to a crisp, when all the fine bones will be chewed up before they are swallowed.

TO BAKE A LARGE FISH WHOLE, cut off the head and split the fish down nearly to the tail; prepare a dressing of bread, butter, pepper and salt, moistened with a little water. Fill the fish with this dressing, and bind it together with fine cotton cord or tape; lay the fish on a grate or a bake-pan or a dripping-pan, and pour around it a little water and melted butter. Baste frequently. A good-sized fish will bake in an hour. Serve with the gravy of the fish, drawn butter or oyster sauce.

CATFISH, *To Fry*. Skin, clean, and remove the head; sprinkle with salt, and lay aside for an hour or more; have ready two or three eggs beaten to a froth, and, in a flat dish, a quantity of powdered cracker; dip the fish first in the egg, then in the cracker, and fry quickly in hot lard or drippings; take up as soon as done. Catfish cooked in this manner are sweet and savory—a trifle too rich for delicate persons, but very nice for those who are blessed with good digestion.

Another: Skin and split them, remove the backbone, wash and dry the pieces, season them with salt and cayenne pepper, dredge them with flour, and fry them brown in smoking hot fat.

To Stew. Skin, clean and cut off the heads; sprin-

kle with salt to remove any muddy taste they may have contracted from the flats or holes in which they have fed, and let them lie in a cool place for an hour or so; then put them into a saucepan, cover with cold water, and stew very gently for from ½ to ¾ hour, according to their size; add a chopped shallot or butter-onion, a bunch of chopped parsley, a little pepper, a large tablespoonful of butter, a tablespoonful of flour mixed to a paste with cold water; boil up once, take out the fish carefully, and lay in a deep dish; boil up the gravy once more, and pour over the fish; send to table in a covered dish.

Salt Cod, *To Boil.* Put the fish to soak over night in lukewarm water, as early as seven o'clock in the evening; change this for more warm water at bed-time and cover closely; change again in the morning and wash off the salt; two hours before dinner take out the cod, examine to see that no crystals of salt adhere to the under side, and place it in very cold water to make it firm; set it over the fire in lukewarm water enough to cover it and boil for ½ hour; drain well, lay it in a hot dish and pour over it egg sauce, when it is ready for the table. What is left over from this dish will be excellent for codfish balls.

Codfish Balls. After preparing as above for boiling, cut it in pieces and boil 20 minutes; turn off this water, pour on boiling hot water and boil 20 minutes more; drain very dry and spread upon a dish to cool; pick to pieces with a fork, removing every vestige of skin and bone and shredding very fine; add an equal bulk of mashed potato, a little butter, sweet milk and beaten egg, and work into a stiff batter; flour your hands and work into balls or cakes, and fry to a light brown in boiling lard or dripping. Plainer fish cakes are often made by simply molding shredded cod and mashed potatoes together. Codfish ready boned, and sometimes shredded also, is to be found at groceries, under the name of "desiccated codfish." No adulteration of it is yet known.

Eel, *To Boil.* Take small specimens, boil them until tender, with a bunch of parsley; serve with butter sauce.

To Stew. Inquire, before buying, where they were caught, and give so decided a preference to country eels as to refuse those fattened upon the offal of city wharves. Nor are the largest eels the best for eating. One weighing a pound is better for your purpose than a bulky fellow that weighs three. Skin and clean, carefully extracting all the fat from the insides; cut into lengths of an inch and a half; put into a saucepan, with enough water to cover them; throw in a little salt and chopped parsley, and stew slowly, closely covered, for at least one hour; add, at the last, a great spoonful of butter and a little flour wet with cold water; also pepper; serve in a deep dish. The appearance and odor of this stew are so pleasing as often to overcome the prejudice of those who "wouldn't touch an eel for the world! they look so like snakes!" and those who have tasted once rarely enter a second objection.

To Fry. Prepare and wash the eels, wipe them thoroughly dry, and dredge over them a very little flour; if large, cut them into pieces about four inches long, brush them over with egg, dip them in bread-crumbs, and fry them in hot fat. If small they should be curled round and fried, being first dipped into egg and bread crumbs. Serve them up garnished with fried parsley.

To Bake. Skin, empty, and thoroughly wash four large eels, cut off the heads, and divide them into rather short pieces, wipe them very dry, dip each piece into a seasoning of cayenne, salt, minced parsley, and a little powdered savory herbs; put them into a deep dish, cover them with veal stock, put a thick paper or cover over the dish, and set it in the oven until the eels are tender. Skim off the fat, take the pieces of fish carefully out on a hot dish to keep warm, and stir into the gravy the wine, strained lemon juice, and sauce; make it just boil up, and pour it over the fish. Garnish with sliced lemon.

Halibut, *To Boil.* Lay in cold salt and water for an hour; wipe dry, and score the skin in squares; put into the kettle with cold, salted water enough to cover it. It is so firm in texture that you can boil without a cloth, if you choose; let it heat gradually, and boil for ½ to ¾ of an hour, in proportion to the size of the piece. Four or five pounds will be enough for most private families. Drain and accompany by egg-sauce —either poured over the fish, or in a sauce-boat. Save the cold remnants of the fish, and what sauce is left until the next morning. Pick out as you would cod, mixed with an equal quantity of mashed potato, moisten with the sauce, or with milk and butter if you have no sauce; put into a skillet, and stir until it is very hot. Do not let it burn. Season with pepper and salt.

To Bake. Take a piece of halibut weighing 5 or 6 pounds, and lay in salt and water for two hours; wipe dry and score the outer skin; set in the baking-pan in a tolerably hot oven, and bake an hour, basting often with butter and water heated together in a sauce-pan or tin-cup. When a fork will penetrate it easily it is done. It should be of a fine brown. Take the gravy in the dripping-pan, add a little boiling water; stir in a tablespoonful of Worcestershire sauce, the juice of a lemon, and thicken with brown flour, previously wet with cold water; boil up once and put into the sauce-boat. There is no finer preparation of halibut than this, which is, however, comparatively little known. Those who have eaten it usually prefer it to boiled or broiled. You can use what is left for the same purpose as the fragments of boiled halibut.

Halibut Steak. Wash and wipe the steaks dry; beat up 2 or 3 eggs, and roll out some Boston or other brittle crackers upon the kneading-board until they are fine as dust; dip each steak into the beaten egg, then into the bread crumbs (when you have salted the fish), and fry in hot fat, lard or nice dripping. Or, you can broil the steak upon a buttered gridiron over a clear fire, first seasoning with salt and pepper. When done, lay in a hot dish, butter well, and cover closely.

Cutlets of Halibut, Cod or Salmon. Three pounds fish, cut in slices ¾ of an inch, from the body of the fish; a handful of bread crumbs, with which should

be mixed pepper and salt, with a little minced parsley; one egg, beaten light; enough butter, lard or dripping to fry the cutlets. Cut each slice of fish into strips as wide as your two fingers; dry them with a clean cloth; rub lightly with salt and pepper; dip in the egg, then the bread crumbs, and fry in enough fat to cover them well; drain away every drop of fat, and lay upon hot white paper lining a heated dish.

MACKEREL, *To Cook.* Put into a crock (flesh side down), with plenty of water; let soak 8 to 10 hours before using. After thoroughly cleaning, put into a spider in cold water; bring to a boil, turn off water, then pour over it ½ cup of cream (sweet) and a piece of butter the size of an egg; bring this to a boil and it is ready for use.

To Boil: same as codfish.

OYSTERS, *Raw, To Prepare for Eating.* Select, by experiment, from the following seasonings: salt, pepper (black and red), vinegar, etc.

To Stew. Put the liquor in a saucepan upon hot coals; when it all boils up, add the oysters and pour in a little milk, or, if you choose, water, about a teacup to a quart of oysters. Let them boil 2 or 3 minutes, not more; meantime put in a small piece of butter, and dredge in some flour; set the saucepan off, and stir the oysters till the butter is melted. Lay some crackers or toasted bread in the dish, and pour on the oysters. They are very fine with roast or boiled turkey.

To Fry. Select the largest and best oysters you can find; take them carefully from the liquor; lay them in rows upon a clean cloth, and press another lightly upon them to absorb the moisture; have ready several beaten eggs, and in another dish some crackers crushed fine, in the frying-pan heat enough nice butter to cover the oyster entirely; dip each oyster first in the egg then in the cracker; roll it over that it may become completely incrusted; drop them carefully into the frying-pan; fry quickly to a light brown; if the butter is hot enough they will soon be ready to take out; test it by putting in one oyster before you risk the rest; do not let them lie in the pan an instant after they are done; serve dry, and let the dish be warm. A chafing-dish is best.

Scalloped Oysters. Crush and roll several handfuls of "oyster" crackers; put a layer in the bottom of a buttered pudding-dish; wet this with a mixture of the oyster liquor and milk, slightly warmed; next have a layer of oysters; sprinkle with salt and pepper; lay small bits of butter upon them, then another layer of moistened crumbs, and so on until the dish is full; let the top layer be of crumbs, thicker than the rest; beat an egg into the milk you pour over them; stick bits of butter thickly over it; cover the dish, set it in the oven and bake ½ hour; if the dish is large, remove the cover and brown by setting it upon the upper grate of the oven, or by holding a hot shovel over it.

PICKEREL, *To Fry.* The pickerel ranks next to the trout among game-fish, and should be fried in the same manner. Especially do not fry it slowly and too long; and when it is done take it out of the grease.

SALMON, *To Boil.* Put it into warm water instead of cold, in order to preserve its color and set the curd. It should be thoroughly well dressed to be wholesome; scale it; empty and wash it with the greatest care; do not leave any blood in the inside that you can remove. Boil the salt rapidly in the fish-kettle for a minute or two, taking off the scum as it rises; put in the salmon, first trussing it in the shape of the letter S, and let it boil gently till it is thoroughly done. Take it from the water on the fish-plate, let it drain, put it on a hot folded fish napkin, and garnish with slices of lemon. Sauce: shrimp or lobster. Send up dressed cucumber with salmon.

To Broil. Cut slices of an inch or an inch and a half thick from the middle of a large salmon; dust a little cayenne pepper over them; wrap them in oiled or buttered paper, and broil them over a clear fire, first rubbing the bars of the gridiron with suet. Broiled salmon is extremely rich, and really requires no sauce. The slices may also be simply dried in a cloth, floured and broiled over a clear fire; but they require the greatest care then to prevent them from burning. The gridiron is always rubbed with suet first.

To Bake. Wash and wipe dry, and rub with pepper and salt. Some add a slight taste of cayenne and powdered mace. Lay the fish upon a grating set over your baking-pan, and roast or bake, basting it freely with butter, and toward the last, with its own drippings only. Should it brown too fast, cover the top with a sheet of white paper until the whole is cooked. When it is done, transfer to a hot dish and cover closely. Add to the gravy a little hot water thickened with arrow-root, rice, or wheat flour,—wet, of course, first with cold water,—a great spoonful of light tomato sauce, and the juice of a lemon. Boil up and serve in a sauce-boat, or you can serve with cream sauce, made as for boiled salmon. Garnish handsomely with alternate sprigs of parsley and the bleached tops of celery.

WHITEFISH, *To Cook.* Same as mackerel.

To Bake. Soak them all night in a pail of cold water. If not fresh enough in the morning, then slightly scald them till fresh enough; then lay them on a plate, well buttered, and put them into the oven till the butter melts, after which they are ready for use.

Most other kinds of fish may be prepared in the manner of those most nearly like them in the above list.

CHOWDER. See page 261.

Fish as Food. Fish affords comparatively little nourishment, and its fat is more insoluble and indigestible than that of any other animal, and turns rancid with peculiar readiness. Acid sauces and pickles, because they are calculated to resist putrefaction, render fish more wholesome and digestible; while butter has a tendency to increase its indigestible character. Spice and salt aid the stomach to digest fish by stimulating the fibers of the stomach. Fish when dried in the open air and afterwards boiled soft, is quickly digested; but salt and smoked fish are hard of digestion, and afford but little nutrition. Fish with flesh of a tender kind are less indigestible than those

which are more solid and tough, and some of the former have very little to be said against them as food.

Fistula (fis' tu-la), a non-healing, abnormal opening into the soft parts, with a constant discharge; a deep, narrow, chronic abscess. Requires the treatment of a skilled physician or surgeon.

Fixtures. All machinery and buildings that are attached to the ground by brick walls, or by sills imbedded in the ground, are fixtures, and pass by deed or mortgage with the land. But such things are largely governed by the intention of the parties at the time. Many things that would ordinarily be considered personal property may, by the intention of the parties, become a part of the real estate. Rails in a fence, or laid along the line for a fence, are part of the real estate and pass with the land. See Deed.

Flagon, a vessel with a narrow mouth, used for holding and conveying liquors.

Flail is a hand implement for threshing grain. It is both simple and ancient. It is the only threshing implement in use over a large portion of continental Europe; and though now very generally superseded by threshing-machines, it continues to be in use for general purposes on multitudes of small farms, and for particular purposes, such as the threshing out of garden crops, of small seed crops, and of specimens or samples of the grain crops, even on large farms. It consists of a handstaff, or light ashen rod, of about five feet in length, a beater or rod of ash, thorn, or other hard wood, of from 30 to 36 inches in length and one and a quarter or one and a half inches in diameter; and such a mutual attachment of the handstaff and the beater as will allow the latter free play, both in striking the grain and in gyrating around the head of the thresher. The method of using the flail is so well known as not to require description.

Flange, a projection from the end of a pipe or other mechanism so as to be screwed to another part; a term also applied to the projection of a car-wheel to keep it from running off the rail.

Flank. The part of a quadruped's body which extends from the ribs to the haunches. When the flank of a horse is abnormally large, it is accompanied by weakness in the loins and to great length in the back; and when it is hollow, it indicates comparative shortness in the transverse process of the lumbar vertebræ, and consequent insufficiency of space for the due attachment of the large muscles of the loins. Either fever or a diseased state of the lungs is indicated by a comparatively rapid rising and falling of the flank in respiration.

Flannel, a soft, nappy, woolen cloth, of loose texture. See Woolen Fabrics, Dyeing, Stains, etc.; as under-clothing, see Hygiene.

Flap-Jack, a sort of broad pan-cake; also, an apple puff.

Flat-Irons. To remove starch or rust from flat-irons, have a piece of yellow beeswax tied in a common cloth. When the iron is nearly hot enough to use, but not quite, rub it quickly with the beeswax, and then with a clean, coarse cloth. Some have salt on the cloth with which they wipe the irons. Flat-irons should always be kept in a warm place or wrapped in paper, to prevent the condensation of the vapors of the kitchen upon them and rusting.

A flat-iron is now in market which has a hollow, perforated handle, that is cooler than the ordinary handle; or, as it is detachable, it may be kept as cool as desirable. (See engraving.) Being semi-circular,

Flat-Irons.

it fits the hand better than the ordinary horizontal kind.

Flavoring Extracts: see Extracts.

Flax. This is said to be one of the oldest cultivated plants of which we have any record, and its home is almost all over the globe. Latterly it is not raised so much, proportionally, as is cotton, but, on account of its utility as a material for certain kinds of clothing and fancy articles, as a source of oil for paints, etc., and of food for cattle in the form of cakes of its pressed seed, it will probably remain a staple of cultivation for ages to come. The profit of flax-raising in Ohio, in 1868, was twice as great as that of corn per acre, and one and a half times that of wheat.

The importance of the flax crop to the farmer in the Western and Northwestern States will hardly be denied by any one. Flax has been raised for many years in these States, but only the seed has been utilized hitherto; while the much more valuable fiber has been either burned, or used for thatching, or as litter, or at best, given as feed to the cattle. The reason of this regrettable waste of such a valuable material as the flax fiber, is, partly, that there has hitherto been no regular market, where it could be disposed of easily and on a large scale, there being as yet in the United States no manufactories using flax fiber to any large extent. It must further be remarked that the production of a good fiber, suitable for manufacturing purposes, requires from the outset a very different and much more careful treatment than when

the object is merely to produce seed; and after being pulled, the flax plant has still to undergo various processes and manipulations to make it marketable, and these the farmers have either been unwilling or unable to go through. On the other hand the raising of flax for the seed offers the farmer such an easy and quick way of turning this produce into cash (as he has only to send it to the nearest railway depot, or to the next market town, if he has not already sold it before hand to the oil mill in his neighborhood) that he has been content with the scanty profit which the seed yielded to him.

From the agricultural reports of the different States it appears that the raising of flax-seed yields to the farmer an average net profit of from four and one-half to six dollars per acre, rarely more, whereas the production of flax fiber would yield no less than ten dollars, and may be as much as $50, according to the length and fineness of the fiber produced. As, therefore, the cultivation of flax for the fiber requires a more careful treatment and a greater outlay for seed than if his object is merely to obtain seed, the farmer is largely compensated by the result of the former crop.

It is evident that the future development and prosperity of the flax and linen industry in the United States is entirely in the hands of the farmers, and that, unless they energetically apply themselves to the production of a first-class fiber, according to the best methods employed in the Old World, the above industry will never take root in the United States for want of raw material, as the following example will show: In a Western county having annually about 20,000 acres under flax, with an adjacent county having annually about 30,000 acres under flax, an Eastern firm some time ago, at great expense, erected a flax mill. They were compelled, however to close, as they state, "in despair for want of proper culture, because the farmers will not raise flax straw for fiber, will neither pull it, keeping the straw straight, nor treat it as it deserves. They seem to be satisfied with raising flax for seed alone."

The following quantities of clean flax fiber were produced in 1880 respectively in the countries named, with the acreage devoted to flax.

	ACRES.	TONS.
Austria	218,042	45,162
Belgium	140,901	29,580
France	162,009	36,969
Germany	329,362	57,432
Ireland	157,534	24,508
Italy	200,350	22,953
Russia	2,000000	250,000

Referring in particular to Russia, it may be remarked that the breadth of land under flax in that country alone is little less than four-sevenths of the entire acreage devoted to the production of the fiber, and it alone produces practically one-half of the total produce of the world. A large proportion of this quantity is raised in the governments of Archangel, Wiasma and others, under the 65th degree of north latitude, where the summer lasts little more than two months, and the mean temperature in winter is about 25° below zero. Agriculturists in those remote countries have to contend with difficulties and hardships of which the American farmer has not the slightest conception. A comparison of the tiller of the soil in those high Northern latitudes with the Western farmers above alluded to will scarcely be in favor of the latter.

Now, as the area under flax in the United States is more than one million acres, it is surely no exaggeration to say that the loss to the farming community through the neglect of this branch of agriculture, is no lass than $25,000,000 per annum. It is to be hoped that these facts will open the eyes of our farmers, and that many of them will in future leave the old beaten track of raising flax for seed alone, and by doing so, lay the foundation for the future creation and development of the flax and linen industry in this country.

Culture. The proper soil for flax is a good alluvial or vegetable loam about midway between a loose sand and tenacious clay, and well-drained. In a very rich soil the fiber grows too close, and on a hard soil the crop will not do well. The soil should be new to it, as it is a very exhausting crop. A rich sod which has been long pastured, well plowed and rotted is about the best model of ground for flax. A good wheat soil is also generally a good flax soil. Salt, ashes, and gypsum are proper fertilizers for this plant. The last mentioned has the greatest effect if applied after the plant is up, and while covered with dew or moisture. Plow deeply in the fall, roll well, and in the spring, in corn-planting time, pulverize to the depth of three or four inches, when it is ready for the seed.

The heaviest seed is best for sowing. It should be of a bright brownish cast and oily to the touch. The inside should be of a yellowish green tint, and taste sweet and oily. Obtain it of a reliable dealer, run it twice through a fanning-mill with a brisk blast, and sift it through a fine wire sieve. Seed may be tested by placing say 50 between a couple of sods, placed earth-sides together, and laying up in the kitchen where the seeds will keep warm. Moisten the seeds once or twice, and in two or three days the good seed will have germinated. Count these and you will know the proportion of good seed to the whole lot. Before sowing, soak the seed two or three hours in water and roll it in land-plaster (gypsum). With a log chain mark the field into squares 18 feet each way, a breadth wide enough to sow at one round or two casts. If you are growing for the seed only, or for seed and coarse tow, sow about three pecks to the acre; if for fiber only, about one and one-half bushels. In the former instance, the plant will branch generously, producing much seed; in the latter case it will have few branches, which, with the seed, will be near the top, leaving the fibers long and unbroken by branches. Count the lands you have marked off, and calculate the amount of seed required for each land, each way. Begin at a corner; take as much seed as you can handily hold between the thumb and three fingers, and scatter as evenly as possible. Some sowers go directly back and forth upon the same land;

others take a number of lands and walk around them as in plowing. The main thing is to scatter the seed evenly.

Covering flax should never be done with a team, but with a brush-harrow drawn by man or boy. Such a harrow may be made at a trifling expense of time and labor. It saves in many capacities, and if put in a dry place after use, will last several years. Take a five-foot piece of two to four-inch scantling; bore holes and insert a pair of shafts, with a cross-bar, as in a hand-cart. Then bore two rows of three-quarter-inch holes, alternating the holes. Into these place the butts of brush cut about two feet long, fastening them with nails. Similar brush may also be nailed along the sides of the scantling. To make it heavier, if necessary, tie blocks of wood upon the top. With such an implement, a man may cover four or five acres a day, and do it well. Flax-seed needs but about half an inch of covering, but that should be fine soil. It should be covered evenly, or it will ripen unevenly and cause loss and trouble. The Riga and Dutch are the two principal varieties grown in this country. The former is adapted to more soils than the latter, and yields the heavier crop, though the Dutch has a finer fiber.

When the flax has grown three or four inches high, it may be carefully weeded by hand; and for this it is best to employ children, as they are not so heavy as to press down the soil and harden it. Adults employed to weed flax should go barefoot at the work, so that what plants are trodden down may be able to rise again.

Harvesting, etc. Flax should be pulled or cut when the bolls are brown in color, the stems a light yellowish hue, and the leaves also of the same color about one-fourth the way up. If pulled when green there is much loss in quantity and quality, though it is best to be harvested when flowering if the fiber is wanted for cambrics and the finest linen. If left until dead ripe the seed will be excellent but the fiber will not be strong, soft or heavy. For dew-rotting it need not be pulled until nearly ripe. If, however, the crop falls or "lodges" before ripening, it should be pulled at once, whatever be its stage of growth, as that is the only means of saving it at all. In pulling, grasp a handful just below the top, jerk quickly, shake the dirt of the roots by rapping them on the ground, and either lay in swaths or bind into four-inch "gavels" (little shocks), with strips of bass-wood bark or stems of flax. Keep the dirt ends perfectly even. If left in the swaths, allow it to dry, and bind it in the morning when the dew is on. The gavels are subsequently gathered into ricks or windrows running north and south, to receive sunlight upon each side, the ricks to be made of 18 or 20 gavels set two and two. Before stacking or stowing away in the mow, flax should be as dry as hay should be.

Cradles, scythes, and machines are used for cutting flax, but the work is not so satisfactory as hand-pulling. Machines for pulling have also been invented, with doubtful results.

To stack flax, lay three timbers parallel with each other upon the ground, from two to three feet apart, as the flax is long or short, and lay the bundles upon these, heads upon heads and roots toward roots, alternating. Cover the stack with boards or clean straw, so that it will be kept dry. If the flax is to be stored in a mow, see that all hay seed and litter is first swept out. The assorting of flax in regard to its length is most easily attended to when it is pulled. That which is tangled should be kept separate.

Threshing. This is done in October, either by whipping the flax by handfuls over a stone or an upturned plow, by flails, by a machine, or by drawing the heads through a comb or rake of finely-set teeth. Flails, however, somewhat injure the fiber. Tangled flax is, of course, threshed out by the rougher and more rapid methods.

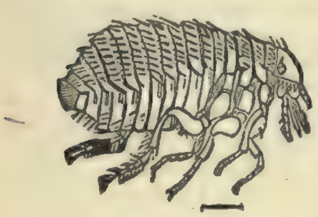
Rotting. This is best done by the manufacturer, as follows: For dew-rotting, spread the flax, in October, evenly upon a smooth, clean grass-plat, in swaths about half an inch thick, keeping the butts even; after lying a week or ten days, according as the weather is wet or dry, turn the swaths over by a long pole. In three to six weeks it will be sufficiently rotted for breaking. For water-rotting, or steeping (which is a better method), simply keep the flax under water, not in contact with the ground, until the mucilage in the stalk is thoroughly dissolved, which will be in five to seven days if the weather be warm, longer if the weather is colder. Sink a platform with stone, place the bundles upon it and fasten them down with slats over them nailed to stakes driven into the ground. In both the above processes the degree of rotting can be ascertained from time to time by breaking a few stems. After rotting it is dried and stored away until it is broken.

Breaking, etc. The old-fashioned hand flax-break is still in extensive use, though machines are taking its place. The "shives" (the woody stem, as broken) are next "scotched" out by a hard-wood, double-edged knife, two feet long, called a "swingle," striking it over the flax as the latter is held on the end of a board. The fiber is next drawn through a "hatchel" to straighten and smooth it, and clean what shives there may be remaining.

Flax straw makes excellent packing for ice. But a comparatively small amount of it is required. It is clean, easy to handle, and not as liable to mold or rot as the substances that are usually employed. A piece of ice taken from the house and wrapped in flax straw may be carried a long distance with but very little waste. Many farmers do not put up ice because it is difficult to obtain saw-dust or tan-bark for packing. Flax straw makes excellent bedding for all kinds of stock, and it is especially good for hogs. It is excellent material for mulching, and there are very few things superior to it for mulching strawberry vines. It forms a close sort of matting on which the berries can ripen without being spattered with mud. Most stock will eat flax straw after they have become ac-

customed to its use by having small quantities fed at a time.

Flea, a well-known, nimble, annoying, parasitical insect. Its habits and general appearance do not require description, further than is given by the accompanying illustration. Its suckers are complex and thoroughly adapted to its blood-drinking nature. A sharp, razor-like apparatus, with its blade working on a kind of handle, exists on each side of a slender, bristle-like tongue. Fleas are especially parasitical on dogs, and often cause them great torment, and render them obnoxious and disgusting to human beings. To remove fleas and lice on dogs, mix soft soap with as much carbonate of soda as will make it into a thick paste. Then rub this well into the roots of the hair all over the dog's body, adding a little hot water as you go along, so as to enable you to completely saturate the skin with it. Let it remain on for half an hour, then put the dog into a tub with warm water for ten minutes, letting him quietly soak, and now and then ducking his head under. Lastly, wash the soap completely out, and let him dry by exercise in the sun, choosing a warm day for the operation. This, after two or three repetitions, will completely cleanse the foulest skin. To prevent vermin from again accumulating, moisten the hairs once a week with a teaspoonful of carbolic acid to half a pint of water. Keep his house or resting place and bedding clean and sweet, and sprinkle it occasionally with the last mentioned solution. The oil of pennyroyal will certainly drive them off; but a cheaper method, where the herb flourishes, is to dip dogs and cats into a decoction of it once a week. Mow the herb and scatter it in the bed of pigs once a month. When the herb cannot be got the oil can be procured. In this case saturate strings with it and tie them around the necks of dogs and cats, pour a little on the back and about the ears of hogs, which you can do while they are feeding, without touching them. By repeating these applications every 12 or 15 days the fleas will leave the animals. Strings saturated with the oil of pennyroyal, and tied around the necks and tails of horses will drive off lice; the strings should be saturated once a day. A wash containing from six to ten per cent. of petroleum, naphtha or benzine will drive fleas from animals; a weak solution of carbolic acid would be efficacious. All mats or straw on which dogs, cats, hogs or other animals sleep about the house, kennels, or sties, should be frequently renovated or burned. Cleanliness is important. In the beds of the house, a sprinkling of chamomile flowers is recommended, or the placing of new flannel between the sheets.


Flea Magnified.

Flecks in Cream. Flecks are generally supposed to be pieces of dried cream, and possibly sometimes they may be, but usually they are not, for occasionally they exist in milk before any cream rises, and sometimes are mingled with butter made by processes of cold-setting in which the cream remains soft, no part of it being dried at all. They seldom appear, however, in butter made by cold-setting; they are mostly found in butter made in dairies where the milk is set without any other cooling than that of the air in the room where the milk stands. For the most part they are developed in milk after it comes from the cow. By quickly cooling milk to a low degree, change is so much arrested that they cannot develop. They can only form within certain limits of temperature, and when they do, are likely to appear as plentifully in the milk as in the cream, and often more so, which is evidence adverse to their being originated from dried cream. In milk which is in a perfectly normal condition they never appear. They always occur in milk which is more or less faulty. They are very apt to accompany an inflamed state of the udder, and seldom or never appear without it.

When milk in which flecks are liable to occur is set where the sun will shine directly on it, or even where much reflected light falls upon it, they form much faster than when light is pretty much excluded, and form on or near the surface, and much more plentifully in the cream than in the milk. A current of air over the milk also favors their development, and a damp air more than a dry one.

Flecks, or "white caps," whichever they are called, are apt to be more common in the fall and winter, when cows are drying up, and in hot and dry weather in the summer, when they are affected by heat and drouth. At such times their udders are apt to get inflamed, and this appears to be the cause, or at least a stimulating cause, of their origin.

There are different ways for disposing of flecks. The first and best way is to keep cows so healthy and well supplied with food and drink that they will not form in their milk. Some attempt to dispose of flecks by mashing them and crowding them through a strainer made of wire-gauze with fine meshes. By forcing them through the gauze by rubbing with a smooth wooden roller around the sides of the conical strainer, the flecks are broken to pieces and disappear by being pulverized. They never churn, however, whether fine or coarse, any more than curd would, and the finer they are the more likely they are to get caught in the butter and affect its keeping. Such butter ought not to be packed with that which is sound, for it is always a little imperfect. If one has milk in which flecks are liable to form, their development can be prevented, as already stated, by either high heating or low cooling while new; and if, by unforeseen occurrences, they form and appear in the cream, they can be kept out of the butter when churning by gathering it in the granular form.

Fleece, the woolly coat shorn from the body of the sheep. A primitive and barbarous method of obtaining the fleece was to force a flock through a narrow

and rough passage, in order that by rubbing against one another and the asperities of the passage, they might denude themselves of their wool; and a later and exceedingly cruel method, which continued till not very long ago to be practiced in Orkney, was to catch the animals and forcibly tear off their wool. The mild and economical method now practiced, together with the proper rules for observing it, will be noticed in the article Wool.

A fleece, immediately after being shorn from the animal, ought to be spread unbroken on a board, carefully examined, thoroughly cleaned of all adhering substances and filthy locks, rendered completely pure and neat, and then folded to a breadth of two or two and one-half feet, rolled up from the tail to the neck, and tied up in such a manner as to form a neat, compact bundle. Its shorn surface ought to be outside; and this, in consequence of the secretion technically called yolk, exhibits a silvery and lustrous appearance. The fleeces obtained at any one shearing ought to be carefully assorted according to their different qualities; for even though the whole flock be of one breed, and as nearly as possible homogeneous, the fleeces, in every case, possess considerable varieties of character. Some differ from the others in color; some have their wool matted and almost felted like cloth; and some may have suffered deterioration and loss by the partial shedding of their wool. The fleeces of the two sexes, and the fleeces of either sex of different ages, also widely vary. See Wool.

Flies. A fly is a two-winged insect. The word, in popular usage, is sometimes so restricted as to designate only a few species, or at most a limited portion of the dipterous order, and sometimes so extended as to include some winged insects of other orders, but it best comports with definiteness of idea, and at the same time is not much twisted out of any of its ordinary applications, when used as strictly synonymous with the scientific name, diptera.

The wings of flies, or dipterous insects, are two in number, and consist of veined and transparent membranes, and are attached to the middle of the sides of the thorax, and, for the most part, possess, near the point of their intersection, a pair of short clubbed organs called halters or balances. The body consists of head, thorax and abdomen. The mouth has a sucker of from two to six lancet-like scales, enclosed in a kind of sheath. The antennæ exceedingly vary in several of their characters, but especially in their length. The eyes are lateral, but in some instances they meet on the summit; and in others they are so large as to occupy nearly the whole head. The legs, in most species, are long and slender, but in some are thick and spiny, and in others are exceedingly long. The larvæ of flies have a fleshy head and a simple structure, and in general are so like one another that those of different species, or even of different genera, are quite undistinguishable from one another by unpractised observers. Most of the larvæ pass into the pupa state without shedding the skin, or simply by a gradual transmutation of it into a cocoon; and some shed the skin and become inert-looking and cocoonless pupæ; but two entire families of flies, the Hippoboscidæ and the Nycteribudæ, possess the extraordinary constitutional habit of producing their young in the condition of pupæ, or of affecting the transformations from ovules to larvæ, and from larvæ to pupæ within the body of the parent.

Flies, as to both their numbers and their habits, act a powerful part in the economy of the animal creation, and not in a few instances of great moment, challenge the attention of almost all observers, but particularly of cultivators of the soil. In their perfect state they are scarcely less numerous, in point of species, than any other order of insects; but if we look at them with respect to the number of individuals, we find them infinitely to exceed any other.

The clouds of midges, for instance, rising at eventide over the marshes, like the incense of the temple, equally pay homage to the Divinity in showing forth his mighty power; whilst myriads of flies of every kind are to be found in every quarter of the globe, traversing plants and every minute object, and more particularly all that has ceased to live. This immense profusion with which they are dispersed over the globe, causes them to fill two very important functions in the economy of nature; first, they serve for food to a vast number of the higher animals; charged with a divine mission by Him "who giveth food to the young bird," the swallow and the sparrow destroy them by myriads, and the fly-catcher and the humming-bird alike find in them a constant shedding of manna; whilst, in the second place, they cease not in effecting the disappearance of all substances in a state of decomposition, both animal and vegetable; they are universal scavengers; and so great is their activity, and the rapid succession of their generations, that Linnæus might well say that three flies can consume a horse as fast as a lion. Amongst such vast numbers of objects, it is not surprising that some should be found obnoxious to ourselves or our properties. Many species, accordingly, cease not to make man their prey, by sucking his blood, whilst some attack our cattle, in like manner, or deposit their eggs upon their bodies, within which the parasitic larvæ feed; others deposit their eggs, or young, upon our growing corn, and upon our prepared food of various kinds. Many species reside in woods, meadows and marshes; others move with dancing feet upon the spray of the waves and even upon the snows of the polar regions. Many are attached to plants, upon the flowers of which they abound, sucking the honeyed sweets, without giving the preference to any particular plant, whilst some are confined to a single species of flower, but it is upon the star-like Anthemis of our meadows that the majority seem to revel with the greatest delight. During the summer and autumn, the flies are attracted to our orchards, in order to destroy our fruits, whilst some species delight in the honey-dew of the aphides, or the fluids which escape from the wounds of trees. The domestic fly

feeds alike upon all kinds of household provisions.

TO DESTROY OR DRIVE FLIES AWAY. The best general method of keeping flies out of a house is cleanliness, keeping the rooms open, breezy, and light, and abstinence from the preparation and use of sweet things and meats, gravies, etc. During a warm rain the house should be kept closed, while the family can remain on the porch. Good fly-traps are in market everywhere, but all that can be trapped is but a small portion of the whole number about the premises. As the saying is, "by killing one lot you only make room for the next, which is just outside ready to come in."

TO KILL FLIES. Beat up the yolk of an egg with a table-spoonful each of molasses and black pepper finely ground; set it about in shallow plates, and the flies will be rapidly killed. A sweetened infusion of quassia will answer the same purpose. Dissolve one drachm extract of quassia in a gill of water, mix with one-half gill of molasses, and pour the mixture on a flat dish where the flies have access. The quassia acts on them like a narcotic.

TO DRIVE FLIES FROM STABLES. Scatter chloride of lime on a board in a stable, to remove all kinds of flies, but more especially biting flies. Sprinkling beds of vegetables with even a weak solution, effectually preserves them from caterpillars, slugs, etc. A paste of one part powdered chloride of lime and one-half part of some fatty matter placed in a narrow band round the trunk of the tree, prevents insects from creeping up it. Even rats, mice, cockroaches, and crickets flee from it.

TO KEEP FLIES FROM HORSES. Procure a bunch of smart-weed, and bruise it to cause the juice to exude. Rub the animal thoroughly with the bunch of bruised weed, especially on the legs, neck, and ears. Neither flies nor insects will trouble him for 24 hours, when the process should be repeated. A very convenient way of using it, is to make a strong infusion by boiling in water. When cold it can be conveniently applied with a sponge or brush. Smart-weed is found growing in every section of the country, usually on wet ground near highways.

TO PREVENT FLIES FROM INJURING LOOKING-GLASSES, PICTURE FRAMES, ETC. Boil three or four onions in a pint of water; then with a gilding brush go over your glasses and frames, and the flies will not alight on the article so washed. This may be used without apprehension, as it will not do the least injury to the frames.

Float, TO MAKE. Take a quart of new milk, sweeten and flavor to suit your taste, put it on the fire, let it get hot, almost boiling; now add the yolks of six eggs well beaten, and stir it until it becomes thick; do not let it stand a moment without stirring; as soon as it is thick pour it in a dish or jar and stir it until there is no danger of its turning to custard. Now beat the white of the eggs to a stiff froth, and cut it in slices and lay it on hot water to cook, turning it over so both sides will be cooked. When all is done pour your float in a dish, and lay the white on top.

Float Board, one of the boards forming the exterior of a water-wheel, against which the stream of water dashes.

Flock, any number of sheep or other domesticated gregarious animals which feed together or are under the care of one person. We say a flock of sheep, a herd of swine, a drove of cattle, a pack of wolves, or hounds.

Floors. Floors should not often be wetted, but very thoroughly when done. Uncarpeted floors should once a week be dry-rubbed with hot sand and a heavy brush, the right way of the boards. To give floors a beautiful appearance, after washing them very nicely with soda and warm water, and a brush, wash them with a sponge and clean water, rubbing lengthwise the boards. Then dry with clean cloth, rubbing hard.

To extract oil spots from floors, make a strong lye from pearlash and soft water, and add as much unslacked lime as it will take up. Stir together and let settle; bottle it and stop close; have ready some water to dilute it when used, and scour the part with it. If the liquor lie long on the boards it will draw the color out of them; therefore do it with expedition.

A wax for polishing floors can be made by taking 12½ pounds of yellow wax, rasped, and stirred into a hot solution of six pounds of good pearlash, in rainwater. Keep it well stirred while boiling, and when the froth goes down, stop the heat, and add to the mixture, while still stirring, six pounds of dry yellow ochre. It may then be poured in tin cans or boxes; it hardens on cooling. When wanted for use, dissolve a pound in boiling-hot water, stir the mixture well, and apply to the floor with a paint brush, while the fluid is yet hot. It will dry in two hours, after which polish the floor with a large floor-brush, and wipe with a woolen cloth. A coat of this preparation will last six months.

A HOME-MADE CLOTH for a floor can be made as follows: First, paper the floor of your bed-room with brown paper or newspapers. Then over these put down the wall paper, which has been selected for its carpet-like appearance. A good way to do this will be to put a good coat of paste, the width of the roll of paper and the length of the room, and then lay down, unrolling and smoothing at the same time. When the floor is all covered, then size and varnish; only glue and common dark varnish need be used, and the floor will look all the better for the darkening these will give it. When it is dry put down a few rugs by the bedside and before the toilet table, and you have as pretty a floor cloth as you could wish, and at a trifling expense—a floor cloth, too, that will last for years, if not exposed to constant wear.

If you have a painted floor, keep soap and soapsuds off of it, for it spoils the brightness of the paint, makes it soft, and then it peels off, leaving the floor

looking worse than if it had not been painted. If your floor has not been painted, keep soap off of it, for it gives a dirty, grimy look, and keeps growing worse all the time. Just take clean, hot water, put a teaspoonful of spirits of ammonia into a three-gallon pail of water, stir it, and with a clean, long-handled mop, rub the floor all over, then wipe it off with clean water. It will take a little while to get the gray out of the boards, but it will come out after a time, and you will find it far easier to keep your floor white and nice than it was when cleaned with soap or suds.

When a carpet is taken up to be cleaned the floor beneath it is generally very much covered with dust. This dust is very fine and dry, and poisonous to the lungs. Before removing it sprinkle the floor with very dilute carbolic acid, to kill any poisonous germs that may be present, and to thoroughly disinfect the the floor and render it sweet.

See also Broom, Sweeping and Carpet.

Floriculture, the art of cultivating flowers and ornamental plants with a special view to the finest forms, the most beautiful tints, and their improvement. As the country becomes older and more wealthy, more and more attention is paid to ornamental gardening, to beautifying the homestead, to the decoration of the house, the public park, the churches, public buildings, etc. Floriculture has taken rapid strides in the past ten years. The florists of Europe and the United States have devoted themselves to their trade with praiseworthy emulation ; each country has striven with the other—Germans, French, English and Americans have all been engaged in the strife, and to-day we profit by their exertions. Our old-time garden flowers are utterly eclipsed by the floral belles of the season. Compare the asters, balsams, stocks, pinks, Petunias, which amateur florists now cultivate, with those raised 25 years ago, and the great improvement in each and all is seen at a glance.

Flower gardening can only be commended in its results. Modern art has compassed the globe, and brought to our homes the floral treasures of ancient Asia and the isles of the sea. But flower culture, attractive as it is to the more refined taste of woman, and all who sympathize with her, commends itself to us as one of the most instructive and refining of pursuits. It has, too, its market value, though that seems little thought of; and the increasing demand for flowers by those who can not or will not grow them, will give an added interest to the occupation. Landscape gardening may be said to include the whole, of which ornamental trees and flower culture are parts. Here we bring under consideration the configuration of the surface; the surrounding landscape; the effects of grouping and massing trees, shrubs, and flowers of different colors and shades of color; the massing of single colors.

For flower gardening it is as necessary to select proper soil and location as it is for vegetable gardening. The strong, clayey, putty-like soil characteristic of the Northwest is well adapted to a majority of ornamental plants; a deep sandy loam is better, and it is also better for nearly all plants to be set in a soil which has good under drainage. It is better, in the first place, to select a good location than to turn a poor one into a good one by hauling soil, etc., upon it. In a general way, the natural habits of the plant should be imitated in culture; but this does not mean that the plant should be crowded by other plants, or set in bad ground and neglected as we generally find wild plants. The hints to be heeded are those given by the wild plant where and when it attains its greatest degree of perfection.

The ground should slope gently to the south or southeast; and if protected in the opposite direction by hills or timber, so much the better. If not protected naturally, a spruce hedge on the north and west sides is very desirable. If there is not a sandy or gravelly sub-soil, it is necessary to resort to tile drainage,—even more thoroughly than for other purposes. When one is not able to obtain tiling, he can very easily make a board drain that will last for years. Lay a narrow board flat in the bottom of a ditch, and place two wider boards over it, the upper edges meeting and supporting each other, forming a triangular drain. Some kinds of wood will be serviceable in this way for 20 years. The preparation of the ground, of course, is similar to that for vegetable gardening or ordinary field culture. Never work in the ground when it is wet enough to stick or clog, as that makes mortar of it, which dries into hard lumps and sticks.

For the manner of laying out walks, see Landscape Gardening. For Manure and Fertilizers, look under these respective heads. As to special manures and fertilizers for particular plants, there are no such things requiring attention. Plants, like man, need a general and natural combination of all the foods. For Lawn culture, see that heading also, in its alphabetical place.

The subject of flower-beds we must consider here. The old-fashioned mixed borders four to six feet wide along the walks of the fruit or vegetable garden, were usually planted with hardy, herbaceous plants, the tall growing at the back, with the lower-growing sorts in front. These, when there was a good collection, gave a bloom of varied color throughout the season. But the more modern style of flower borders has quite displaced such collections, and they are now but little seen except in very old gardens or in botanical collections. Then, again, we have mixed borders of bedding plants, a heterogeneous grouping of all kinds of tropical plants, still holding to the plan of either placing the highest at the back of the border if it has only one walk, or if a bed has a walk on each side, the highest in the middle, and the plants sloping down to the walk on each side. The mixed system still has its advocates, who deprecate the modern plan of massing in color as being too formal, and too unnatural a way of disposing of flowers. But be that as it may, we will not stop to argue the matter further than to state that the "carpet" styles of massing plants are more interesting than any mixed border. Nearly all the public parks in and about London are so

planted, and thousands of cottage gardens vie with other in imitation of the parks. But to plant in patterns or in ribbon lines requires for immediate effect a large number of plants, for the reason that they must be so stout that they will meet to form continuous masses shortly after planting. A study of figured carpets, therefore, or of kaleidoscopic views, will best convey to any amateur a general idea of the modern conception of beauty in the laying out of flower beds. In a circular bed, where it is desired to have the taller plants toward the middle, and where there should be planting in masses or ribbon lines, the following lists of plants will be good, the first mentioned being the taller:

LIST NO. 1.

		Height in Feet.
1.	Canna Indica zebrina, leaves green and brown striped.	6
2.	Salvia splendens, flowers scarlet.	5
3.	Golden Coleus, leaves orange and brown.	4
4.	Achyranthes Lindeni, leaves rich crimson.	3
5.	Phalaris arundinacea var., leaves white and green.	2½
6.	Achyranthes Gilsoni, leaves carmine.	2
7.	Bronze geranium, leaves golden bronze.	1½
8.	Centaurea candida, leaves white.	1
9.	Alternanthera latifolia, leaves crimsion and yellow	¾
10.	Lobelia Paxtoni, flowers blue.	½

LIST NO. 2.

1	Caladium esculentum, leaves large green.	5
2.	Japanese maize, leaves striped white and yellow.	5
3.	Coleus Verschaffeltii, leaves chocolate crimson.	4
4.	Delphinium bicolor, flowers blue and white.	3
5.	Cyperus alternifolius var., leaves white and green.	2½
6.	Achyranthes Verschaffeltii, leaves crimson.	2
7.	Mountain-of-snow geranium, leaves white and green.	1½
8.	Tropaeolum, Ball of Fire, flowers flame color.	1
9.	Echeveria metallica, leaves gray, with metallic luster.	¾
10.	Alternanthera amoena, yellow and carmine.	½

Of course the above classes can be transposed in any way to suit beds of all widths, keeping in view that where small beds are placed near walks the lower growing kinds are more suitable, while the taller kinds are placed farther back. Very fine effects are produced by planting on a lawn a single specimen of stately habit, such as a castor oil bean, Datura, Caladium, Hibiscus, etc., which grow five or ten feet high in a single season, and are particularly of a striking appearance; or, instead of this, a mass of six, eight, or 12 plants of scarlet sage, which will form a group six feet high and wide; its dazzling scarlet color, contrasting against the green of the lawn, is superb. Many of the amaranths are also well suited for planting in single groups. Amarantus tricolor gigantea, or Joseph's coat, grows six feet high and is the most brilliantly colored of all plants in foliage, scarlet, crimson and golden yellow predominating. The amarantus bicolor ruber grows five feet high and is plumed with scarlet crimson. In contrast to these, plants of a more somber tint may be used, such as Pampas grass, Ravenna grass, or the Tanyah, or Caladium.

Seedling plants can be nearly as well raised in the window as in a greenhouse, provided the temperature is right; for seeds do not need a strong, direct light while germinating. Indeed, a strong, constant light is a disadvantage, as it dries the earth too fast, necessitating frequent watering, which bakes the surface. The best things in which to sow seeds are shallow boxes, only two or three inches deep, with open seams at the bottom through which water will drain quickly. Fill the boxes within half an inch of the top with light, rich earth; nothing is better than black leaf-mold from the woods, or light sandy soil mixed with an equal bulk of stable manure so rotted as to resemble leaf mold; it will not answer unless rotted as fine as dust. Sweepings from a paved street are excellent mixed with light sandy soil, the object in all cases being lightness of the soil or mold, as the germs of many seeds are too tender to push their way up through a stiff soil. When the proper soil is put into its place, pat it down with a smooth board, sow the seed carefully and evenly over the surface, and then, with a common sieve, sift just as much earth evenly over the seed as will cover it and no more; moisten this covering with the finest possible spray, so that it will not settle and bake in the least. Keep the box at a temperature as near 60° as possible, taking care to give it a shower or spray only when the surface appears to be dry. As soon as the plant is up, a minute fungus will generally attack it, which, if not successfully combated, may sweep off the whole crop in 48 hours. As soon, therefore, as there seems to be any foreign growth upon the little plants, give it a slight drenching of tobacco water, or of water saturated with sulphur and quicklime. As soon as there are indications of any check in the growth of these tiny seedlings, they must be carefully taken up and planted out in similar boxes, prepared exactly as the seed boxes have been; they may be planted quite closely, not more than half an inch apart; then let their further treatment be precisely the same as in germinating the seeds. In the course of a few weeks they will have grown freely, and they may then be lifted and placed in similar boxes, but further apart, say 3 or 4 inches, or potted singly in 2½ or 3-inch pots, as most convenient, until they are ready to be planted out in the open ground or elsewhere. In this way as great a number of plants may be raised from a 25 or 50 cent packet of seed as would cost $25 or $50 to purchase, besides the far greater satisfaction of their being the product of your own hands.

Some plants, as geraniums, roses, Azaleas, Camellias, etc., are best propagated by cuttings. As a general rule, the lowest point at which a twig or clod of an herbaceous plant will break instead of bend, is the best place to cut off the cion for planting; but with woody-stemmed plants there is no general rule. The rose, for example, is in the best condition for cutting when the flower bud is about the size of a large pea. Although the shoot on which the flower bed shows will make a good cutting, yet if it is desired not to waste the flower, cuttings should be made of the "blind" shoots, that is, such young shoots as do not flower. It is not necessary to cut at a joint, although most gardeners still do so.

What is called the "mud" or "saucer" system of propagation is very valuable, and is as follows: Take any common saucer or plate with an inch or two of sand in it, and put into this the cuttings near enough to touch each other; water this until the sand is in the condition of mud; place in a sunny window, green-

house or hot bed; keep the sand constantly as wet as mud. Be careful to apply the water gently so as not to remove the plants; keep the temperature between 65° and 100°; with this system the plants will bear a higher temperature, as so much water is used; a temperature of 75° or 80° in the sunlight is about the best. The cuttings will root in 6 to 20 days; verbenas, heliotropes, fuchsias, etc., root in a week, while roses, carnations or Azaleas take 3 or 4 weeks. When rooted they should be potted in light soil, such as described above for propagating by seeds, in pots two or three inches in diameter, and treated carefully by shading and watering two or three days.

Layering, Grafting and Budding flowering plants are done precisely as with fruit plants. See those headings in their alphabetical order in this work.

Every class of plants requires some peculiarities in their propagation and culture, and a full detail of these would fill a very large volume; here we can only give those general directions which will enable one to manage most plants successfully; and now a few words in regard to tropical bulbs, seeds, etc. The tuberose in most Northern States must be artificially forwarded to bloom in perfection in the open air. To do this, place the dry bulbs in soil in pots or boxes about the first of May, keeping them rather dry until they start to grow freely, and more water may be given; the first week in June transplant these bulbs to the open border. While being forwarded the bulbs may be kept in any place where the thermometer ranges from 65° to 75° at night; at this time light is not necessary; nor is a greenhouse essential for the purpose, as a hot-bed or even a warm sitting-room will do nearly as well. Caladium bulbs should be treated in the same way, started in small pots and shifted into larger ones as soon as these get filled with roots; if properly treated they will be large enough by late summer or early fall to require a flower pot a foot wide, and the plant should be, according to variety, two to three feet in diameter across the leaves. They require a partial shade. The same general treatment is also best for Begonias, Bouvardias, Cissus, Coleuses, Dracænas, Euphorbias, Poinsettias, and indeed all other plants known as "hot-house" or "tropical." All plants kept in windows should be turned around every day that every part may receive an equal portion of sunlight. The matter of temperature in all this cultivation is very important; unless one is able to keep the necessary high temperature, he should not undertake to raise tropical plants. Late planting, both of bulbs and seeds, is therefore advised. Even tomato, pepper and egg-plant seeds are better sown in April than in March. Amaranths, balsams, Salvias, double portulacas, Cannas, cockscombs, Zinnias, etc., should not be sown in hot-bed before April, or in the open ground before the middle of May. Of the tens of thousands of pot plants sold from the street stands in spring, probably not one in ten survives. They are forced into bloom in small pots, have no constitution, and very few ever give another flower. Plants from the warm greenhouse should be gradually inured to the cool rooms where they are to remain. Plants taken from the garden in autumn should be carefully potted early in September, hardened in the shade out doors, and removed to the parlor when the nights become frosty, and have plenty of fresh air on warm and sunny days. If taken up late, they are long in blooming. The following sorts are named as best for windows: Of roses few do well, but among these few are sanguinea, the best; agrippina and Safrano; nearly all the Abutilons; Cuphea, a constant bloomer; Cyclamen Persicum; Oxalis, all the species; Chinese primrose; most of the monthly pinks, which bloom all the last half of winter; the zonale pelargoniums; the Indian jasmine and Calla lily.

For the potting of plants the best mold is soil immediately under a turf mixed with well rotted stable manure, or street sweepings thoroughly mixed with fresh soil. For small and tender plants it should be sifted. In shifting to larger pots there is danger of taking those which are too large: they should be large enough merely to admit an inch or two more of soil around and below the plant. If old pots, they should be washed, in order that there be free evaporation through the pores. Do not water the plants immediately before transferring them to another pot: but after the fresh soil is carefully adjusted around them in their new place, water the new soil, and then the roots will make vigorous effort to extend themselves out into it. The leaves of all plants in the house should be kept clear from dust by frequent sponging. A sprinkling every day is good for them, but the soil should not be watered but once in several days, and then it should be thoroughly saturated. Most plants do better without saucers or dishes of water under and in contact with their pots. In the greenhouse it will be convenient to set the pots upon an inch or two of wet sand, from which moisture can be absorbed when the watering is neglected. Pots which contain ornamental plants in rooms, are often needlessly repulsive by the exposure of the earth in which they are planted. We have found a covering of an inch of white sand to prevent crusting the surface or soiling the edges of the pot, and at the same time allow free watering. A more ornamental appearance is effected by procuring from the woods the handsome flakes of fresh, green moss found in damp places or on rotten logs, and covering the earth in the pots neatly with one of these flakes. It serves as a mulch, keeps the earth moist and mellow, admits watering, and furnishes a neat, green carpet under the plants.

The more hardy house-plants, requiring a temperature of 45° to 55°, comprise the Azaleas, Abutilons, Ageratums, carnations, Cinerarias, Catalonian jessamines, Cape jessamines, Camellias, Callas, Chorizemas, geraniums of all kinds, Hibiscus, Hyacinths, Myrsiphyllum, Smilax, Mahernias, Primulas, Stevias, roses, violets, and the so-called greenhouse plants. Those requiring a temperature 10° higher are begonias, Bouvardias, Clerodendrons, Euphorbias, Epiphyllums, Fuchsias, heliotropes, Poinsettias, tuberoses, etc. Roses will do in either temperature. Both classes of plants require a moist atmosphere. In the common

dwelling it is necessary to keep upon the stove a very wide, shallow pan of water in a constant state of evaporation.

The green fly and most other pestiferous insects can be kept away by fumigation with smoke of burning slightly moistened tobacco stems, or by syringing with a cold infusion of the same. The red spider is kept off simply by a proper temperature and degree of moisture, as they appear only when the atmosphere has been too dry or warm. This insect is so small that we can hardly see it, but the effect of its work is the abnormal brown color of the leaves. The mealy bug can be destroyed by alcohol thrown on with an "atomizer," an apparatus sold by druggists for the purpose; but as some plants can not stand any drug strong enough to kill the bug, it is safer to "sponge him off," either with a sponge or a brush. He is easily recognized in the axils of the leaves by his dusty, or white-mealy appearance.

To destroy mildew on roses in house cultivation, boil one pound each of lime and sulphur, in two gallons of water, until it is reduced to one gallon; allow the liquid to settle until clear, and bottle it for use; one gill only, and no more, of this liquid is mixed in five gallons of water, and this is thoroughly syringed over the roses in the evening. This liquid should indeed be used as a preventive. The rose slug, a light green, soft insect, varying from one-sixteenth to nearly a whole inch in length, eating out the substance of the leaves, is almost invulnerable to all attacks; a good preventive is daily syringing the plant in early spring with a solution of whale-oil soap in the proportion of one pound of the soap to eight gallons of water. The rose bug, or chafer, which is also destructive to the dahlia, aster, balsam, and many other flowers, can be himself destroyed only by picking off with the hand. An English writer says that quassia and soft soap will destroy lice on roses—used by boiling four ounces of quassia chips for half an hour in a gallon of water, and when cold and strained adding two or more gallons of water and six ounces of soft soap. With this syringe the bushes. The best remedy, however, is tobacco water, made by pouring a gallon of boiling water on four ounces of tobacco, and covering till cold. The shoots may be syringed or dipped in it. The blue aphis attacks the extremities of the roots of asters, verbenas, petunias, Centaureas, etc., and can be reached only by thoroughly saturating the ground with a very strong decoction of tobacco. When ants attack a plant they can be easily led off by a fresh bone; when the bone is covered with them take it off and destroy the insects. Brown and white scale insects, which infest oleanders, ivies, etc., have to be washed or rubbed off. Thrips (see under Grapes), does not succumb to the usual remedies so easily, but Mr. Peter Henderson says a moist atmosphere, tobacco smoke or water, and good culture generally, will keep off almost all insects. Where angle-worms make the ground too open around pot-grown plants, they can be thoroughly driven away by saturating the place with quick-lime water—one quart of lime to ten gallons of water. All kinds of worms can be driven out of pots by securely corking up the drainage holes and flooding for several hours with clear lime-water.

Whenever plants begin to drop their leaves it is certain their health has been injured by wrong culture, generally one that has been too rich or stimulating. In this case do nothing more to it until signs of reaction appear, or let the earth in which it is planted become nearly dry, take the plant from the pot, crush off the old, soured soil, and put the plant into new earth and a new pot. Be careful not to overfeed it. Give it water enough to settle the new soil, but no more water until it has recuperated and begun to grow, unless the atmosphere is so dry as to endanger the life of the plant. The most common error is too much watering. Sometimes the escape of gas in the house, or smoke of wood or coal, causes plants to suffer. In all cases of sick plants, withhold water for awhile, as we do food from a sick person who has no appetite, and whose system can therefore make no use of food.

Frozen plants should be immediately removed to a warmer atmosphere and *not* treated to cold water, as is too often the case. To prevent freezing in inadequate rooms, cover the plants with newspapers, fastening the edges of the paper together so as to prevent a circulation of air to and from the plants.

A number of winter-blooming plants can also be set out for summer decoration, as the carnations, heliotropes, Fuchsias, geraniums and the monthly varieties of roses; and the following will give a continuous bloom from June to November: Snapdragon, dwarf Dahlia, coral plant, Gladiolus, geranium, Pelargonium, Lantana, lobelia, Petunia, pansy, Pentstemon, passion-flower, Rondeletia, Salvia, Tropæolum, verbena, Veronica; and the following are useful only for the brilliant coloring or other peculiarities of foliage: Alternanthera, Achyranthes, Artemisia, Cerastium, Centaurea, Caladium, Coleus, Cineraria, Dracæna, Echeveria, silver, gold or bronze geraniums, variegated ivies and grasses, loose-strife (Lysimachia), Peristrophe, Sanchezia nobilis, Vinca major, etc. Of course, for full descriptions of varieties and many peculiarities of cultivation and propapation, one must consult the catalogues of florists, which can be obtained free. All the above mentioned can be raised from slips or cuttings taken from plants (or by seeds where noted in the catalogues), during the winter or early spring months, or from large plants which have been preserved for the purpose. One of the most common mistakes made by purchasers of plants in our city markets, is that of almost invariably choosing large plants *forced* into flower. Of course these plants are raised for market, and the raiser of them is not responsible for the drooping of the leaves and flowers, or entire death of the plant, soon after it is removed to its new home, where the temperature and other conditions are different. Nothing is more satisfactory to the lover of flowers than the raising of his own plants.

Window Gardening is very popular, and would be far more so if our climate were as favorable as that of some other countries. The principles of this art are about the same as those already inculcated, except that it is more important to turn the plants frequently so that every part may receive plenty of sunshine. Cleanliness is as essential to health in the vegetable as in the animal kingdom, and in some respects, perhaps, more so. Every plant being an organized existence, its health largely depends on its ability to perform its natural functions—analogous to perspiration, respiration, and digestion, in the animal economy. Remembering this, we see at once how much they suffer when covered with dust and the excretions of insects. As frequent washings are thus promotive of health, so frequent sprinklings over the foliage of most plants will act as the great antidote to disease, insects and decay. The insects and disease that infest and not unfrequently destroy plants, may be kept at bay to a considerable extent by good cultivation, which consists in providing at every stage in the life of a plant conditions favorable to its full development in any form desired. As a rule, the appearance of insects, or mildew, is an evidence of debility in the plant, induced very frequently by neglect of the ordinary rules of cultivation. The best remedial agents are air, water and light; but in aid of these we are sometimes compelled to employ tobacco, soap, sulphur, or patent preparations, made of no one knows what.

Whatever plants we cultivate, the more healthy they will be in proportion to the fresh air they receive. Those are the most dependent on this change of air which receive least sunshine, because in sunshine the plant, to a certain extent, purifies its own atmosphere. Air-giving, however, must be dependent on human comfort, as well as the welfare of plants, and should only be given when air above freezing can be admitted, and be careful to avoid draughts. When people talk of dry air being injurious to plants, they really mean impure air; air is seldom too dry. A temperature of 55° gives more flowers than any other.

It is seldom necessary to shade a plant out of doors, but it is sometimes desirable to shade plants in windows. There, for instance, is a fresh potted plant, perhaps partially disrooted a week ago; the weather has been dull ever since; but to-day the sun shines brightly, and water as you will, every leaf wilts; there are greater demands made upon the leaves than the roots can, in their torpid state, properly meet; and in such a case, when the soil is wet enough, instead of deluging it with more water, the proper plan to adopt is shading, and sprinkling the foliage with water until the reciprocal action between roots and leaves is restored. But another evil is sometimes induced by continuing the shade longer than is necessary. Plants lengthen in heat, but increase only in unobstructed light; so that too much shade has the tendency to spindle out what previously existed. Use it, therefore, but do not abuse it.

A south window is the best position for plants during the winter and spring months. For the summer months, north or east is preferable.

Watering Plants. There is no subject more perplexing to beginners than this. When to water plants is governed by the circumstances of the plant at the time, whether growing, at rest, or approaching a state of repose, and on its position as respects sunshine or shade, and a high or low temperature; so

Fig. 1.—*Spiræa Eximia.*

that judicious watering is not so much a matter of regular routine, as of thought, intelligence, and adaptation to circumstances. Watch the first signs of distress, and there and then apply the relief. Do not wait for the proofs of suffering in the plants wilting and hanging their heads in festoons around the pots. As a general principle, the same rule holds good in respect to a cutting. Here is a Cactus; water it regularly, and you will kill it with juices it cannot get

rid of. There is a bulb which requires a season to ripen and another season to rest; continue to water it, and if you do not kill it, you will look in vain for flowers another year. Plants may wilt from weakness, or excess of sap in the tissues, or from sunshine on their leaves and stems, especially after dull weather, and yet not need watering. No doubt, during the summer months the evening is the best time, as at night every part of the plant is filled up with moisture, and the morning finds it enlarged in stature, or in size, and much renewed in health and vigor. Though many of the objections to watering in sunshine are largely theoretical, and appear only in the writings of those who have had but little actual experience, the real objection to watering in sunshine is, that the water is rapidly dissipated, and this prompt evaporation induces such an amount of cold that retards rather than stimulates growth. Whether plants grow most by day or night, may still be a doubtful question, though cultivators believe they grow most at night; certainly night growth would be still more effective were plants watered near sundown, as evaporation is so much less rapid at night, and this loss of heat is avoided. When water is given to the soil, let it be in such quantity as to reach every root, and then wait until the soil becomes dry again. Mere surface watering leaves you in ignorance as to the state of the bulk of the soil. To a great extent the same rule applies out of doors, encouraging surface roots at one time to render them liable to be scorched at another, while the mass of roots below is rendered torpid and inactive. Rainwater is best, as nothing is more certain than that hard water will kill hard-wooded, fine-rooted plants. It should be used at a temperature somewhat near that of the room, and is improved by exposure to sun and air. When kept in tanks below ground, it is frequently rendered as hard as spring water from its absorbing magnesia or lime from the materials of which the walls of the cistern are composed. Stronger liquids, containing some manurial matter in solution, if given, should generally be done at the period of flowering. Such solution should be weak and clear. All over-stimulation of the plant-system should be avoided: some plants bear it, but in others, as the carnation and rose, a distortion of the flower may ensue. The stamens may change into petals, petals into leaves, or the flower may become altogether double if the soil is too rich.

Manuring Flowers. Little or no crude manure should be used, as it induces a too luxuriant growth of foliage and wood, at the expense of the flowers. The liquid form is the best. It should be made very weak. One bushel of horse droppings, or two bushels of cow or sheep droppings, or a half bushel of hen manure or soot, or six pounds of guano, to one hogshead (60 gallons) of water, applied every two weeks, is about the proportion. Allow the liquid to stand two or three days before using, stirring daily. Use the clear liquid. For house plants, take a quantity of soot from a stove or chimney where wood is burned; pour hot water upon it, and when cool, apply. Common glue, one ounce to the gallon of water, is a good fertilizer. A few drops of ammonia to a quart of water, too, are excellent. If wood and foliage are desired, apply manure as soon as the buds begin to swell in the spring. Apply at intervals up to August, then stop. Plants over-urged after that date are apt to winter kill, for it is then the wood naturally begins to harden preparatory to its winter rest. When fine flowers are desired, do not apply manure until the flower-buds begin to swell. This causes a larger development of petals and enhances the colors. A good method of manuring or watering plants is to make holes 12 to 18 inches deep with a crowbar or stake, one to each square foot, near the plants. Fill

Fig. 2.—*Chinese Wistaria.*

these with the liquid and nothing is lost by evaporation; it soaks away in immediate contact with the roots, and there is no waste of material. Previous to planting the ground to flowers, it should be thoroughly drained and made rich with barnyard manure, or compost. A portion of it should be shaded by fence, hedge, screen or wall, for such flowers as delight in shade and moisture.

Table. Plants in rooms are best grown in hollow tables lined with zinc, and deep enough so that the tops of the pots may be covered with moss.

What we will now discuss has reference chiefly to those operations necessary to keeping plants from season to season, and to providing ourselves with young plants from seeds or cuttings, a matter of no small moment to window gardeners, as it is seldom desirable that such plants should be very large.

POTTING PLANTS. Many of the plants we have tended with so much care are now demanding more pot room, or fresh earth, in similar or smaller sized pots, by getting rid of a part of the old soil. As a general rule, pots ranging from three to six inches in diameter are large enough for windows, increasing the size of the pot from an inch to an inch and a half in diameter. No plant should be transferred to a larger pot while its ball of earth is dry, as no ordinary watering would ever afterwards moisten it, nor should it stand deeper in the new pot than it did in the old one. In every case it is well to wait until a plant has filled with its roots every part of the pot it occupies before changing it into one of a larger size, and in all cases the compost must be pressed firm and to an equal degree of firmness all around the ball; for if less firm on one side than the other the water will drain away down that side, and the other side will be only partially moistened. When new pots are to be used, place them in a tub of water for several hours, allowing them to dry thoroughly before using. The reason for this is, that in proportion to the porosity of new pots would they extract moisture from the soil, forming a vacuum between the pot and the soil, which might deceive you very much in future waterings. Old pots are as good as new, only they should be clean inside as well as outside. Put a plant in a clean pot, and in time it will become well rooted. If you wish to re-pot it, the ball of earth will come away from the pot as clean as possible, but if the pot had been dirty or wet when used the ball will be broken and the roots very much injured. For house culture in general we would prefer hard-burned pots and of a light color, as the soil would then have a more even temperature and there would be less absorption and radiation of heat. Neat, strong pots might be made of zinc, and the outside painted so as to look very ornamental.

FIG. 3.—*Deutzia Crenata, the "Pride of Rochester."*

SOIL AND DRAINAGE. Loamy soils taken after removing the grass sod, with the addition of a little leaf mold, will grow almost any plant that would be a real ornament to a window. Leaf mold not only keeps other soils open, but from the vegetable matter it contains acts as the best assistant to plants. In practice it will be found that young plants of all kinds, and especially soft-wooded plants, thrive best in a light soil containing a large proportion of sand and leaf mold; whereas, plants that are advanced beyond the stage of infancy, and all plants of woody texture, require a firmer compost. The vigorous circulation induced by too rich soils should be avoided, as with abundant moisture they give us strong shoots and great luxuriance generally, but few flowers; to get these less water is needed, and more of the solid matter it contains. We see this in the well-ripened wood of the peach or grapevine, so necessary to good bearing, and generally in the fact of plants flowering, not on sappy shoots, but on the matured wood of the present or previous season. As a general rule, every plant in a pot over four inches in diameter should have one inch of drainage, over which place a layer of moss; it is valuable as a moisture equalizer, and will prevent the drainage clogging up.

RAISING AND PROPAGATION. The essential conditions necessary for raising plants from seeds are warmth, moisture, comparative darkness, access to atmospheric air, and a light, sandy soil. Whatever be the temperature in which a plant rejoices, a little more heat may be given to promote the germination of its seeds. Even the seeds of the most hardy plants will bear a strong heat with impunity, if, as soon as they are up they are gradually hardened off. Some seeds are so hard that we may bury them for months before the shell will be burst by the embryo, because moisture can not reach them; these may be soaked in water of a temperature of 130° for a couple of days. In sowing seeds, a good, general rule is to cover only to the thickness of their own diameter, and small, dust-like seeds should be sown on a damp surface, without any covering of soil whatever.

A box, a foot or so square and three or four inches deep, is better to sow seed in than a pot, as it retains moisture longer; and this is one of the secrets of raising plants from seed, as they are apt to perish if frequently watered before they have gained some strength. Fill the box to within one inch of the top with light porous soil and press smoothly with a piece of board, after which give a good watering with a fine sprinkler, then sow the seed and press gently into the soil. Cover the box with a piece of glass, and on that place any opaque substance, such as a piece of paper or a little moss, and stand the box in a shady corner. The glass will check evaporation from the soil and yet allow of the admission of air, while the box will absorb quite as much moisture as it parts with, and thus the soil will hold just enough moisture to slowly expand the integuments of the seed. Failures in raising plants from seeds are chiefly due to getting the seeds too deep, or from filling the pot or box too full of soil and sowing so near the surface that the seeds are dried up or washed away in watering.

Success in rooting cuttings will, in general, be in proportion to our skill in preventing the cutting feel-

ing its removal from the parent plant. Hence, other things being equal, well-ripened shoots of deciduous plants are more easily rooted than those in a less mature condition, though if proper conditions were at hand the latter would root the soonest. Suppose you have a nice growing plant in your window early in May, and it has many young shoots on it two or three inches long, slip them off close to the stem, cut off a few of the lower leaves and insert a pot of sand, expose them to the sun and air in your window, and most likely your labor will be in vain; but cover the pot with a piece of glass, to keep the atmosphere about them moist, and shade from sunshine until they can bear it without wilting, and you will have rooted plants in as many days as you would have in weeks from deciduous cuttings. In general it is best to have a cutting cut off at a bud, as the vital forces are stronger there, and there is less danger of their decaying from extra absorption of water. Sand as a medium in which to root cuttings is preferable to anything else; because it prevents too much water collecting about the base of the cutting, on the one hand, and on the other the entrance of too much air to dry it up. Other methods of propagation are chiefly the separating of tuberous and bulbous plants and the dividing of the roots of herbaceous plants. Whenever plants get frozen they should be thawed out gradually, by putting them in a cool, dark place and sprinkling with cold water. When the frost has thawed out, restore them to the light. Lime water will remove the ordinary worms from plant pots; the strength is of no particular consequence, so long as the water is perfectly clear; but to kill wire-worms you must use salt, or some chemical stuff equally strong. The most effective plan to get rid of worms is to heat the soil.

PLANTS TO BLOOM IN WINTER. About the latter end of May plants intended to flower in winter may

FIG. 4.—*Statice.*

be placed in the ground up to the rim of the pot; they should be turned two or three times during the summer, to prevent rooting in the ground, and liberally watered: though if well rooted in their pots, most plants will do better turned out of their pots and planted in the ground. If treated in this manner, they should be potted early in September, and stood in a shady place until they become rooted in their new quarters. While in the ground during summer, they must not be allowed to flower, because the plant we wish to flower at an unnatural time of year must not have exhausted its flowering powers during summer. A plant well prepared for winter flowering should be well rooted in its pot, with plenty of flowering wood, ready, when properly supplied with the stimulus of heat and moisture, to burst into bloom; but plants taken from the ground after flowering all summer, potted, and placed in heat at once, meet every difficulty unprepared, and will generally fail, the steady high temperature allowing the formation of blossoms only to a limited extent, and by spring such plants are worthless. On the contrary, if the plants when brought indoors in the fall were placed in a cool, airy room, they would ripen their wood, become strong and vigorous, storing up strength against the demand that will be made upon them in the future; and when brought into the warmer air of another room and carefully treated, flower as liberally and as beautifully as the average of greenhouse plants.

FIG. 5.—*Spiræa lanceolata.*

Some of the mistakes most commonly made by the inexperienced are, potting too loosely, filling the pots too full of soil, and making no provision for drainage. These matters seem small, but it is usually the attention to small matters that makes the difference between success and failure. It should be thoroughly understood that no amount of instruction can compensate for any lack of personal attention, as the art of plant-growing cannot be acquired from books; books are useful to give the impetus and to direct our energies aright; but proficiency is only attained by attention to causes and effects; if there is an interest in the work at its commencement, that interest will increase as skill and dexterity are acquired. The plants suitable for house culture are far more numerous than is generally supposed; we can therefore mention but a few, and those such as are more generally known; and first, there is no plant with which success is more

certain than the Chinese primrose, as it readily accommodates itself to all conditions, and is in bloom from December to May. In the latter month place them out of doors, where they get but little sun, and during the summer pick off all flower buds as they appear. They should be repotted in spring. The Calla lily should be in every collection. It is not a lily, but popularly it is so. To have it flower in winter, it should be exposed to the full summer sun without water. Re-pot in August, shaking off the old soil, and place the pots in an exposed position until they are taken indoors at the approach of frost. The Calla likes an abundance of water and light. If it is of the spotted-leaf variety, they die down and rest every fall and start again every January or February. Give them plenty of hot water—on the earth, not on the plant. All Callas need plenty of water. When at rest, no water. The Cyclamen thrives well in an atmosphere where other plants suffer, as it seems to be but little affected by the impure air of our rooms. Re-pot the bulbs in September or October, placing them in their pots so that the crown of the bulb will be just above the surface of the soil; stand in a sunny window and water while the plant is in bloom and the leaves green. After the flowers have faded, and the leaves show a yellowish tinge, gradually withhold water and place the pot in a shady position out of doors for the summer, but never allow the bulbs to shrivel.

The Lady Washington geranium, after flowering, should be placed out of doors for some weeks to ripen its wood, giving no more water than will keep its leaves from wilting; you must then prune back to two or three buds of the old wood, keeping rather dry for a week or so, when they may be watered; re-pot into small sized pots; when the young shoots have grown one inch, trim back any straggling roots, and in February transfer to a large pot in which it will flower. All varieties of the Pelargonium are readily grown from cuttings planted in July or August, or from seed sown in spring. The variegated, scented zonales and ivy-leaf geraniums are all desirable, especially the zonales, which are valuable for winter blooming. Fuchsias should be brought from the cellar in February or March, and pruned back closely; water sparingly until growth begins, then transfer into smaller pots—using larger ones until it is desired to have them flower; after flowering, withhold water and return them to the cellar during winter. The Fuchsia likes partial shade, rich soil, and plenty of water. Carnations of the tree kind bloom freely in the window. Cuttings may be rooted at any time during winter; pinch out the center of the young plant, and plant in good soil out of doors in spring; pot in September, before severe frost. It is necessary to start with young plants every spring. Oleanders are readily grown from cuttings in a phial of water. We must prune and treat this plant as we wish some of the shoots to flower this year, and some the next; or all this year and none the next. Whether a plant blooms every year, or every second year, the flowers can only be produced one spring and summer at the ends of shoots grown and matured last season. Here in May is a plant with two shoots: one shows signs of flowering, the other not; cut the flowerless shoot down to near its base; from thence you get two or three shoots for next year; when done flowering, cut that shoot down also, so as to obtain a further succession of shoots; these are induced to grow as much as possible until September, after which keep in a low temperature, and give but little water until growth recommences in April.

Of the roses, the everblooming class are the best for house culture. Roses for winter blooming are usually grown in pots all summer; but two or three year old plants may be grown and flowered in the ground all summer, and if potted early in September, and kept from wilting, they will fill their pots with healthy fibers by October, and flower abundantly all winter. The case is different, however, with younger plants grown in the ground; these having few if any feeding roots, must be kept at a low temperature for some time until nature has restored the loss incurred in digging them up. These roses should be potted in October, and placed in a cool, light cellar until February, then placed in a sunny window where they will flower ,the remainder of the winter and spring months. If you want oleanders to grow all the time give them warmth and water, in a rich soil mixed with sand; but they will do very well to grow out all summer, and set in the cellar in winter with water occasionally while in a state of rest. Take up tuberoses, keep in a warm, dry place till spring; let the tops be on, as the substance in them will be absorbed by the root. When you set it out, take off the offshoots, if any, and plant by themselves for bloomers another year, as the old root never blooms but once, and must be three years old to do that.

All of the cactus tribe should be treated somewhat alike. Use sandy loam and lime rubbish, with a little leaf mold, for potting. They bloom chiefly during the summer months. Water liberally until the middle of September; from this time until March they will hardly need a drop, unless the stems get very brown and shriveled. Commence watering them in the spring very gradually.

Plants with slender drooping foliage are most suitable for baskets, such as the Smilax and Maurandia. The former has a tuberous root, and should be dried up in summer. The nasturtion, especially the dwarf, dark varieties, climbing and drooping, are very desirable. The German and English ivies are graceful and of very easy growth, as are also the well-named rat-tailed cactus and the so-called ice plants. All of these are good, and are but a few of the many available for this purpose.

Fern cases are a never failing source of pleasure when properly managed, the soil for which should be a sandy loam and leaf mold. Give water sparingly in winter and more abundantly in summer. Occasionally admit a little air, and when not too powerful, expose the case to the influence of the sun. No

doubt nine-tenths of the cases in use are supplied with an excess of moisture. Drainage and having double bottom attached to the case to catch the surplus water would remedy this. To plant a fern case it isn't absolutely necessary to purchase expensive plants, unless you prefer to do so; for if we go out into our woods and marshes we shall there find plants and flowers that are the admiration of thousands on

FIG. 6.—*Hydrangea.*

another continent. Almost every house has a cellar, which, if dry and frost-proof and has good light from windows on the south, east, or west side, but no openings to the north, would be a suitable place to keep many plants in winter. Let it be remembered that the great essential to their preservation is dryness. A plant will exist during winter and at its period of rest, even if very dry, though the extreme of dryness sometimes causes decay. When obliged to water, let it be given in mild weather and just sufficient to maintain life. Geraniums, Fuchsias, the Agapanthus, hydrangeas, and orange and lemon trees are a few of the many plants that may be kept in this way. The care that they require is but trifling and is amply repaid by the increased vigor of such plants in summer.

As to dahlias and everlastings, the greatest object is not to plant them out before all danger of frost is is over. Put your roots in a box and cover them with ground, rich garden soil, about the middle of March, and keep them in a warm place to sprout. When you want to plant them, take them out and divide the roots, never allowing more than one or two to grow in one place. If you wish to get new varieties without going to the expense of purchasing them of the florists, you can sow the seed. Sow them only in the spring in a sunny window. They will bloom the first season, but you must not be discouraged if the flowers are only single. They will double themselves the next season provided the roots are dug up after the first hard frost in the fall, and dried in the air a day or two, and then kept where they will neither freeze, rot, nor dry up.

HANGING BASKETS, HANGING POTS, POTS ON STUMPS, or on imitations of stumps, and many other rustic designs, and plant stands, Wardian cases, ferneries, etc., are common in floral culture. A glance at illustrative cuts will give any amateur a start in his imaginations, enabling him to originate others according to his own fancy. The best way to water a plant in a hanging basket is to submerge the whole in water until it is thoroughly saturated; but this should never be done except when the earth is dry in which the plant is growing. To ascertain when it is dry enough for the process (for the earth should not be watered little and often, as some people feed babies), dig out a little from toward the center and pinch it between the fingers; if it sticks together like putty it is not dry enough to be watered. It is often a good plan to grow moss over the surface of the earth around the plant when in the shade. This is impracticable in the sunshine, where plants are put in order to make them bloom. In the latter case, however, dead moss is the best mulching.

Greenhouses should be built with their gable ends north and south, so that sunlight will be equally distributed to the plants; or, if attached to a house, they should be on the east or south side, or the southwest side. If a detached greenhouse is made on the shed-roof plan, that is, with the whole roof slanting one way, of course that roof (of glass) must face the south and the gable ends of the greenery would be east and west. The walls below the glass should be of wood, as the heat inside during the winter, when it is very cold outside, will destroy any stone or brick wall. Use roofing paper with the frame wall, and a good cheap structure can be had. A hot-house is so made by putting a heating apparatus into the greenhouse. Of course no one will undertake to build these structures without carefully inspecting a good one or two. Very good cheap, neat greenhouses for many plants can be arranged by altering the cellar. See Greenhouse.

FIG. 7.—*Moss Pink.*

As sunshine is necessary for the development of flowers, shady places should be utilized by putting in them such plants as Calceolarias, Fuchsias, lobelias, herbaceous phloxes, pansies, forget-me-nots, lily of the valley, etc., whose native habitat is shady woods; or foliage plants, as Coleuses, amaranths, Achyranthes,

Caladiums, Cannas, Centaureas, Cinerarias, Gnaphaliums, etc.

The seeds of all trees and all those plants whose native habitat is deep, shady woods, must be germinated in cold frames, covered with lattice work or shaded with twigs of evergreens; and all plants started in the shade must continue to have shade provided for them when they are transplanted to the open border, until they have become hardened to the new situation.

Plants kept in the windows during the summer months will, if in a sunny exposure, require some kind of a shade; and if the one provided to keep the sun from the room shuts out too much light, or excludes air as well as the sun, something must be provided which will give protection during the heat of the day and still allow sufficient light and circulation of air. Any one with ingenuity can arrange a screen of white cotton cloth to answer the purpose.

The old practice of stripping the greenhouse in the summer is falling into disuse, and by proper selection of plants and sufficient shade, it is made as attractive then as at any other season; but, even for tropical plants, it must be shaded. For a small lean-to, a screen of light canvas or muslin arranged upon the outside, so that it may be wound up on a roller when not wanted, will answer; and if it be desired to keep the house as cool as possible, this should be so contrived that there will be a space of six inches or so between that and the glass. The roof of a large greenhouse, however, of the curvilinear form is generally whitewashed. The whitewash is gradually washed off by the rains during the summer, so that by fall there will be but little to do to finish the task. Later in the summer the plants can receive about as much more light as such an arrangement will furnish. By spattering the wash upon the glass, different parts of the house can be shaded heavier or lighter, as may be needed.

Flower Gardens for Children. Children love flowers quite as much as older people, and if they are permitted to have a small garden of their own, in which they can plant and dig and weed and hoe and use the tiny little implements that are made so cheaply for the flower garden, they will not only take the greatest delight in its possession, and in the buds and flowers, but will also gain a large amount of health and muscular development. Their love of the beautiful will also be largely cultivated, and they can be taught to give flowers to the sick and the poor children, and learn that to give pleasure to others is the surest way of receiving it themselves. But of all the lessons to be taught to children by working in a garden, the most valuable is the art of observation. So minute, so varied and so delicate, and yet so unerring are the operations of nature, that, although the closest study may fail to divulge her secrets, the rewards of such study are so rich and so surprising that they are stimulated to fresh researches. Let the child plant morning-glories to run over a bean-pole or strings whieh bloom so brightly every morning, mignonette and sweet alyssum and forget-me-nots to make tiny, sweet bouquets. Then give a monthly rosebush, a geranium, feverfew, and some verbenas and pansies, and there will be an amount of flowers that will gladden the hearts of a shopful of children. If the kind mother will attend to it and have the beds laid out, and teach her darlings how to plant the seeds and plants, she will give them an occupation that they will not weary of while life lasts.

Species and Varieties. There is no end to the number of these. It can even be said that the origination of new varieties is an annual business with many florists, as the devising of new styles is that of the manufacturers of fancy articles. Indeed, the choice of flowers, like dress, is subject to the vicissitudes of fashion. Everybody nowadays regards as "out of fashion" the hollyhocks, marigolds, sweet pinks and poppies of fifty years ago; while heliotropes, Deutzia, wax plant, fuchsias, lily of the valley, hyacinths, geraniums, verbenas, etc., are now in fashion.

Whatever is intended to please the fancy must be, in the nature of things, unlimited in its varieties; for "ever the soul wants something new." It would therefore be useless for us to attempt to give here a list of the varieties of flowers and other ornamental plants in cultivation, or even of the species. Every one is hereby entreated to send to some floriculturist for his catalogue, as the best guide to the selection of the plants he desires. Nearly or quite all floriculturists who advertise in the agricultural and similar papers, are honest and will give proper advice and send good seed, bulbs, etc.. to those ordering them. With nearly all the common flowers, almost any color or degree of variation desired can be produced by the art of hybridizing, etc. Besides, there are "foliage" plants, as Coleuses, Bignonias, etc., of nearly all colors, which are best and cheapest for permanent kaleidoscopic views.

Flour, the farina of the grain of wheat, barley, rye, or other grain separated from the husk and reduced to a state of fine powder. Flour of wheat is now divided into many grades, fine, superfine, family flour and extra being the principal grades. Formerly the word "flour" applied only to the flour of wheat, that of rye and buckwheat being denominated meal, but now the word is used for all the better grades of ground bread grains, except Indian corn. Good white flour has the following characteristics: It is white, with rather a yellowish, instead of bluish, tint; absorbs a good deal of water, and when wet a little and worked between the fingers it does not grow sticky; a little of the dry flour thrown against a smooth surface tends to remain in a little heap, while poor flour completely scatters out like powder; or, squeezed together between the finger and thumb, it tends to retain the shape given it, instead of falling away like dry powder. Very little adulteration of flour is carried on in this country, and when one is so unprincipled as to undertake it, he generally uses the flour of the cheaper grains, and of peas, beans, and bones, and terra alba,

China clay, silicate of alumina, mineral white, or hydrated sulphate of lime, alum and carbonate of soda. "Self-raising" flour is coming into use. Of course this is necessarily drugged to some extent, and advantage is taken of the occasion to doctor up poor flour. Knowing the *penchant* of the people for *white* flour, the dealers, and especially the bakers, do not hesitate to make it "white" for them, while it is well known among manufacturers and physiologists that the most healthful is necessarily a little dark, from the gluten next the bran.

GRAHAM FLOUR at the present day, is not understood to be merely branny flour, but that which contains the rich, glutinous portion of the grain, and hence is of a dark color. While it is difficult for millers to disguise the bad quality of poor wheat in graham flour, cracked wheat, etc., it is also difficult to obtain a good article in this line, as very few have learned how to make it well. Nor will it keep as long as the less highly organized white flour. To manufacture graham flour it requires sharper stones and a lower degree of temperature; and any dirt or mustiness in the grain ground is more perceptible in the product than in the "bolted," "fine," or "white" flour. The extra patience and skill required for this manufacture deters millers from the undertaking unless they can obtain a correspondingly greater price for their work. This flour is more popular in cities, especially among the wealthy and those of sedentary habits, than in the country; and when the world shall have paid as much attention to the preparation of palatable and healthful graham bread, cakes, puddings, etc., as it has to white flour, the latter will probably go out of use.

SELF-RAISING FLOUR is made thus: Mix well together 3 pounds of carbonate of magnesia, 28 pounds of tartaric acid, 112 pounds of potato flour and 12 ounces of turmeric, all perfectly dry; add 4 pounds of this mixture to every 100 pounds of the flour, stirring thoroughly. Keep perfectly dry, and when wetted for use it must be baked immediately. Or,—

PREPARED FLOUR. Take 1 package of Horsford's Bread Preparation and sift it into 25 pounds of flour, and set it aside in a covered box, to use for biscuit, cake, fruit-roll, pot-pies, fruit short-cakes, and puddings. Can be mixed with either water or sweet or sour milk.

TO PREVENT FLOUR FROM SOURING. Take out from the barrel or sack a small quantity of the flour, say 25 or 30 pounds, or a little more if you can conveniently do so, loosen the remaining portion so as to make it quite light in the barrel or sack, and keep in a dry apartment. Compactness and moisture are the only causes of souring.

TO BROWN FLOUR. Put some flour in a pan or dish and set it in the oven or over the fire. Stir it about that it may not burn; but let it brown well. Keep it in a dredging box for browning ordinary gravies.

Flower, the reproductive organ of a flowering plant. All flowers are temporary, and some are exceedingly short-lived; yet they aggregately constitute the chief glory of the vegetable creation; and multitudes are superlatively interesting for the delicacy of their organization, the elegance of their forms and the brilliancy or beauty of their tints. They are by far the most refined portion of plants, and possess a mighty power to arouse the curiosity, to excite the admiration, to charm the fancy, and to thrill and to fascinate our sense of the beautiful; and so completely do many of them fill the imagination of all beholders as popularly to give their names to the entire plants on which they grow. "A love of these beautiful things of nature," says the most distinguished female poet of America, "has been sometimes assumed as a criterion of the health of the mind. Those who are under the habitual influence of evil tempers do not approximate to the spirit and language of flowers. In vain do they reach forth their sweet, clustering blossoms; envy, hatred, and malice are beyond the reach of such charmers, 'charm they never so wisely.' But he who, amid the care and weariness of life, finds daily an interval or a disposition to commune with the dew-fed children of heaven, to devise their welfare, and shelter their purity, has not yet been injured by the fever of political life, the palsy of the heart or the eating gangrene of the inordinate desire of riches. Err they not, therefore, who consider a taste for the charms of nature a waste of time? The railroad machinery of a jarring world, bridging its abysses, and tunneling the rocks of political ambition, her steamboats, rushing to the thousand marts of wealth, silence, with their roaring funnels, its still, small voice. But let it be heard by those who meditate at eventide, when the rose closes its sweet lips, and the tired babe is lulled on the breast of its mother. Let it be a companion to those who, in the morning prime, walk forth amid the dewy fields loving the beauty of the lily which Omnipotence stooped to clothe, and from whose bosom, as from the scroll of heaven, the Redeemer of man taught listening multitudes the lesson of a living light."

Some flowers issue from the roots of the plants which produce them; some from the stem; and some from the leaves; but the majority issue from the extremity of the branches.

The colors of some species of flowers are uniform and unalterable, those of others usually possess two or more invariable tints, or sets of tints, constituting so many varieties of the species; and those of a few, particularly of some species of the brilliant and pet beauties technically called florists' flowers, are exceedingly numerous, and often wonderfully variable and sportive. Species of different colors, even when all are invariable, occur, in multitudes of instances, in the same genus. The mere color of flowers, therefore, seldom possesses the rank of a botanical character, so as to afford to the learner any criterion of genera or species. The elaboration of the various colors and tints must constitute one of the most complex and beautiful of the processes of natural chemistry; but it proceeds on too filmy a scale, and under too recondite conditions, to have been hitherto detected by the researches of

chemical phytology. The tints of some flowers, as may be familiarly seen in many hybrid violets, fade or change on the plant under the play of sunshine; and those of many either pass into other tints or wholly perish, soon after the flowers are cut or gathered.

Double flowers are such as have a duplicature, triplicature, or multiplicity of their normal petals; and thoroughly double flowers, such as those of the best kinds of dahlias, roses, camellias, ranunculuses, carnations, pinks, stocks, wallflowers, hepaticas, rockets, polyanthuses, and other species of the choicest flowers, possess an absolute profusion of petals, and exhibit them from center to circumference of all their natural space. All doubleness is supposed to result from an excess of nourishment and warmth, or from a profuse luxuriance and plethoric energy of growth in the plants at the time of flowering; and it is always accompanied, in its fullest and middle-rate forms, with a want of pistils and stamens, the parts of the flower essential to natural or seminal reproduction, and is, therefore, regarded by botanists as a monstrosity. In all such perennial plants as are propagable by offsets, division of the roots, tubers, cuttings, layers, or buddings, the habit of double-flowering is, in all ordinary circumstances, conveyed into the young plants by these methods, so as to be quite certain of development, but in plants which are propagated by seeds, whether they be annual, biennial, or perennial, it is conveyed only by the same kind of recondite agencies which originated it, and is always contingent and doubtful of development.

A notion prevails that seed from a plant which has grown by the side of a double-flowered plant possesses a superior power of producing a double-flowered habit; but this is mere fancy. Sound, plump, properly ripened seed, no matter how grown, is no doubt one condition of eminent success in producing double-flowering plants, and the other conditions are the particular circumstances of soil, climate and culture, be they what they may, which induce extraordinary vigor and luxuriance in vegetation, particularly at the period of the formation and development of the flower buds.

Flowers, Arrangement of. Consider, first the vase. Bright-colored vases are not as effective as white, brown, Swiss wood, silver or bronze; all will readily see, if the vase is green or blue, the color conflicts with the foliage in the bouquet; if pink or red, with the flowers. A bowl or broad open vase seems the most appropriate shape for roses. A tall, spreading vase, for gladiolus, ferns, tuberoses, etc.; flat glass dishes, or cups, for violets and early wild flowers. A flower lover will in time collect shapes and sizes to suit each group. Assort your flowers according to size and color, and arrange them mentally. Before beginning, put the whole mind upon the work and harmonize the colors perfectly, using green to separate the flowers.

In arranging flowers in a bouquet, do not crowd them; let each flower show its individual beauty, and a fine effect can be produced with comparatively few flowers. We often see bouquets where fine flowers are used extravagantly, that are not pleasing because of their crowded appearance. The art of arranging bouquets is very simple, if any one possesses a good eye for color, and has some idea of tasteful combination. Care should be taken to harmonize and blend the colors together, using white, neutral tints and green; nature says plenty of green. Each flower is beautiful in itself, but when you group sun-flowers and roses, pansies and marigolds together, the charm of each blossom is lost. We often see at our agricultural fairs, bouquets of this kind utterly devoid of beauty, that are literally packed with beautiful flowers. We long to see in their places something simple, like a handful of nasturtiums, pinks, or a single flower with its buds and leaves. In arranging flowers, avoid stiffness; let the bright fern or fresh, fine grass break forth now and then, and the delicate vine wander about in its pristine beauty.

In arranging hand bouquets, begin at the center with roses or something rare and beautiful, always placing the brightest colors in the center of your bouquet, and gradually decreasing the intensity of the tints as you approach the exterior; mingle shades and colors, but do not put one where it can detract from another, for instance, crimson and scarlet, unless flowers are very scarce; but if obliged to use them together, put plenty of white and green between them. Blue and yellow will not satisfy the eye, unless brightened by red or pink; pink, pale blue, or light purple harmonize well. The color and shape of the green is a valuable adjunct in making all symmetrical; that must also be carefully studied. The lace-figured paper makes a fine finish for hand bouquets. In arranging baskets, begin at the outer edge. Drooping flowers and vines, and nearly all kinds of garden flowers, look well in baskets.

Bouquets for the dining-table are usually made rather low. The custom of making bouquets as high as the heads of the guests at the table, is happily passing away. The custom of putting a small fragrant bouquet of rose-buds, pansies, heliotrope, geranium leaves, etc., in the napkin, is a charming one. Large rooms, with high ceilings, will admit of very high, showy bouquets. We once saw, against a very white wall, upon a corner bracket, a huge vase filled with broad, green leaves, long, drooping lily or corn-leaves, several ferns more than three feet long, a few plumes of grasses, one or two spikes of hollyhocks, gladiolus, large zinnias, and dahlias, and cut with very long stems, that gave us great delight. The foliage, from a little distance, reminded one of the tropics. Bright green, feathery ferns, and trailing vines, with a few bright flowers, are used in profusion in decorating our houses. Ferns were never in such demand as at the present time.

We do not half appreciate the importance of bringing flowers into our school-rooms. They are many times to the mind what exercise is to the body; a bright bouquet, a mound of fresh, green moss from the woods, or a healthy, blooming plant, will refresh

the tired mind of the student, and enable him to renew the tedious lesson with new life and willing heart; will give the weary teachers rest and comfort. We will take a short extract from a note written by a model teacher to a lady who occasionally sent her a bouquet. "One bouquet you sent me last winter will ever be fresh in my memory. There was nothing cheerful in the school-room, not even a map; the school was large; some very large pupils to get along with, and thinking I had such a large school, made it harder. I went into school one day greatly discouraged; your daughter came and gave me a bouquet. I knew not what to say or how to thank her. It awakened my better self; the tears would flow. A day never passed after that that I did not try to say something cheerful to them." Who can say after reading this testimonial that flowers have no influence in the school-room? And what influence, too, they have in church! For these purposes flowers are used more and more every year.

Bouquets may be kept a month in continuous blooming (of course, with a proper selection of continuous bloomers), by sprinkling with fresh water, and placing them in water containing some soap-suds. Take them out each morning and lay them in fresh water a minute or two, and replace them. Change the soap-suds twice a week.

Cut Flowers. Flowers decay much sooner when tied in bunches than when arranged loosely. Too little air and too much water are the bane of most species. The moisture furnished cut flowers should be rain-water of a moderate temperature. When gathering flowers use a pair of sharp shears, or a knife for woody plants, such as roses, Camellias, spiræas, Deutzias, Fuchsias and the like. It is far better to gather your flowers than to let them fade upon the plants. A cool room is best adapted for keeping flowers fresh; stale tobacco smoke will wilt flowers. Take away each flower as it fades, or it will destroy others. Hot water will often restore flowers to freshness, even when every petal is drooping. Place the stems in a cup of boiling hot water; let them remain until each petal has become smoothed out, then cut off the coddled ends and place them in water of moderate temperature. Ammonia added to the water also revives them quickly. A good way to keep cut flowers fresh is to lay them in wet cloths. Take them out of the vases at night, sprinkle with cold water, and then wrap them in cloths made very wet with cold water. The weight of the cloth will not crush the most delicate flower, while it keeps out the air and prevents their falling to pieces or opening farther. When you receive a bouquet, sprinkle it lightly with fresh water; then put it into a vessel containing some soap-suds, which nourish the roots and keep the flowers as good as new. Take the bouquet out of the suds every morning, and lay it sidewise in fresh water, the stock entering first into the water; keep it there a minute or two, then take it out, and sprinkle the flowers lightly by the hand with pure water. Replace the bouquet in the soap-suds and the flowers will bloom as fresh as when gathered. The soap-suds need to be changed every third day. A small quantity of nitrate of soda put into the water every time it is changed, will preserve cut flowers a fortnight or more. If you wish your flowers to remain fresh a long time (and who does not), cut them early in the morning while the dew is still upon them; cut them with sharp scissors or knife, and remove unnecessary leaves; as soon as cut, drop them into a basket or tray. Do not touch them with the hands more than is necessary. In cutting roses, cut buds or half-blown ones; place them as soon as gathered in shallow tins or bowls in a dark cellar or cool place, until you wish to arrange them. They should be arranged two hours, at least, before wanted. A little water sprinkled finely over them sometimes improves fresh flowers, but rarely; it improves flowers beginning to decay. Flowers decay sooner when tied in clusters or bouquets than when arranged loosely. When ready for the table, place them in the vase, or dish, with cold, soft water, add a few drops of saltpeter, carbonate of soda, ammonia, salt, camphor, or bits of charcoal; give plenty of fresh air, particularly at night. Some flowers, like the Archenia, Azalea, Rhododendron, have a way of dropping their petals just as they are most wanted. Florists let a drop of gum Arabic fall into the center of the flower, where it hardens at the base and fastens them tightly to the stigma. In cutting flowers, if you wish to avoid cutting unnecessary buds, cut the flower stem short, and tie with yarn to broom-corn; put a little cotton between the stems and splint to preserve moisture.

Plants in Sleeping Rooms. So far from plants being injurious when placed in sleeping rooms, it has been proved that they are actually conducive to health; they are actual and perfect "atomizers," and have a material influence on the humidity of the air in which they are kept. Experiments made by means of the hygrometer show conclusively that house plants may properly be classed as therapeutic agents. As to their unwholesomeness because of giving off carbonic acid gas at night, it has been shown by experiment that it would require 20 thrifty plants to produce an amount of the gas equivalent to that exhaled by one baby sleeper. A practical application of the data gained by experiment is given in the carefully prepared formula: Given a room 20 feet long, 12 feet wide, and ceiling 12 feet high, warmed by dry air, a dozen thrifty plants with soft, thin leaves and a leaf surface of six feet square each, would, if well-watered and so situated as to receive the direct rays of the sun (preferably the morning sun) for at least several hours, raise the proportion of aqueous vapor to about the health standard. It is evident, then, that the air of a room is kept moist by thrifty plants.

Cut flowers are a fruitful source of malaria in rooms, not from the odor from the flowers, but from stagnant water or decaying vegetable tissues in the vessels containing the flowers. Putting a little charcoal in the water will keep it sweet longer; but the only sure remedy for putridity is frequent changing of the water.

To Preserve Flowers. Gather them before too ripe or ready to fall; take the most perfect and beautiful and dip them in melted (not hot) paraffine; move them about a little, so as to let the air escape and all parts of the flower become coated. They will soon dry and may be framed under glass. Another way is to crystallize them by dipping in a solution of alum (alum, 1 pound; rain-water, 1 quart); a few dippings will coat them nicely. For winter blooming, select the most perfect buds of such flowers that are latest in in bloom. Just before they are ready to bloom, cut them off with a pair of scissors, leaving the stem three or four inches long. Do not bruise the stem; immediately seal the cut end with Spanish wax. Lay them in a cool, dry room. As soon as they shrink a little wrap each one separately in clean, white paper. Lock them in a drawer where nothing can injure them. When you want flowers take them out, cut off the waxed end, put in a vase or dish of cool water in which a little niter has been dissolved. Set them in a warmish room and in 10 or 12 hours your flowers will open as nicely as if on the bush.

The best thing to change the color of flowers is a liberal supply of charcoal from the stove pounded up and put around the roots.

To Restore Faded Flowers, immerse them halfway up their stems in very hot water, and let them remain there until the water cools or they have recovered their color; then take them out, cut off the cooked portion of the stems and place the flowers in clean, cold water. Some of the more delicate kinds cannot be restored in this way.

To Hasten Blooming, dissolve together 4 ounces sulphate or nitrate of ammonia, 2 ounces nitrate of potash, 1 ounce sugar, in 1 pint of water. Keep in a well-corked bottle. For use, put 8 or 10 drops of this liquid into the water of the jar or vase, and change the water every 10 or 12 days. For plants in pots, a few drops must be added to the water employed to moisten them.

To Preserve Flowers for Perfumery, pack them tight with one-fourth their weight of salt in bottles, jars, or casks. In this way they may be preserved for two or three years. Both flowers and salt should be perfectly dry. The salt should be dried in an oven.

For culture and variety of flowers, see Floriculture, page 489

Flue, an air passage, especially one for conveying smoke and flame from a fire; a tube in a steam boiler.

Fluke-worm, a worm sometimes found in the livers of sheep, particular when they are affected with the rot.

Flush, in hunting, is to frighten a bird out of its cover unintentionally.

Fly-wheel, a wheel with a heavy rim, for retaining inertia and equalizing the motion of machinery. The simplest of all contrivances for regulating machinery are fly-wheels, which are nothing more than large heavy wheels driven with great velocity by the machinery to which they are attached.

Foal, a colt or horse fœtus; also, to give birth to a colt.

Fodder, the bulky, vegetable food of domestic animals, and particularly of cattle. It does not properly include any kind of food which contains nutritious matter in a concentrated form, but it includes all bulky kinds of food, whether green or dry, which either act principally as ballast or nourishment. How to raise and take care of these various crops is described under their respective heads. See also Ensilage and Soiling.

Fog. There is a constant ascent of watery particles from the surface of the earth, occasioned by the evaporation from masses of water and moist bodies. Part of the water which rises in vapor is intimately united with the atmospheric air, which holds it in solution. This portion of aqueous matter is invisible, and exists in the greatest quantity in very warm and serene weather. Thus, in the hot days of summer, any cold body (as a vessel filled with ice water) is immediately covered with little globules of water, which are the vapor of the atmosphere precipitated. But when the air is saturated, the watery particles which continue to rise are no longer dissolved, but remain suspended in vesicular vapors, which form clouds when they rise to a great height, and fogs when they hover near the surface of the earth. Fogs are more frequent in those seasons of the year when there is a considerable difference of temperature in the different parts of the day; as, for instance, in autumn, when, in the warmest part of the day, the air is capable of holding a great quantity of aqueous matter in solution, which on cooling, towards evening, it is no longer capable of dissolving. In hot weather the air is not so easily saturated, and in cold weather the process of evaporation is very slow, so that in these cases fogs are less common. In low, moist places, and in confined places, as valleys, forests, bays, or lakes, surrounded by high lands, they are much more prevalent than open countries, or elevated spots where they are quickly dispersed by the winds. There is another atmospherical phenomenon, which has been called dry fogs. In 1783 all Europe was enveloped with a dry fog, at the moment of a simultaneous volcanic action in Iceland and Calabria. In 1755, before the earthquake which destroyed Lisbon, a similar fog overspread the Tyrol and Switzerland. It appeared to be composed of earthy particles reduced to an extreme degree of fineness.

Foliage, the collective or aggregate leaves of a tree, a shrub, or an herb. A foliage crop is one whose leaves alone are available, and which requires to be used green, and cannot be made into hay. All the cabbages and kale, for example, are foliage crops.

Following Cattle: said of hogs, which follow cattle to obtain the undigested grains of corn that pass through with their droppings.

Foment, to apply hot water, or cloths wrung from

hot water, to a part of the body, to reduce pain and create muscular relaxation. Many poultices and other applications also foment to some extent, besides producing other effects. Blistering and any other irritation of the skin have similar effects, with complications. India-rubber bags can now be had at most drug stores, which can be filled with hot water, screwed up tight, and safely used in bed; one can lie upon them without any danger of bursting them. They constitute by far the most convenient method of applying fomentations.

In cases of sprains or other affections where heat has to be applied, pieces of thick flannel are used dipped into the hot liquid, and applied one after the other. In colic, obstinate cases of constipation, and other affections of the bowels, hot fomentations are recommended. They are also used in cases of gout and quinsy, when it is necessary to bring the tumor to a suppuration. An excellent fomentation to relieve acute pain is composed of white poppy heads and ½ an ounce of elder flowers boiled in ¾ of a pint of water until the latter is reduced to a quart. In cases of dysentery, flatulent colic, retchings to vomit, an aromatic fomentation may be employed, made with ½ an ounce of black pepper in red wine. A strengthening fomentation for application to weak parts may be composed of oak bark, 1 ounce; pomegranate peel, ½ an ounce; alum, 2 drachms; and of water in which a red-hot iron has been thrust until it gives the water a strong taste, 3 pints. The bark and peel must be boiled in the water until the quantity has evaporated ⅓, after which it must be strained and the alum dissolved in it. Cold fomentations are useful in sprains before inflammation has subsided. The best way of applying them is that of putting a thick bandage upon the part, and continually pouring cold water upon it.

Food, substances which yield nutriment to plant or animal. Proper food for man or the lower animals contains no deleterious substance to prevent the assimilation of the proximate elements into tissue. The digestive system rebels against the introduction of articles not needed for the welfare of the body, and endeavors to cast them out; some by emesis (vomiting), some by purgation, some by the urinary system, some by perspiration, and some by eruptions. Hence, on these principles, medicines are classed as emetics, purgatives, diuretics, diaphoretics, etc.

The system, however, is not able to expel all the improper elements. A portion of them is laid away, as it were, on the shelves of the vital domain, that is, in the recesses of the animal economy, for an indefinite length of time. If too much of such material becomes stored up, the vital forces, on some exposure to extreme temperature, exhaustion by over-work or other intemperance, commence a revolutionary action to expel some or all of them. This is the *rationale* of fever, indeed of all disease. Failure in such an effort is death.

In studying tables of the elements of food, of their digestibility, etc., one must remember that an article may be three-fourths or more nutriment, and yet, on account of poisonous or repulsive matter present, be unusable by the animal system, as for example, buckeye. Not a particle of the nutriment in such substances can be utilized: nature rejects all. On the other hand, only five per cent. of an article may be nutriment according to the tables (which are constructed from chemical analyses), and yet, there being no inimical substance present, the animal system appropriates the whole five per cent.; for example, apples, turnips.

The digestibility of a given article of food is no index to its utility. Beans, for example, which require three or four hours for stomachic digestion, may be better, in every sense of the word, for a person in health, than oysters, which would get out of the stomach in one hour. The stomach, as well as the other organs of the system, require a certain amount of exercise to keep it strong.

The foregoing principles are essential and universal throughout the domain of human and animal physiology.

Nature appears to be extremely jealous of admitting nutriment of baneful qualities into the blood vessels, and even into the stomach. If food be putrid or putrescent, or, in other words, deficient in organic principles (animal or vegetable) the stomach refuses it; and if it finds its way there, the most violent nausea and vomiting ensue, till the deleterious matter is ejected. But if, notwithstanding the vigilance of nature, the contaminated food passes out of the stomach into the lower bowels, the gall-bladder contracts and pours out a large portion of the bile, to facilitate the escape of pernicious ingredients; and if, notwithstanding all those efforts of nature, a portion only of the putrescent food arrives at the mouths of the vessels which take up the digested food, instead of receiving it, they become inflamed, swelled, and consequently shut up against its intrusion. The glands also which occur in the course of these vessels become swollen and obstruct the vessels by their pressure. If these inflammations are not sufficient to keep out the improper nutriment, a general fever results.

To fully understand the table on the next page, observe the following facts: The amount of water in a substance is found by thoroughly drying it and noting the difference in weight. About nine-tenths of the substance of fruits, melons, roots, and green fodder, is water, but is such water as is more usable by the vital forces than common water from other sources. Hay, dry fodder, wheat, corn, and all the other seeds, consist of about one-tenth water, unless thoroughly dried in a hot oven. To find the amount of mineral, or ash, the article is burned. The albuminoids, called also protein compounds, are flesh-formers, and comprise the nitrogenous elements termed casein, gluten, gelatin, fibrin, etc. On the other hand, the non-nitrogenous elements, or carbo-hydrates, are the heat-formers, namely, fat, starch, sugar and woody fiber (cellulose). The values of the grains, fruits and roots for man varies but little from the figures here given.

TABLE OF FOOD VALUES (STOCK FEED).

Articles of Food.	Water.	Ash (mineral).	Total Organic Substance. Albuminoids.	Woody fiber.	Other carbohydrates.	Fats.	Digestible Substance. Albuminoids.	Carbohydrates.	Fats.	Nutritive ratio.
Grains and Fruits.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	as 1 to
Apples	83	½	½	4	12		0	13		43
Barley	14	2	10	7	64	2	8	59	5	6
Barley feed	10	4	13	7	63	3	10	57	2	6
Beans, field	14	3	25	9	46	2	23	50	1	2
Buckwheat	14	2	9	15	59	1	7	47	1	7
Corn	14	1	10	5	62	6	8	61	5	9
Corn, New England yellow, ground	13	1	10	2	75	4	8	67	3	9
Corn, Western yellow ground	13	1	9	2	72	3	7	68	2	10
Corn, Southern white	13	1	10	2	71	3	8	68	2	9
Corn, sweet	11	2	11	4	64	8	10	17	6	8
Cotton seed	8	8	23	16	15	30	17	15	27	
Hemp seed	12	4	16	12	21	34	12	16	30	
Linseed (flax-seed)	12	3	20	7	20	37	17	19	35	
Oats	14	3	12	9	56	6	9	43	5	6
Oats, No. 1 white	11	3	11	12	53	5	9	43	4	6
Peas	14	2	22	6	52	2	20	54	2	3
Pears	83	⅜	⅜	4	12		0	13		43
Pumpkins	89	1	1	3	6	0	⅜	7	0	18
Rape seed	12	4	19	10	12	42	15	10	40	
Rice	14	⅔	8	2	75	⅜	7	73	0	11
Rye	14	1	11	3	67	2	10	63	2	7
Wheat	14	2	13	3	66	1	12	64	1	6
Roots and Tubers.										
Artichoke, Jerusalem	80	1	2	1	15	0	2	17	0	9
Beets, fodder	88	1	1	1	9	0	1	10	0	9
Beets, sugar	81	1	1	1	15	0	1	17	0	17
Carrots	85	1	1	2	11	0	1	12	0	9
Parsnips	88	1	2	1	10	0	2	11	0	7
Potatoes, Irish	75	1	2	1	21	0	2	22	0	11
Rutabagas	87	1	1	1	9	0	1	10	0	8
Turnips, common white	92	1	1	1	5	0	1	6	0	6
Hay.										
Clover, Alsike or Swedish	16	6	15	27	33	3	9	35	2	5
Clover, lucerne, medium	16	6	14	33	28	2	9	28	1	3
Clover, red, medium	16	5	12	26	38	2	7	38	1	6
Clover, cut when ready to bloom	14	7	12	24	41	1	7	39	1	6
Clover, cut in full bloom	14	7	12	24	42	2	6	39	1	7
Clover, cut nearly ripe	14	6	9	27	43	1	4	40	½	10
Clover, white, medium	16	6	14	26	34	3	8	36	2	5
Corn, Southern, young	25	5	7	24	37	1	4	40	½	9
Corn, Southern, older	25	4	4	26	39	1	3	39	½	15
Grass, Italian rye	14	8	11	23	41	3	7	41	1	6
Grass, upland average	14	6	9	29	39	3	5	41	1	8
Grass, Hungarian	13	6	11	29	38	2	6	41	1	7
Grass, Hungarian, cut nearly in bloom	17	7	11	29	35	2	6	38	½	7
Grass, Hungarian, cut in full bloom	17	7	8	28	42	1	4	37	1	9
Grass, Timothy, medium	14	4	10	23	46	3	6	43	1	8
Grass, Timothy, cut ready to bloom	12	4	8	29	44	2	4	44	1	11
Grass, Timothy, cut in bloom	12	4	6	29	47	1	3	42	⅜	13
Grass, meadow, poor	14	5	7	33	38	1	3	35	0	11
Grass, meadow, medium	14	2	10	26	41	2	5	41	1	8
Grass, meadow, good	16	8	13	19	40	3	9	43	1	5
Peas, cut in bloom	17	7	14	25	34	3	9	33	2	4
Vetch (tares) medium	17	8	14	25	33	2	9	32	1	4
Rye, cut before blooming	14	5	10	23	44	3	7	44	1	7
Green Fodder.										
Buckwheat, in bloom	85	1	2	4	6	½	1	7	0	5
Cabbage	85	2	2	2	8	1	2	8	0	5

Articles of food.	Water.	Ash (mineral).	Total Organic Substance. Albuminoids.	Woody fiber.	Other carbohydrates.	Fats.	Digestible Substance. Albuminoids.	Carbohydrates.	Fats.	Nutritive ratio
Green Fodder.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	as 1 to
Carrot leaves	82	3	3	3	7	2	2	7	0	4
Corn	85	1	1	5	8	½	1	7	0	11
Corn, fermented	79	2	1	8	9	1	1	10	½	16
Clover, pasture, young	83	1	3	4	7	1	4	7	1	4
Clover, red, when ready to bloom	83	1	3	4	7	1	2	7	10	4
Clover, red, in full bloom	80	1	3	6	9	½	2	9	0	6
Clover, white, full bloom	80	2	3	6	8	1	2	8	1	4
Grass, before blooming	75	2	3	6	13	1	2	13	0	7
Grass, pasture, medium	80	2	3	4	10	1	2	10	1	4
Grass, pasture, rich	78	2	4	4	10	1	3	11	1	4
Grass, Italian rye	73	3	4	7	12	1	2	13	1	6
Grass, Hungarian (Millet), in bloom	75	1	3	8	11	1	2	12	0	7
Grass, Timothy	70	2	3	8	16	1	2	16	½	8
Grass, upland, average	70	2	3	10	13	1	1	14	½	8
Oats	81	1	2	6	8	½	1	9	0	7
Peas, in bloom	81	1	3	6	8	½	2	7	0	4
Rye	76	2	3	8	10	1	1	11	½	6
Rutabaga leaves	88	2	2	2	5	½	1	5	0	4
Sorghum	77	1	2	6	12	1	2	12	0	7
Vetch, at beginning of blooming	82	2	3	5	7	½	2	7	0	3
Straw, Stalks and Cobs										
Barley straw, spring	14	4	3	40	37	1	1	41	⅝	32
Bean straw, field	16	5	10	34	34	1	5	35	⅝	7
Corn cobs	14	3	1	38	43	1	⅜	42	⅝	71
Clover, after removal of seeds	16	6	9	42	25	2	4	28	1	7
Oat straw	14	5	4	39	36	2	1	40	⅝	30
Pea straw	16	4	6	38	34	1	3	33	⅝	12
Rye straw, winter	14	4	3	44	33	1	1	36	⅝	4[illegible]
Vetch straw	16	4	7	42	29	1	3	32	⅝	1[illegible]
Wheat straw	14	5	3	40	37	1	1	36	⅝	4[illegible]
Chaffs, Hulls, etc.										
Barley	14	13	3	30	38	1	1	35	⅝	30
Bean	15	5	10	33	34	2	5	35	1	7
Oat	14	10	4	34	36	1	2	37	⅝	24
Rye	14	7	4	43	30	1	1	35	⅝	32
Wheat	14	9	4	36	35	1	1	33	⅝	24
Manufacturing and Waste Products, etc.										
Blood, dried	12	4	81		3	1	54	3	⅝	
Bran, wheat, fine	13	5	14	9	55	4	12	44	3	4
Bran, wheat, shorts	11	5	13	8	59	3	10	48	3	6
Bran, corn	12	3	10	9	62	4	8	57	3	8
Buttermilk	90	6	3		5	1	3	5	1	3
Brewers' grains	77	1	5	5	11	1	4	11	1	3
Cake, cotton-seed	11	6	24	22	30	6	17	15	5	2
Cake, linseed	12	9	29	10	30	10	25	27	9	2
Cake, sugar beet	70	3	2	6	18	0	2	25	0	14
Cake, palm-nut	10	4	17	17	41	10	16	55	9	5
Cream	62	⅜	3		3	32	3	3	32	30
Malt sprouts	12	7	26	9	45	1	21	44	1	2
Middlings	12	2	11	5	67	3	9	55	3	7
Meal, flesh	11	4	73			12	69		11	⅜
Meal, linseed, extracted	10	7	33	9	39	2	28	34	2	1
Meal, rice	10	11	11	11	48	10	9	47	9	8
Meal, wheat	11	3	14	5	63	3	11	54	3	6
Milk, cow's	87	1	3		5	4	3	5	4	4
Scraps, meat	11	4	73			12	69		11	⅜
Rice feed	15	6	9	8	60	2	7	49	1	7
Potato, starch factory residue	86	⅜	1	2	12	0	1	14	0	17
Whey	93	1	1		5	⅜	1	5	1	7

Food, FOR MAN: See article Hygiene. See also the same article for Food for Children and Food for the Sick.

Fool's Parsley. A wild plant growing in the Eastern United States, of the appearance of parsley, and poisonous. Poison hemlock is a similar plant growing through all the Northern States. Both bear seed-tops like parsley, celery or parsnip. It is safe never to eat or taste of any wild plant which has this kind of a seed-top, as most of them are more or less poisonous. When one is accidentally poisoned by them, he should be treated as for poisoning by Bane-berry, which see.

Forage (for' age): see Fodder.

Force-Meat, meat chopped fine and highly seasoned, either served up alone or used as stuffing. Sometimes called "farce-meat."

Forceps, a pair of pincers or tongs; especially a finely-made pair for surgeons' or dentists' use.

Force-Pump, a pump which forces water through a tube by a pushing motion, instead of a lifting movement, as is done by a simple suction pump. See Pump.

Forcing PLANTS, starting them in hot-beds or otherwise before the season is warm enough for their out-door culture. Forcing was known among the ancient Romans, and was practiced from early times in England. At present it constitutes a large part of the care of gardeners. Among them success in forcing is an object of ambition, and its honors are worn with a good deal of professional pride. Some affect to have peculiar modes of practice, which they hide carefully from others, but which are often mere worthless conceits. The best forcing is that which is done in an atmosphere most conducive to the highest and strongest development of the plant, and not that which produces only a tender, abnormal growth. The artificial climate should not differ from what is normal to the plant, and the quantity of fruit should be kept somewhat below its capacity. Some plants are forced for use in winter by a process of simple self-exhaustion. Their strong roots being transferred in the fall to a cellar, or hot-bed frame, or heated pit, or green-house, yield a limited crop under the stimulus of the warmth thus furnished; this being obtained, the roots thus taxed are either thrown away or set out again in the spring to regain their ordinary strength. Sea kale, asparagus, pie-plant, succory, etc., are thus treated where it is deemed worth while. The more common vegetables, as lettuce, radish and other salads, require in their forced production in hot-bed frames but little if any more or different care, though longer continued, than is necessary for raising early hot-bed plants of various vegetables for setting out.

Cucumbers and melons are often raised in unfavorable localities by a system of half-forcing sometimes called "ridging." For this purpose a pit or trench, of any desired length, about three feet wide and two feet deep, is dug at the close of spring, and filled with heating manure in the manner of making a hot-bed, the manure being covered 12 or 15 inches deep with surface earth well enriched with garden compost and also chopped half-rotted sod, adding sand or road-wash if the soil be heavy. Potted plants, previously prepared in a hot bed, are set out carefully along the center of this ridge, in hills from four to six feet apart. Set a hand-glass over each hill; give air and culture as needed until the vines begin to run freely, then raise the hand-glasses upon bricks or blocks, that the vines pass under, nip or stop them at about two feet from the collar, that they may branch and blossom compactly; and when the full summer is upon them, remove the hand-glasses entirely, and give them ordinary but careful culture until the crop perfects. To make the vine-growth more moderate, old seed is generally used, or cuttings, if new seed has been sown. The cuttings made in the ordinary manner are set two or three in a pot and placed in a hot-bed with a slight shade, where they will root in a week or so, and form hardy, compact-growing plants. In more northern latitudes a closer confinement to the hot-house is of course required. For this class of plants the temperature should range from 60° to 80°; and to secure a uniform limit to this range, a lining of fresh manure must occasionally be substituted for the old around the bed-frame.

Fruits are forced by various methods. For strawberries, special houses are often made. They are narrow, of single pitch, with the glass reaching nearly to the ground. From a furnace sunk a sufficient depth at one end, a single line of stove-pipe or small brick flue, slightly raised, runs along the middle of the floor. The staging is built over this. Grapes are better forced in "graperies," and peaches in "peach-houses," made for these purposes. Several varieties of fruit are sometimes forced together in "orchard-houses." In all these structures, of course, reference is had to the peculiar demands of each plant. Fruits so forced require, even more than vegetables, constant care in respect to temperature, moisture, air, pruning and fruiting. Forced vegetables are started at once in summer heat; but in forcing fruits we endeavor to imitate the progress of spring, passing from 35° or 40° gradually to summer heat. During the period of the higher degrees of heat there should be free ventilation and plenty of moisture produced by syringing and watering. The night temperature may range uniformly about 10° below that of day. To make the treatment sure, a double-registering thermometer will be required. The ripening of the larger fruits will generally be effected in about five months from the first application of heat. Severe pruning has to be attended to during the summer, and many other nice points observed, which are fully described in works devoted especially to this subject, if one desires the highest possible results. Of course no one will undertake this difficult art unless he is convenient to a city market where high prices can be obtained.

See Hot-Bed, Cold Frame, Green-House, Gardening, and the various vegetables in their alphabetical order throughout this volume.

Foremanize: see Timber, Preservation of.

Forehand, the fore part of the trunk of the horse, or part immediately before the rider. It has to support and direct the neck and head, and is attached to the former by a great strength and peculiar arrangement of the muscles. In a saddle horse it should be light and unburdened, but in a draught horse it requires a sufficient body of muscle to combine the labor of propelling with that of supporting. The service derived from extra weight of the forehand, in horses used solely for the draught of heavy burdens, may be thus illustrated. Suppose a horse in endeavoring to make his way up hill overloaded, or as nearly as possible balanced by his load: he uses all his muscular force in vain, he can not advance, and it is uncertain which will obtain the mastery, he or his load; this is immediately decided by placing a boy or other weight across his shoulders; he is then enabled almost magically to proceed with facility, overcoming his load by means of a few extra pounds on the fore part of the body.

Forestry, the science and art of propagating forest trees; woodcraft. In our language and in our country, the forest usually implies a considerable extent of surface, while a smaller area covered with trees is called a wood, and a more limited number of trees constitute a grove. The portions of our country now occupied by trees are more appropriately called woodlands than forests. Planted in lines of one or of several rows of trees, intended to intercept currents of air, they constitute hedge-rows, wind-breaks, or shelter-belts. The coppice or copse is a wood that is intended to be cut off from time to time, when comparatively small.

At firstone would think that scarcely anything practical on the subject of forest tree planting could be said further than, when you get ready to plant forest trees, go and plant them; but when we consider the diminishing numbers of large lumber trees in the United States, their value as wind-breaks on our western prairies and the fact that the ground denuded of one kind of trees must be followed by another kind if any, etc., we perceive that comfort for our later years, and justice to future generations, require us to pay some attention to this matter. We find here not only a large field for thought, but also a large "field" for the actual planting of trees. As this enterprise is comparatively so slow in yielding pecuniary returns, and as it interests posterity more than ourselves, it becomes everybody's business and therefore nobody's business, in particular, and the aid of National and State legislation has to be invoked. Such legislation we have already obtained, indeed, to some extent, but need more State aid. In connection with the general Government we have a National Forestry Association, with which every one ought to be in communication. The address of the proper officers can be obtained without cost by asking the Department of the Interior at Washington.

The destruction of our forest trees and the waste of timber still go on at a more rapid rate than renewal. Correspondence and statistical compilation have revealed the fact that at the present time (1881-2) the forest trees are diminished a little more than twice as rapidly as planting is carried on. At a late meeting of the Chicago Lumbermen's Exchange the somewhat startling statement was made, and substantiated by conclusive figures, that, owing to the enormous growth of the lumber business in this country, it will take only twenty years longer to exhaust the pine forests of the United States of America. If the present rate of depletion continues, in the course of five years all of the black walnut timber large enough for logs will be used up; also the rate our oak timbers are being used up for railroad ties, cooperage and other purposes, in the course of forty years our forests of oak will be consumed. Other varieties of timber are disappearing in proportion to the above named.

The value of the annual cutting from the American forests is near $1,000,000,000, which is consumed in 1,000 different ways. Over 1,000,000,000 cords are used for fuel. In 1871 10,000 acres were stripped to supply Chicago alone. To supply the demands of the railroads in the State of New York 50,000 acres of woodland have been cleared in a single year. Then, the annual losses by forest fires are something enormous. The loss from the fires of 1871—which swept over Wisconsin, Michigan and New York—is estimated at over $125,000,000. In 1876, and again in 1879, Pennsylvania suffered terribly from these forest fires, which in 1876 destroyed timber in value beyond computation in New Hampshire, Vermont, Massachusetts, Wisconsin and New Jersey. In 1878 the woods on Lake Superior were afire almost continuously for 160 miles. These figures give a general idea of the importance of a proper care being taken of our forest lands and of the immense annual demands upon them.

In view of these facts every philanthropist is exhorting land-owners throughout the country to plant trees, and scolding all those who burn up timber which might be marketed; but, whether to save or burn a given tree or log depends upon the primary law of demand and supply. If it costs more to take the timber to market than can be obtained for it, and it is not worth as much as the ground it occupies, of course it should be burned. The reproof for wanton destruction is deserved by those who are carelessly ignorant of the value of timber. Many trees are worth more than their owners imagine. Many a black walnut, for example, in the Lake region, has sold for $1,000 to $1,200 in the rough. The specimens were about seven feet in diameter three feet from the ground. Butternut, maple (especially "bird's-eye"), hickory, white ash, iron-wood, tulip-tree, oak and cedar are specimens of the most valuable species, much of which are either wantonly destroyed or carelessly permitted to go to waste.

On the other hand, the direct profits of tree-planting have been definitely tested in this country. One experiment, in Massachusetts, where an exact book

account was kept, resulted as follows: 100 acres of nearly valueless land was assessed at $50 an acre by the law officers; interest for 20 years, $6,000; taxes, $5,000; fencing, $400; oversight, $50 a year, $1,000; 50,000 trees (expense), $1,500; planting, $600; total, $14,500. Per contra, 50,000 trees at 75 cents each, $37,500; 5 per cent. loss, $7,300; gross proceeds, $30,200; net profit, $15,700, which is more than 200 per cent. of the capital invested, or 11 per cent. each year. But several improvements even on that experiment can be made. In the West the European larch is found the most profitable tree. It is hardy, of rapid growth, easily transplanted, and bears close or thick setting. At seven years of age the tree may be used for stakes. Then the first thinning is made. The second thinning is made at 14 years, when 3,600 fence-posts are cut per acre, valued at $1,000. The third thinning is made at 21 years, giving 600 trees per acre, worth $3,000. The fourth cutting, at 30 years, yields 300 trees, at $6,000. This makes a total of $10,000 from the acre in 30 years, with 300 trees still left upon the ground, worth $6,000 more, which will continue to increase in value for half a century longer. This is not mere paper scheming, but actual facts, so far as reached by Mr. Schofield, of Elgin, Ill., by the Dunlap estate, near Champaign, Ill., by Ezra Sherman, Preston, O., and others.

The following calculations are safe: At four feet apart, there will be 2,720 plants to the acre. Thinning out every alternate tree at the end of six years will leave 1,360 trees on the ground. At the end of 12 years one-half of these may be cut. The 680 trees will give 136 split posts first cut, at

20 cents	$272
680 round posts second cut, at 20 cents	136
680 round posts third cut, at 15 cents	102
Total	$510

Were the whole to be cut, the yield would be double, or $1,020 as the value of the tract, and we may say, in round numbers, that the crop of an acre at the end of twelve years is worth $1,000. Or, taking the safer estimate of 1,200 trees to the acre after being thinned, and allowing a higher valuation of the posts, but still below the market value of posts, we make the following showing:

2,400 split posts at 25 cents	$600
1,200 round posts at 25 cents	300
1,000 round posts at 20 cents	200
Total	$1,100

It is not, however, good policy to remove the whole crop at this time, for the half that is left at each thinning will rapidly improve until the number is reduced to about 300 per acre and then for half a century longer these will go on increasing in value in a geometrical proportion.

But we are only beginning to experiment in this country. We want more statistics on every point and feature of the subject,—the kind of soil and exposure for each species of tree, the term of rotation, the time required by them to reach their maximum of profit, their relative rapidity of growth, their nature as to proximity to each other, their influence upon climate, health, farm, garden and orchard products, money values, etc., etc. To work up data upon these points requires longer study and more patient trial than anything else in the whole vegetable or animal kingdom. In Germany they actually have forestry schools, where one may attend and learn what is to be known. That country is far in advance of any other Christian nation in forestry science, having several million acres under the supervision of the government, with officers to distinguish what trees to plant, in what situations, what trees to cut, etc. In this country every farmer should have a moral and educational, as well as a pecuniary interest in making the study of the woods attractive, both to himself and to his children. Sunday afternoons the whole family should take a stroll in the wildwood, if such a place can be found within eight or ten miles from home. Every boy should become thoroughly acquainted with all the trees and shrubs of his locality, so that he can recognize them both summer and winter, whether standing or lying as logs in any stage of decay. He should become familiar with the habits of growth, the nature and uses of the wood, bark, etc., of every species of tree and shrub in his vicinity. The primary products of the forest are logs for lumber and nuts for eating, and the secondary are the barks, fibers, withes, roots, pitch, resins, oils, galls, dye-stuffs, medicines, sugars, gums, charcoal, ashes, etc.

As an expression of the general interest taken in tree-culture by men of information, we here give the substance of the resolutions under which the Ohio State Agricultural Society is working, namely: that farmers and land-owners should plant their hillsides, ravines, and broken or rocky grounds with forest trees; that at least one-tenth of each farm should be planted with groves and shelter belts of timber trees, deciduous and evergreen; that agricultural societies be urged to offer suitable premiums for the encouragement of tree-planting and nurseries of trees; that State Legislatures should encourage tree-planting along the sides of highways and railroads, and adopt more stringent measures for the protection of the present forests: that Congress, by grants of land and otherwise should encourage the enterprise of private citizens who may give assurance of their ability to demonstrate the important problem of planting artificial forests on the great Western plains, and should require railroad companies and settlers of homesteads to plant a due proportion of their land with useful timber trees; and that the agricultural schools give more attention to the teaching of the science and art of forestry. There is a real objection, however, to hedging and shading the highways with trees, as it keeps the roads muddy and rough a greater portion of the time; but, notwithstanding this objection, and in full view of the case after a thorough discussion, a majority of the societies as well as of the experiment-

ers, seem to be in favor of lining all roads with trees, as the less of the two evils we must suffer.

We have not space here to give the proofs and considerations pro and con on the questions of the influence of timber belts upon the fall of rain, the relative value of the different species of trees, or even the history of what has been done in forest culture in the United States; but will attempt merely to give the substance of the practical results, although there are some good people who may doubt a few of the statements here made:

1. Extensive forests do cause a more even distribution of rain-fall throughout the season, and groves near a plantation do protect it from high winds and much of the excessive rigor of climate. When the wind is from the West, it is one to ten degrees warmer on the east side of a hedge or timber belt than on the west side, according to the amount of sunshine on either side. On a large scale a heavy forest protects the land on the same principle that a heavy stock of dead grass protects the ground on a small scale.

2. On most of the Western prairies there are not timber trees enough planted yet, although there are more young trees now coming on than there have ever been before. Much of this young growth will be cut off before it is large enough to make boards or good manufacturing material.

3. In the timbered sections the clearings are not followed up quite closely enough by the planting of other and more useful trees to succeed the old forests.

4. In renewing a grove, never plant on the ground the same kind of trees which were upon it before.

5. In transplanting young trees from the forest, preserve its natural surroundings as closely as convenient as to kind and condition of soil, amount of shading, etc., and keep the same side to the north as it originally had. Putting out a tree with its north side turned to the south, the sun will scald and kill it. Stake and tie, or otherwise protect against the wind all those young trees transplanted from a protected place in the woods. The principles of root and top pruning applicable to orchard culture of fruit trees are also applicable to forest tree culture. High winds shake and tear the leaves and tops of most of our wayside trees so much that they cannot perform their function, and the trees send up suckers or sprouts for a substitute.

6. Some trees are more rapidly and vigorously started from the seeds, and a few are better propagated by cions.

7. The most valuable trees, in general, are those of rather slow growth, as the oak, the hard maple, black walnut and white ash, while those of rapid growth soonest produce shade, but have rather poor wood and are more exhaustive of the soil, as cotton-wood, white maple and buckeye.

Some trees are uncouth in their appearance, some cannot stand the high winds characteristic of our Western prairies, some are subject to a borer which weakens the limbs, while others are sickly in their new situations from some unknown cause. Of native species worthy of planting, the most valuable tree for furniture is evidently the black walnut; next are white ash and hard maple; bird's-eye or curled maple is a fancy wood for ornamental work, but it cannot be propagated at will; the most valuable wood for floors and stairways, handles and stocks of implements, is the white ash; the best for veneering is the white walnut, or butternut; for hedge and wood-work of wagons and carriages, the best is Osage orange; for railroad ties, the best are European larch and white oak; for high hedges and wind-breaks, among the best are Norway spruce and white pine; for fence posts, the Osage orange and the magnolia (speciosa, the Western), are among the best; for bordering sloughs and wet places, the best is almost any kind of willow.

Culture. There are, on almost any farm, some portions that are more or less broken and indifferently adapted for cultivated crops. On the most level farms there are knolls and swells, or ravines and swales, but in the hill country there are steep declivities, some of which are rocky or stony. All such lands may be made to produce great crops of timber, and should be so appropriated, to cover them and to prevent the necessity of cultivation or the loss and inconvenience of having them neglected eye-sores and briar patches, wastes, secreting vermin and giving the whole farm a neglected and untidy appearance. In a level country, where the whole surface is arable land, and where there are no such waste spots to occupy and embellish with timber growth, any portion of the property may be appropriated to the grove; but here it may be well to make the plantation as a shelter belt, by planting one or two strips to the windward, say the west, north or south sides. These should be sufficiently wide to protect themselves and the rest of the farm, or from four to eight rods. Mr. Bryant advises a strip of eight rods on two sides of every quarter section of land.

The land should be well plowed and harrowed. In raw prairies, the trench plow will be the best means of preparation; if old ground, any good plowing will answer. Like any other crops, the timber planting will be aided by thorough preparation of the soil for the seeds, cuttings or plants. Large seeds should be set at once in the field; cuttings and delicately growing seedlings had better be started in a nursery. If the land be very broken or rocky, this thorough preparation of the soil cannot be given to it, and all that can be done will be to clean it up, by grubbing and removing the weeds and briars, digging holes for the trees.

The usual method of renewing the forest is either pitting, notching, seeding and self-seeding or natural reproduction, which last, when not entirely satisfactory in its results, is complemented by filling in the gaps with useful and desirable species, planted by the first named process; this is particularly practiced with the oaks, and these are usually planted of large size. Pitting consists in digging holes, at suitable intervals, in which the young trees are planted. Notching is a

very simple process, cheap and primitive. The tool used is a peculiar, narrow and thick spade, which is thrust down into the sod, withdrawn and again inserted so that the two cuts shall be at right angles, and before withdrawing the tool the cleft is opened, and the plant is inserted by an assistant and held in the angle thus formed until the spade is withdrawn, when the earth is pressed against it with the foot, and the little tree is left to take care of itself. Attempts to plant in this way have not been very satisfactory in our country, especially where blue grass abounds.

For the larger seeds or nuts, the ground should be marked off with a light furrow, into which they are dropped and then covered with a plow or harrow. They may be put in hills or squares, like corn. If young trees are set out, it will be necessary to open holes for them with the spade, and in planting them it will be advisable to pack the earth very firmly about the roots. This is particularly necessary with young conifers, such as larch and cedar, and other evergreens. The planting should also be done very early in the spring, or as soon as the labor can be done after the soil is dry enough to work pleasantly. It has been recommended to plant a crop of corn on the land preparatory to setting out the trees, in which case the work may be done in the fall, planting a tree beside each hill; the cornstalk or stubble will afford protection to the young tree, and guide the planter. In meadow soil properly prepared, the planting of young trees is a very simple affair. The spade is thrust deeply into the ground, a cleft is opened into which the tree is planted, and by inverting the spade the soil is pressed against the roots firmly. When we have to deal with the more valuable and costly tree, or with those of larger growth, more care is requisite. The hole must be dug and the plants set by hand, bringing the earth among the roots and upon them, and then stamping it closely about them. When handling the plants, be very careful to prevent the drying of the roots. This is especially requisite with resinous trees and with some other kinds, such as the tulip poplar. With some of the hardy sorts, such as the cotton-wood and soft maple, a very primitive process is often employed. The little trees are simply laid along, with their roots in the furrows and covered with the plow, after which the land may be rolled. Some of the soft-wooded or marsh trees will grow from cuttings as readily as the grape. Oaks, if removed when two years old, cutting off the tap root, and again afterward when the roots run downward, will do well. Hundreds have been transplanted when 12 feet high and three or four inches in diameter, with little or no loss.

There has been a great difference of practice among farmers as to the proper distance to set trees in timber plantations. Many have erred by planting too wide, few by setting too closely. Both extremes may seem to follow nature. In the matured forest, the trees are widely separated, it is true, but in the young forest growth they are closely crowded together, and where so crowded the finest timber trees are the result. The widely planted trees will require much labor to train them into shape, all of which may be avoided by close planting. Many plantations have been made 8 by 8 feet, some wider, but the best practice with almost all tree-planting is to set closely. Five feet and 5 x 6 is still recommended, but 4 x 4 is much better, and some advise 3 x 3. Mr. Edwards, of Illinois, says he would set larches 3 x 3 as nurses for pines and spruces planted among them every 12 feet. Hickories, chestnuts, elms, and all such trees as may be used for hoop-poles, when these are in demand, can be planted in close drills, thickly, so that in four or five years a crop may be removed, leaving the thinned trees to develop themselves.

The young trees should be thoroughly cultivated for a few years. The first summer the two-horse cultivator may be used; after this the double shovel must be taken. In the fall after planting, it may be well to bank them with a turning plow as a protection in winter. In most cases the hoe will be needed while the trees are small, but in after years the shade will keep down the weeds.

When planted thickly there will be little need for trimming the trees. Nature will effect this unaided by her own process of smothering. It may often happen, however, that some species will produce double headers, one of which should be shortened at once or removed. The side branches will soon die and fall off when the tops form a canopy. This is not the case in wide planting; if they have room to spread, the trees will be branched, and it often happens that several of these branches will strive for the mastery. When this occurs all but one should be shortened, or, if small, removed. If a tree here and there appears stunted, or injured by accident or insect, cut it off at the ground in the winter, and it will be reproduced by a strong, clean shoot. In this case the smaller sprouts must be kept away, in order to concentrate the forces of all the roots upon one shoot, which will thus often be able to overtake the older trees in its vicinity. The extra care, however, required for this procedure, is scarcely ever remunerative.

Trimming will require the exercise of sound judgment; nor can it be directed by a set of rules indicating the days and years when it should be done. The object of close planting is to give the trees an upward growth without side branches, but when this has been attained, we must watch lest the plants become crowded and chafe one another. The period when thinning may become necessary, will depend upon the variety planted and the rapidity of their growth. Some will need it sooner than others, but as a general rule, the plantations should be thinned before the trees are too much grown. If in drills closely planted the supernumeraries must be cut out, taking always the poorer trees, and leaving the stronger with sufficient room for development. If the planting has been done in squares, every alternate tree, or if in close rows, every alternate row may be taken away at the first cutting. In a few years the same process will be

needed as the trees continue to grow and crowd. Every alternate tree may now be taken away.

Fig. 1.-*Transplanting Large Trees.*

Trees can be transplanted safely at any age, but, unless at the best time, extraordinary care may be required. The old practice of digging a trench around the tree late in autumn, leaving it to freeze, and then removing the whole mass as a frozen ball of earth some time during the winter, is generally abandoned as being more expensive than is necessary. Trees, both deciduous and evergreen, can be removed in mid-summer after the growth of the season has somewhat ripened, in which case the foliage of the deciduous tree should be clipped off up to the middle leaf of the stem, and the present year's growth of the evergreens all cut off except one bud.

Figure 1 represents an apparatus for transplanting large fruit or forest trees. It is merely a pair of large wheels and an axle. A piece of 4 x 4 inch studding is tied to the tree with cloths, straw, or something to prevent bruising the bark of the tree, and a rope at the upper end. A trench has previously been dug around the tree. When ready to move it, fasten the axle firmly to the studding or timber, seize the rope and pull the tree into a horizontal position, when it is ready for transportation.

Fig. 2.—*Wrong Way to Treat the Roots.*

The holes into which the trees are set should be four inches greater in diameter than the mass of roots, and the base of the center should be a little mound of earth, on which the roots should be spread out as in Fig. 3, and not as in Fig. 2. Fine rich soil should then be pressed carefully under and around the roots with the hands, and not stamped down with the feet, except a little at the finishing. The upper tier of roots should be covered about four inches, and the whole setting so done that after the earth has settled the tree will be at the same level with the surface of the ground that it originally had. Then mulch for six feet around, more as illustrated by Fig. 4 than by Fig. 5, for several very obvious reasons.

Fig. 3.—*Right Way to Spread the Roots.*

The best age for transplanting apples, pears, and plums as standards is at two years from the growth of the bud or graft. The pear grown upon the quince, the apple upon the Doucain or Paradise stocks, the peach upon the plum, the apricot and nectarine upon the plum, should be planted at one year from the bud or graft. If the trees come from a nursery not cultivated by yourself, first wet the package on the receipt of it, before opening, and then dig a trench in some light dry soil, and heel the plants in. If in autumn too late for planting, throw also some brush over them.

Fig. 4.—*Proper Mulching.*

Seeds of fruit trees should never be permitted to become perfectly dry. Bury them in a moist, cold place, but not wet, say under three or four inches of earth on the north side of a building, until planting time. Peach and plum stones should be carefully cracked; but cherry stones will open of themselves, and should be first planted in spring, which will allow sufficient room for those remaining to go on growing for another term of years. By systematic removal of the surplus trees, always taking the weakest, the remnant may be left at the last thinning, at an average of twelve feet apart, at which distance many kinds may remain for a long time. Valuable trees that you wish to propagate should be cut in the spring. Those that you wish to exterminate should be cut in August.

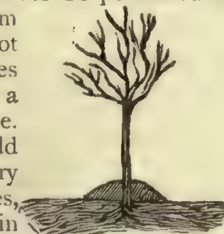


Fig. 5.-*Wrong Mulching.*

Whether natural or artificial, the forest must always be kept carefully inclosed so as to exclude all kinds of stock. Young trees especially need this protection from the trampling of cattle; but even large trees in the more matured forests are often seriously injured by intruders of this class.

The preservation of our native forest growths is a matter of equal importance with the planting of groves and coppices where the former does not exist. For this purpose the first requisite is their inclosure, so as to preserve them from the depredations of domestic animals. Next in importance is the prevention of fires, which are often allowed to destroy vast tracts of the most beautiful trees, and at the same time to burn up infinite numbers of young trees, that, if not so destroyed or browsed off by cattle, would be ready to spring up into new forest growths wherever the trees already matured should be cut away.

An earnest appeal is made to wait no longer, but to begin at once to plant forest trees,—plant them for their beauty; to plant them for the shelter they afford; to plant them for their happy effects in modifying and equalizing the climate, in checking the force of the winds, thus preventing excessive evaporations and cold; to plant them for their utility upon the farm; to

plant them for patriotic motives; and finally, if you can be touched by no more refined sentiment, to plant timber trees as a farm crop, for their *profit*, which is a demonstrable proposition, as already set forth.

SPECIES. Following is a tolerably complete list of the trees recommended for propagation, with such notes as will enable the reader to compile lists for his own locality. The confusion in names of trees, and especially of shrubs, as used in various parts of the country, is often quite bewildering. This arises in a great variety of ways among those who have little observation or no knowledge of botany. For instance, one is called by some "whitewood" and "tulip-tree," by others "poplar." The latter name is also used for several other species of trees. Two species of trees are indiscriminately spoken of as the "soft maple." The names of our oaks are a good deal mixed up. This is true of the scientific descriptions as well as of the common names. We have seven species of birch, five of which are trees. Two or three of them are known as "yellow birch" in different sections of the country. Two others are indiscriminately called the "white birch." Hardly any one, unless a botanist, pretends to know the species of our willows and poplars and cottonwoods. Two or three different species of pine are known in different parts of the country as "scrub pine," "gray pine," "buckwheat pine," "black pine," "jack pine." Of course there is still greater confusion of names and want of any common name among some of the shrubs and the rare trees.

Arbor-Vitæ, American. The most valuable of the Thuyas; wood light-colored, compact, light, very durable and largely employed for posts, railway ties, fencing, etc. The western spe ies is liable to split and warp in the sun.

Ash, White. The most valuable of the family, as its wood is the best for tool and implement handles, for portions of carriages, cabinet-work, cars, stair-steps, etc.; first-rate for fuel also. The black ash is employed in basket-making, etc.

Bass-wood, Lin, Linden, Lime, Teal, White-wood. Well known; wood largely employed in turnery, interior work and manufacture of wooden ware; excellently adapted to our western, black prairie soil. Bark good for cordage, matting, etc.

Birch. The white birch is manufactured into spools, shoe-pegs, etc.; the sweet or mahogany birch (Betula lenta) is valuable in cabinet-making and for fuel; the red birch is common along our western streams, and the canoe or paper birch is good for fuel, for the manufacture of spools, shoe-lasts, pegs, etc.

Box-Elder, or Ash-Leaved Maple. Well known as a fair shade tree, but not very ornamental; propagates itself like weeds, and is very tough.

Buck-Eye. A rather low tree, with beautiful and luxuriant foliage; common in the bottom lands along our larger water-courses.

California Laurel. See Laurel.

Catalpa. The best catalpa for planting in the Northwest is what is called the Western; when full-grown it is 80 feet high, with a trunk 4 feet in diameter; one of the best for railway ties, fence-posts, etc., and is good for cabinet work. Its flowers are earlier, larger and whiter than those of the other kind.

Cedar, Red. The most valuable of the cedars.

Chestnut. Valuable nut-bearing tree in the older States.

Coffee-Tree or Coffee Bean. See Kentucky Coffee-tree.

Cucumber Tree. See Magnolia.

Elm. The white elm is the most common and is being extensively planted as a way-side tree; the wood is used in making hubs, water pipes, etc. The cork or rock elm yields a first-rate wood for heavy agricultural implements, furniture, and all purposes requiring a combination of strength, toughness and solidity.

Fir. The most valuable is the Norway spruce. The black spruce is valuable for paper and for lumber.

Holly, American. A small tree, rarely 40 feet in height; wood white, heart-wood brown, close-grained, heavy; used in cabinet-work, turnery, etc.

Honey Locust. Sometimes planted in the North where it is not found native; good for hedges.

June-Berry. See Shad-bush.

Kentucky Coffee-Tree, or Coffee Bean. Produces beautiful foliage and beans; of little account for anything else.

Larch, American, or Black; Tamarack; Hackmatack. These several names are applied to a well known deciduous tree with pine-like leaves, so valuable for posts, telegraph-poles, railway ties, upper knees of ships, etc. The European variety is more profitable, probably the most profitable of all.

Laurel, Mountain, California Laurel, etc. A tree from the Pacific coast of full forest height, whose roots yield a volatile oil; the wood is brownish, close-grained, susceptible of a fine polish, and is highly esteemed, especially that of the roots, for cabinet-making.

Lin. See Basswood.

Locust, Common. Well known; too tender for the latitude of Northern Illinois.

Magnolia, or Cucumber Tree. A large tree, 60 to 80 feet high and 2 to 4 feet in diameter; wood soft, close-grained; preferred for pump logs.

Maple, Sugar, Hard or Rock. Well known as the best shade and ornamental tree, whose wood is good for manufacturing purposes, and sap the best for sugar.

Maple, White or Silver. Well known as a beautiful tree, except that it is subject to the borer and to breaking down by wind.

Maple, Ash-leaved. See Box Elder.

Mountain Laurel. See Laurel.

Mulberry. A small tree, sometimes 70 feet high, with a trunk two feet in diameter, bearing edible, sweet fruit; wood yellowish, heavy, exceedingly durable, valuable for posts, tunnels, etc.

Osage Orange. The best for farm hedges, if not too far north.

Pine. The white is best for general utility; next the Scotch, Austrian, red, etc.

Red-Bud, or Judas Tree. Good only for ornament.

Service-Berry. See Shad-bush.

Shad-bush, June-berry, Service-berry, etc. Recommended for planting by some horticulturists as a kind of ornamental tree; it bears edible fruit; on the whole it is comparatively unimportant.

Spruce. Fir.

Sweet or White Bay. A small tree in swamps; roots yield a yellow dye.

Tulip-tree, Yellow Poplar, White Wood. A large tree 70 to 100 feet high, 4 to 7 feet in diameter; wood light, close-grained, strong, easily worked, extensively used in building, interior work, shingles, panels, boxes, etc.

Walnut. The black walnut is probably the most profitable tree to plant for future generations, as its wood is so valuable in cabinet-ware, saying nothing of the nuts and the bark, which latter yields a very good dyeing material; becoming very scarce in the forests. The white walnut, or butternut, is now used extensively in veneering, in cabinet-making, its bark yields a valuable dye, and the nuts it bears are very popular. This species is also becoming scarce.

White Bay. See Sweet Bay.

White Wood. See Tulip-tree.

Wild Black Cherry. Too plentiful in the forest to want propagation elsewhere.

Willow. Almost any species is valuable for planting in wet places and along the banks of streams.

Yellow Poplar. See Tulip-tree.

The best trees to raise for timber in Michigan are white ash, hickory, black walnut, white pine, white oak, European larch and chestnut. The five best for Iowa are said to be black walnut, chestnut, white ash, silver maple and European larch.

Fork: for Hay Fork, see Hay.

Founder, to cause internal inflammation and sore feet and limbs—of a horse; also, general fever or acute rheumatism, as "chest founder."

Fountain. Artificial fountains for both parlor and lawn can be obtained at many hardware stores. A parlor fountain has been invented which is renewed every hour by simple inversion of the frame on a rotating bar. Where a residence is situated below the brow of a hill, or where wind-mill pumps are in operation, it is easy and inexpensive to keep a lawn fountain in continual play. A fountain is easily made at home, but those in market are generally far more ornamental. There is nothing so refreshing to the view in sultry weather as a fountain or a cataract.

Fowl, Domestic. In a restricted sense this term is used to designate the cock and hen, or the genus Gallus in the order of Gallinaceous birds; and in poultry vernacular even the word "fowl" itself is used to designate this otherwise nameless species. Other terms are also employed, as "barnyard fowl," "barn-door fowl," "chicken," "hen," etc. But in the broader sense the term "domestic fowls" includes the turkey, goose, duck, Guinea-hen, etc.

There is no more profitable or interesting subject to which the farmer can give heed than that of raising the domestic fowl. No animal or fowl has a record that excels it, and for its antiquity and universality it has no peer. The cock is the well-known chieftain of the poultry-yard, and rural announcer of the passage of time. His shrill clarion, heard in the still watches of the night, inspires the invalid with cheering hopes of the coming dawn, and informs the way-worn traveler of his approach to the habitations of his kind. He is the appropriate emblem of vigilance, virility, warlike daring and gallantry; domesticated, but not subdued, he marches at the head of his train of wives and offspring with a bearing of proud defiance, not less ready to punish aggression against his dependents than to assert his superiority upon the challenge of any rival. At what time this valuable species of pheasant was brought under the immediate control of man, it is now impossible to determine; but as the forests of many parts of India still abound with several varieties of the cock in the wild or natural condition, it is quite reasonable to suppose that the race was first domesticated in the Eastern countries, and gradually extended thence to the rest of the world. It is stated that the cock was first introduced into Europe from Persia; nevertheless it has been so long established throughout Europe as to render it impossible to trace its progress from its native wilds. In the palmiest days of Greece and Rome he occupied a conspicuous place in the public shows which amused the masses of the people. He was dedicated to the worship of the pagan deities, and was connected with the worship of Apollo, Mercury, Mars, and particularly Esculapius.

The practice of cock-fighting, barbarous as it is, originated in classic times, and among the most polished and civilized people of antiquity.

The cock has head surrounded by a notched, crimson, fleshy substance, called comb; two pendulous, fleshy bodies of the same color, termed wattles, hung under his throat. The hen has also a similar, but not so large or so vividly colored excrescence on her head. The cock is provided with a sharp horn or spur on the inside of his leg, with which he inflicts severe wounds; the hen, instead of the spur has a mere knot or tubercle. There is in both sexes, below the ear, an oblong spot, the anterior edge of which is reddish and the remainder white. The feathers arise in pairs from each sheath, touching by their points within the skin, but diverging in their course outwards. On the neck they are long, narrow, and floating on the rump they are of the same form, but drooping latterly over the extremity of the wings, which are quite short, and terminate at the origin of the tail, the plumes of which are vertical. In the center of the cock's tail are two long feathers, which fall backwards in a graceful arch and add great beauty to the whole aspect of the fowl. It is in vain to offer any description of the color of the plumage, as it is indefinitely varied, beiny in some

breeds of the greatest richness and elegance, and in others of the simplest and plainest hue. Except in the pure white breeds, the plumage of the cock is always more splendid than that of the hen. We cannot contemplate the cock, when in good health and full plumage, without being struck with his apparent consciousness of personal beauty and courage; his movements and gestures seem all to be influenced by such feelings, and his stately march and frequent triumphant crowing express confidence in his strength and bravery. The sagacity of the cock is excessive, and one is known as to be quite sufficient for the fecundation of 10 or 15 hens. His sexual powers are matured when he is about six months old, and his full vigor lasts for about three years, varying with earliness of maturity and with his size and even the climate.

The hen is deservedly the acknowledged pattern of maternal love. When her passion of philoprogenitiveness is disappointed by the failure or subtraction of her own brood, she will either continue incubating till her natural powers fail, or will violently kidnap the young of other fowls and insist upon adopting them. She is ready to commence laying after she has moulted or changed her plumage, and is not at the trouble of making a regular nest. A simple hole scratched in the ground in some retired place serves the purpose, and she generally lays from 12 to 15 eggs before she begins to sit upon them for the purpose of hatching. Having thus taken possession of her nest, she becomes a model of enduring patience, remaining fixed in her place until the urgency of hunger forces her to go in search of food. A short time suffices; she runs eagerly about in quest of sustenance, and soon resumes her charge. Her eggs are diligently turned and shifted from the center to the edge of the nest, so that each may receive a due degree of genial warmth, and it is not until about 21 days have elapsed that the incubation is complete. The strongest of the progeny then begin to chip the shell with the bill, and are successively enabled to burst their brittle prisons. She continues upon the nest until the whole are hatched and dry, then leads them forth for food. The hen, except when accompanied by a young brood, is always timid, and ready to fly from disturbance, but when she engages in discharging the duties of maternity her whole nature is changed. She fiercely and vigorously attacks all aggressors; watches over the safety of her young with the utmost jealousy, neglects

FIG. 1.—*Dark Brahmas.*

the demands of her own appetite to divide the food she may obtain among her nurslings, and labors with untiring diligence to provide them sufficient sustenance.

The limits within which we are restricted forbid the attempt to give a complete history of this valuable species, which is, in every point of view, interesting. To detail all that would be necessary to illustrate it as an object of natural history and domestic economy, would require a volume. We will, however, in a practical way, treat the modes of breeding and rearing, the best breeds, with engravings of same, and the manner of preparing for the market and the table.

VARIETIES OF FOWLS.

BANTAMS. Some authorities claim that the original of the Bantams is the Bankiva fowl, of the East Indies; others claim that the numerous diminutive fowls known as Bantams have no ancestry in original stock, but are "artificial fowls," inasmuch as they have been carefully dwarfed and perfected by the art of man. The smaller varieties of poultry are generally known under this name. They are not especially valuable, being kept entirely as pets for ornament.

These little creatures exhibit some peculiar habits and traits of disposition. Amongst others, the cocks are so fond of sucking the eggs laid by the hen that they will often drive her from the nest in order to obtain them; they have been even known to attack her, tear open the ovarium, and devour its shell-less contents. To prevent this, first a hard-boiled, and then a marble egg may be given them to fight with, taking care, at the same time, to prevent their access either to the hen or to any real eggs. Another strange propensity is a passion for sucking each other's blood, which is chiefly exhibited when they are moulting, when they have been known to peck each other naked, by pulling out the new feathers as they appear, and squeezing with their beaks the blood from the bulbs at the base. These fowls being subject to a great heat of the skin, its surface occasionally becomes hardened and tightened; in which cases the hard roots of the feathers are drawn into a position more nearly at right angles with the body than at ordinary times, and the skin and superficial muscles are thus subjected to an unusual degree of painful irritation. The disagreeable habit is, therefore, simply a provision of Nature for their relief, which may be successfully accomplished by washing with warm water, and the subsequent application of pomatum to the skin.

Bantams, in general, are greedy devourers of some of the most destructive of our insects, the grub of the cock-chafer and the crane-fly being especial favorites with them. Their chickens can hardly be raised so well as by allowing them free access to minute insect dainties; hence the suitableness of a worn-out hot-bed for them during the first month or six weeks. They are thus positively serviceable creatures to the farmers, as far as their limited range extends.

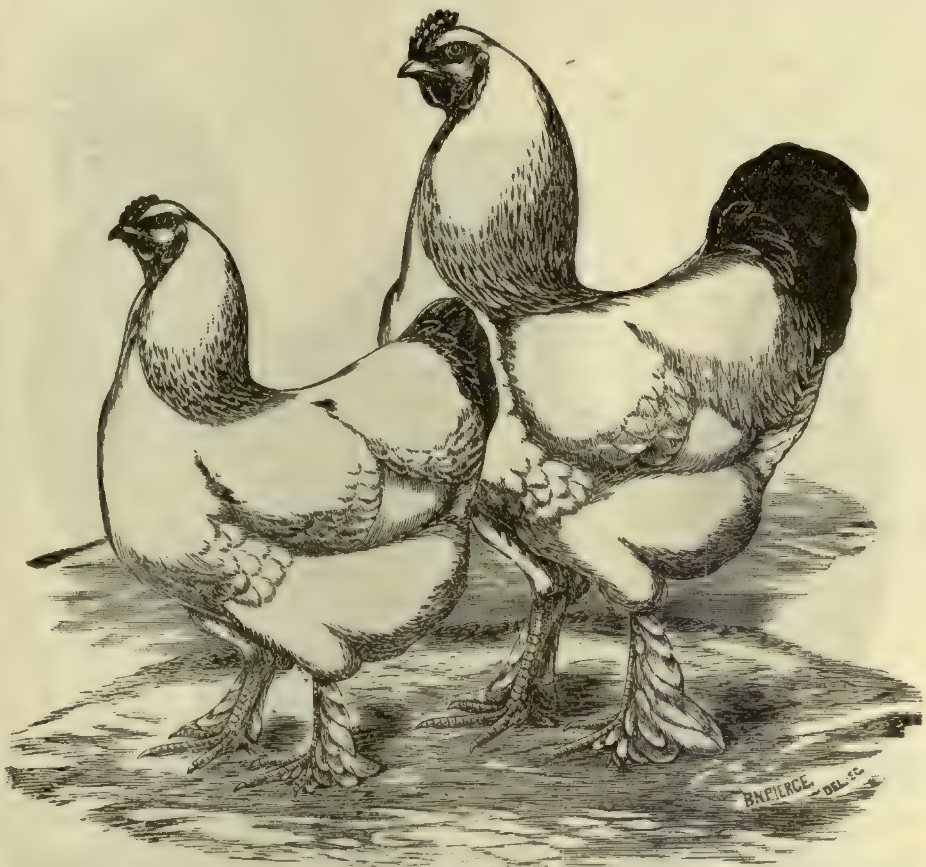


FIG. 2.—*Light Brakmas.*

One of the most interesting and beautiful species of Bantams is the Sebrights, of which there are two varieties, the Golden and Silver Sebrights. In the former, of which we give a fine pair on page 526, the ground

color is a rich golden yellow; in the latter it is pure white. The carriage of the cock is the most conceited it is possible to conceive of; head thrown back till it touches the nearly upright tail; wings drooping half way down the legs; motion restless and lively, always strutting about as if seeking for antagonists. The bird is, in fact, "game to the back-bone," and will attack the largest fowl with the utmost impudence.

Among the numerous varieties of these beautiful birds, besides the Sebrights, are the Game, Black, White, Nankin, Pekin or Cochin, Cuckoo, and Japanese Bantams.

The Game Bantams are, without doubt, the finest specimens of Bantams, as they are the smallest; yet a cockerel, not larger than a pigeon, will drive one of the large Asiatic breeds. The Game Bantams should be exact and diminutive representatives of the large breed of Games they are to represent, whether Black-Red, Brown-Red, Duckwings or Pile Game Bantams. The smaller these are the better, and to reduce the size it is usual to rear chickens from late fall broods. For competition, cocks must weigh less than 24 ounces, and hens less than 20 ounces each. The plumage of the Game Bantams is precisely similar to the corresponding varieties of the Game Fowl, from which they are undoubtedly obtained by long inter-breeding, and continually selecting the smallest specimens.

The plumage of the Black variety is uniform black, and in the cock has a bright luster like that of the Spanish fowl.

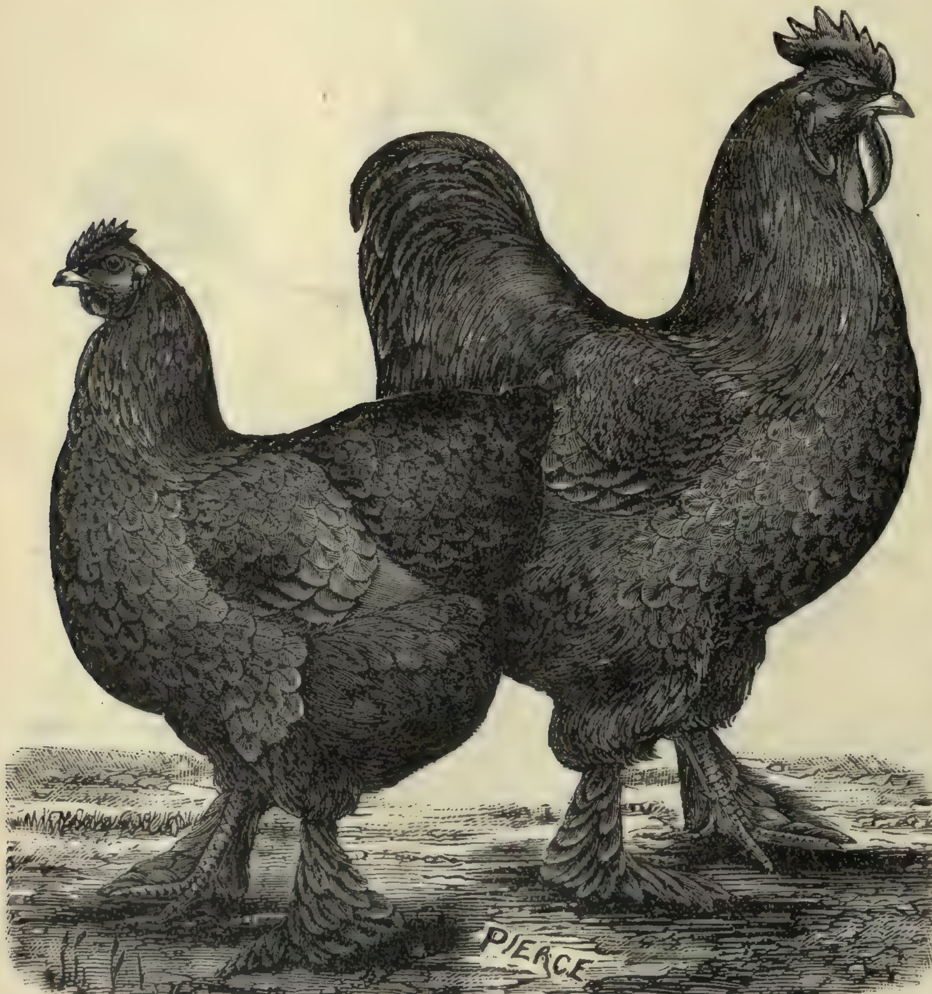


FIG. 3.—*Buff Cochins.*

The White are similar to the Black Bantams, except that the legs are white and delicate, and the plumage spotless white.

Nankin Bantam is of a pale orange yellow color, with slight penciling on the hackle. It is a very old breed, but not common.

The Pekin or Cochin Bantams were introduced in England from China not many years ago, having been stolen from the Summer Palace at Pekin during the Chinese war. They exactly resemble Buff Cochins in color and form, possessing the feather-legs, abundant fluff, and all other characteristics of the parent breed in full perfection, and presenting a most singular appearance.

The Japanese Bantam is the most curious of all the different varieties. It is very short-legged and differs from most other varieties in having a very large, single comb.

BRAHMAS. The Brahmas have long been favorite fowls, from their quiet habits, large size, and the quickness with which they grow to a remarkable size for frying. In all the original breeds the deaf ears fell below the wattles, and this characteristic has constantly been sought to be perpetuated. The hackles should be full and spread well and evenly over the back and shoulders. Vulture hocks, especially, should be well avoided. The backs should be well furnished with soft, curling feathers, and the legs booted (feathered) quite down to the

toes. This to apply to pure-bred birds. In the farmyard, where birds are grown simply for market, nice qualifications are not essential, nevertheless the general characteristics should be preserved.

There are two varieties of Brahmas, known as "Light" and "Dark" or "Pencilled" Brahmas; and on no account should they ever be crossed, the result being according to Mr. Teebay, who was formerly the most successful and extensive breeder of Brahmas in England, always unsatisfactory. The following description of Light Brahams have been carefully drawn up under the supervision of John Pares, of England.

"Light Brahmas are chiefly white in the color of the plumage, but if the feathers be parted, the bottom color will often be found of a bluish gray, showing an important distinction between them and the white Cochins, in which the feathers are always white down to the skin. The neck hackles should be distinctly striped with black down the center of each feather. That of the cock is, however, often lighter than in the case of the hen. The back should be quite white in both sexes. The wings should appear white when folded, but the flight feathers are black. The tail should be black in both sexes. In the cock it is well developed, and the coverts show splendid green reflection in light. It should stand tolerably upright and open well out laterally, like a fan. The legs ought to be yellow, and well covered with white feathers, which may or may not be very slightly mottled with black; the vulture hocks are a great defect. The ear-lobes must be pure red, and every bird should, of course, have a perfect pea-comb, though good birds with a single comb have been shown with success."

The dark or pencilled Brahmas are similar to the above in comb, form, symmetry, etc., but as different in color as can well be.

The following description of "Dark Brahmas" is by Mr. R. W. Boyle, of Bray, Ireland, who has for some years been known as the most eminent breeder of Dark Brahmas in Great Britain.

The head of a perfect Brahma cock should be surmounted by a good "pea-comb," which resembles three small combs running parallel the length of the head, the center one slightly the highest, but all evenly serrated and straight, and the whole low and set firm on the head. Beak strong, well curved, and the color of horn. Wattles full; ear lobes perfectly red, well rounded, and falling below the wattles. His neck should be rather short, but well curved, with a full hackle, which is silvery white striped with black, and ought to flow well over the back and sides of the breast. At the head, the feathers should be white. Back, very short, wide and flat, rather rising into a nice, soft, small tail, carried rather upright. The back almost white. The saddle feathers white, striped with black, as in the neck, and the longer they are the better. The soft rise from the saddle to the tail, and the side feathers of the tail, to be pure lustrous green black, except a few next the saddle, which may be slightly ticked with white; the tail feathers themselves pure black. The breast should either be black, or black with each feather slightly and evenly tipped with white, but on no account splashes of white; it should be well carried forward, full and broad. Wings small and well tucked up under the saddle feathers, and thigh fluff. "A good sharply defined black bar across the wings is very important. The fluff on the thighs and hinder parts ought to be black or very dark gray. The lower part of the thighs should have plenty of nice soft feathers, almost black, rounding off about the joint and hiding it, but on no account running into 'vulture hocks,' which I consider a great eyesore. The cock should carry himself upright and sprightly, and great width and depth are important points; a good bird should show great size and look big.

Fig. 4.—*White Cochins.*

"The hen's head should be small, with a perfect pea-comb, as in the cock, but smaller; and the beak also resembling his in the decided curve and color. Wattles quite small and neatly rounded, the red ears hanging below them. Neck short, and gradually en-

larging from head to shoulders. Feathers about the head grayish, verging to white, and the hackle more striped with black than in the cock. General make of the back, tail, thighs, wings, and breast the same as in the cock, but, of course, in proportion.

"The color of the hen, except the neck and tail, is the same all over, each feather, even up to the throat on the breast, having a dingy white ground very much and closely pencilled with dark steel gray. The pencilling on the throat and breast is very important, and is one of the first points looked at in a prize hen. Light Brahmas by Figs. 1 and 2, pages 514 and 515.

BLUE DUN. The variety known under this name originated in Dorsetshire, England. They are under the average size, rather slenderly made, of a soft and pleasing bluish-dun color, the neck being darker, with high, single combs, deeply serrated. The cock is of the same color as the hen, but has, in addition, some handsome dark stripes in the long feathers of the tail, and sometimes a few golden, or even scarlet marks, on the wings. They are exceedingly impudent, familiar and pugnacious.

FIG. 5.—*Partridge Cochins.*

The hen's legs are short and thick, not quite so yellow as the cock's, and profusely feathered on the outside with feathers the same color as the body. Her carriage is scarcely so upright as that of the male bird.

"With regard to the economic merits of the Brahmas, the pullets lay when six months old, and usually lay from 30 to 40 eggs before they seek to hatch. They have been known to begin to lay in autumn, and never stop,—let it be hail, rain, snow or storm—for a single day till the next spring."

We present excellent specimens of the Dark and

The hens are good layers, wanting to sit after laying a moderate number of eggs, and proving attentive and careful rearers of their own chickens, but rather savage to those of other hens. The eggs are small and short, tapering slightly at one end, and perfectly white.

Some authorities class these birds with the Game fowls, not recognizing them as a distinct breed, upon the ground that, as there are Blue Dun families belonging to several breeds, such as the Polish, Spanish, Game and Hamburgs, it is more proper to refer each Blue Dun to its own proper ancestry.

CHITTAGONG. The Chittagong is an Indian breed and the largest variety. It is a very superior bird, showy in plumage, exceedingly hardy, and of various colors. In some the gray predominates, interspersed with lightish yellow and white feathers upon the pullets. The legs are of a reddish flesh-color; the meat is delicately white, the comb large and single, wattles very full, wings good size. The legs are more or less feathered; the model is graceful, carriage proud and easy, and action prompt and determined.

This breed is the largest in the world, the pullets usually weighing from eight to nine pounds when they begin to lay, and the cocks from nine to ten pounds at the same age. They do not lay as many eggs in a year as smaller hens; but they lay as many pounds of eggs as the best breeds. This breed has been, by some, confounded with the great Malay, but the points of difference are very noticeable. There is less offal; the flesh is finer, although the size is greatly increased; their fecundity is greater; and the offspring arrive at earlier maturity than in the common Malay variety.

There is also a red variety of the Chittagong, which is rather smaller than the gray. These have legs sometimes yellow and sometimes blue,—the latter color perhaps from some mixture with the dark variety; the wings and tail are short. Sometimes there is a rose-colored comb, and a top-knot, through crossing. This variety may weigh sixteen pounds a pair, as ordinarily bred. The eggs are large and rich, but not very abundant, and they do not hatch remarkably well.

The Chittagongs are generally quite leggy, standing some 26 inches high; and the hens 22 inches. A first cross with the Shanghae makes a very large and valuable bird for the table, but not for breeding purposes.

COCHIN CHINA FOWLS. This breed of fowls was introduced into England from the East Indies in 1843, when they are said to have been presented to Queen Victoria. It was introduced into this country about the year 1847, and to this is mainly due the celebrated "poultry mania" long to be remembered by breeders of domestic fowls. Men became almost wild after Cochins, and were willing to spend a small fortune for a trio of fine birds.

They differ very little in their qualities, habits and general appearance from the Shanghaes, to which they are undoubtedly nearly related. The cock has a large, upright, single, deeply-indented comb, very much resembling that of the Black Spanish, and, when in high condition, of quite as brilliant a scarlet; like him, also, he has sometimes a very large white ear-hole on each cheek, which, if not an indispensable or even a required qualification, is, however, to be preferred, for beauty at least. The wattles are large, wide, and pendent. The legs are of a pale flesh color; some specimens have them yellow, which is objectionable. The feathers on the breast and sides are of a bright chestnut brown, large and well-defined, giving a scaly or imbricated appearance to those parts. The hackle of the neck is of a light yellowish brown; the lower feathers being tipped with dark brown, so as to give a spotted appearance to the neck. The tail feathers are black, and darkly iridescent; back, scarlet-orange; back hackle, yellow-orange. It is, in short, altogether a flame-colored bird. Both sexes are lower in the leg than either the Black Spanish or the Malay.

FIG. 6.—*Black-Breasted Red Game.*

The hen approaches in her build more nearly to the Dorking than to any other breed, except that the tail is very small and proportionately depressed; it is smaller and more horizontal than in any other fowl.

Her comb is of moderate size, almost small; she has also a small, white ear-hole. Her coloring is flat, being composed of various shades of very light brown with light yellow on the neck. Her appearance is quiet, and attracts attention only by its extreme neatness, cleanliness and compactness.

The eggs average about two ounces each. They are smooth, of an oval shape, equally rounded at each end, and of a rich buff color. The newly-hatched chickens appear very large in proportion to the size of the egg. They have light, flesh-colored bills, feet and legs, and are thickly covered with down. It is most desirable to hatch these, as well as other large-growing varieties, as early in the spring as possible, even as soon as the end of February. A peculiarity in the cockerels is, that they do not show even the rudiments of their tail-feathers till they are entirely full-grown.

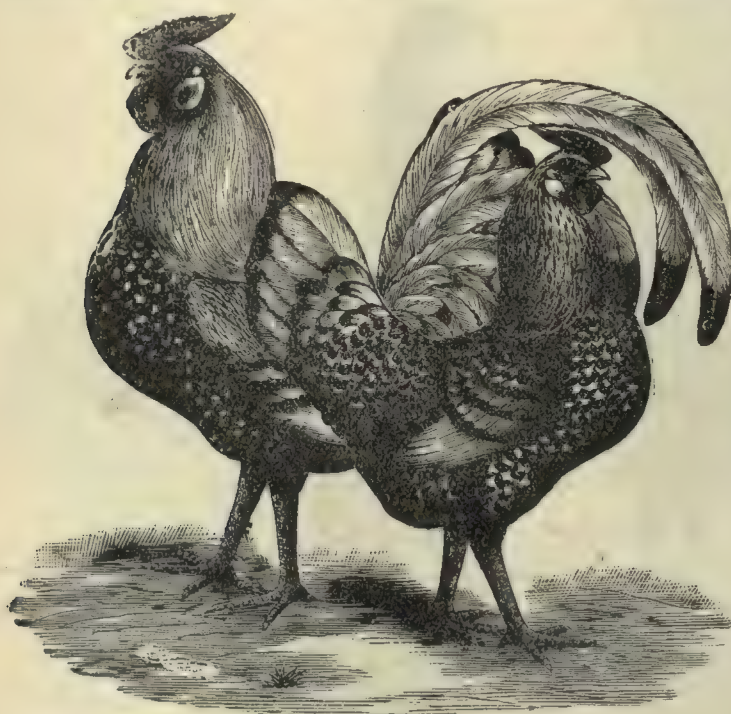


Fig. 7.—*Hamburgs.*

The principal sub-varieties of the Cochins are the White, Buff, Black and Partridge; which we most perfectly illustrate. On page 516 we show a fine pair of the Buff Cochins; on page 517 is the White and on page 518 we illustrate fine specimens of the Partridge Cochins. With those who breed the White variety, every feather must be pure; otherwise the fowl is looked upon with disfavor. The Buff Cochins may be of any shade, but the birds in a flock must correspond in color. Among the most admired of the Cochins is the "Partridge" variety. The neck hackles of the hens are bright gold, striped with black, the rest of the body being light brown, pencilled with a darker shade of the same color. The hackles of the Partridge Cochin cock are bright red, striped with black, the back being dark red, with a bar of metallic green upon the wings. The breast and under part of the body are pure black. Some of the points of merit, as claimed by the breeders of these fowls, are as follows: They are hardier than other breeds except the Brahmas, and will thrive under conditions where most others would perish. They are of large size, with a very gentle disposition, and the ease with which the Cochins are kept in confinement makes them favorites with many poultry raisers. When full grown the weight ranges from 10 to 15 pounds; they are too heavy to fly, and a fence two feet high will confine them. As sitters and mothers the hens are not surpassed, and are prolific layers, especially in winter when eggs are scarce. The chickens grow rapidly, and at three months are large enough for eating.

It is true they have many defects. The flesh is inferior, especially of old birds. The inclination to sit sometimes interferes with their greatest usefulness. This tendency is developed by over-feeding. As a breed the Cochins are most useful to supply the demands of a family for early chickens and a plenty of large, rich eggs.

On the farm the White Cochins are sturdy birds, and will forage, if allowed, long distances in search of insects. If kept in confinement they must have animal food, and also green food, daily, and if possible they should be allowed a short ramble late in the afternoon, when they will not trespass much. As winter layers of eggs the hens are among the best of all breeds of Gallinaceous fowls. They also cross kindly with other barnyard fowls, and live contentedly with other breeds. The objection to them is that they are rather coarse-boned and inclined to undue accumulation of fat.

Among the other principal varieties of the Cochin breed are Cinnamon, Lemon, Silver Buff, Silver Cinnamon, Black Cochin, Cuckoo, and Silky-Feathered Cochins.

Creve-coeurs. This breed has been the longest known in England, and is one of the most preferred in France for the quantity and quality of its flesh. The full-grown cock will not unfrequently weigh 10 pounds, but 7½ to 8 pounds is a good average.

In form the Creve is very full and compact, and the legs are exceedingly short, especially in the hens, which appear almost as if they were creeping along on the ground. In accordance with this conformation, their motions are very quiet and deliberate, and they appear the most contented in confinement of any fowls we know. They do not sit, or very rarely, and are tolerable layers of very large white eggs. The comb is in the form of two well developed horns, surmounted by a large, black crest, and giving the bird a decidedly

"diabolical" appearance. Wattles full, and, like the comb, a very dark red. The throat is also furnished with ample whiskers and beard. Plumage mostly black, but in the largest and finest birds not unfrequently mixed with gold or straw on the hackle and saddle. The merits of the Creve consist in its edible qualities, early maturity, the facility with which it can be both kept and reared in confinement, and the fine, large size of its eggs.

DOMINIQUES are probably one of the oldest varieties, being only a fixed type of those "cuckoo" fowls which have always been such favorites. They resemble, in fact, the cuckoo-colored fowls known as Scotch Grays, with the exception of having rose combs and yellow legs. Their combs are generally double, or rose, as it is sometimes called, and the wattles small. Their plumage presents, all over, a sort of greenish appearance, from a peculiar arrangement of blue and white feathers, which is the chief characteristic of the variety, although, in some specimens, the plumage is inevitably gray in both cock and hen. They are very hardy, healthy, excellent layers, and capital incubators. No fowl has better stood the test of mixing without deteriorating than the pure Dominique.

The name is taken from the island of Dominica, from which they are said to have been imported. Take all in all, they are one of the very best breeds of fowl which we have; and although they do not come into laying so young as the Spanish, they are far better setters and nursers.

DORKINGS. This is a pre-eminently English breed of fowls, and is, as it always will be, a general favorite—especially with lady fanciers. Its flesh is extremely delicate, especially after caponization; and it has the advantage over some other fowls of feeding rapidly and growing to a very respectable size, when properly managed.

The varieties of Dorkings usually recognized are the Gray or Colored, Speckled, Silver Gray, and White. For those who wish to stock their poultry yards with fowls of the most desirable shape and size, clothed in rich and variegated plumage, and, not expecting perfection, are willing to overlook one or two other points, the Speckled Dorkings should be selected. Dorkings are peculiarly subjected to "bumble foot," a chronic gathering, or abscess, probably first produced by the heavy birds descending to the ground from too high perches; but now it appears more or less hereditary in the breed; at least we have seen it repeatedly in fowls never allowed to roost high enough to cause it in this way, and which had the unrestricted run of a spacious park. We believe there is no remedy but to let the abcess grow to maturity and then remove it surgically. The operation will be successful about once out of three times.

The great merit of Dorkings has already been hinted at and consists in their unrivaled excellence as table fowls. In this respect we never expect to see them surpassed. The meat is not only abundant and of good quality, but is produced in greatest quantity in the choicest parts. The hens, in addition to their gay colors, have a large, vertically flat comb, which, when they are in high health, adds very much to their brilliant appearance, particularly if seen in bright sunshine. The cocks are magnificent. The most gorgeous hues are lavished upon them, which their great size and peculiarly square-built form display to the greatest advantage. Their legs are short, their breast broad, there is but a small proportion of offal, and the good, profitable flesh is abundant. The cocks may be brought to considerable weight, and the flavor and appearance of their meat are inferior to none. The eggs are produced in reasonable abundance, yet the Dorking is not a good layer, except when very young, and in winter is even decidedly bad in this respect. Though not equal in size to Spanish hens, they may fairly be called large.

FIG. 8.—*Houdans.*

The Fawn-colored Dorking is a cross between the

White Dorking and the Fawn-colored Turkish fowl. They are of lofty carriage, handsome and healthy.

The Black Dorkings are of a large size with the usual proportions of the race, and of a jet black color. The neck feathers of some of the cocks are tinged with a bright gold color, and those of some of the hens bear a silvery complexion.

Dunghill Fowl. This is also known as the barn-door fowl. It is a mongrel breed and may be found of all colors. It is known by having a thin, serrated, upright comb, and wattles hanging from each side of the lower mandible. The tail rises in an arch above the level of the rump. The female's comb and wattles

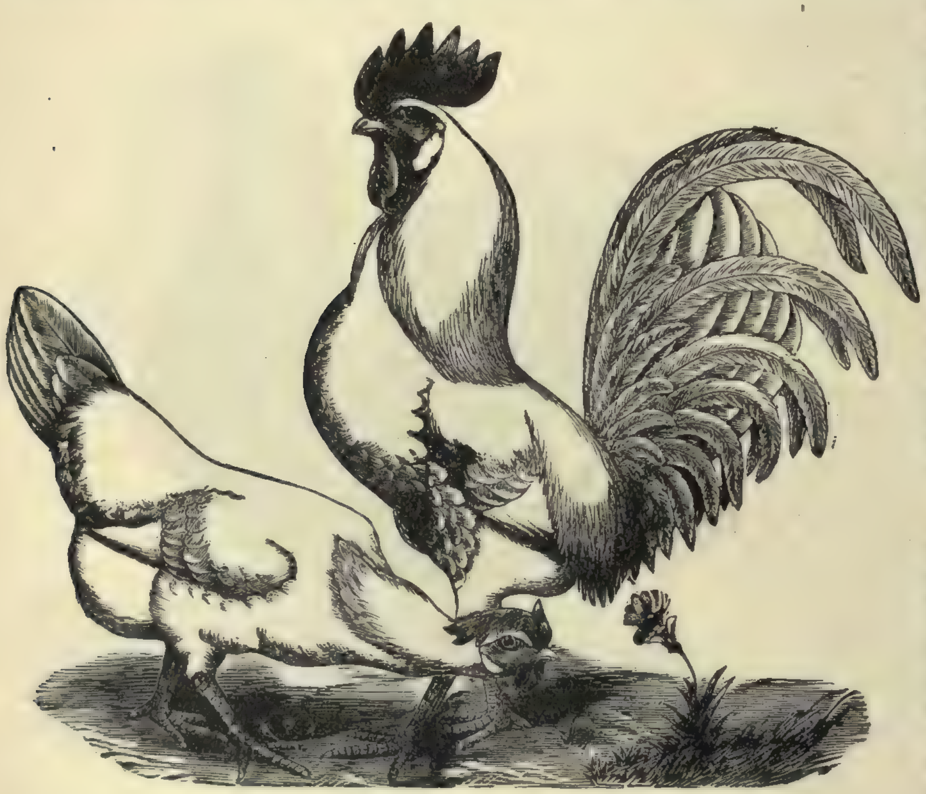


Fig. 9.—*White Leghorns.*

are smaller than those of the cock; she is less in size and her colors more dull and somber.

Game Fowl. The flesh of this fowl is beautifully white, and superior to that of any other variety in richness and flavor. They are also the most elegant and intelligent of the gallinaceous tribe of barnyard fowls. The hens are excellent layers, and although the eggs are under the average size, they are not surpassed in excellence of flavor. Such are the excellent characteristics of this fowl; yet it is not a desirable breed for the farmer on account of its pugnacious disposition and the smallness of the size of both birds and eggs. The pugnacious disposition of these little birds often manifests itself as soon as they are freed from their shell. Their one great mission of life seems to be to fight, and they take to it as readily and with as much relish as they do to the little morsels of meal given them. A brood is scarcely feathered before at least one-half are killed or blinded by fighting.

It is probable that these fowls, like other choice varieties, are natives of India. It is certain that in that country an original race of some fowl exists at the present day, bearing in full perfection all the peculiar characteristics of the species. In India, as is well known, the natives are infected with a passion for cock-fighting. These fowls are carefully bred for this barbarous amusement, and the finest birds become articles of great value. In Sumatra the inhabitants are so much addicted to the cruel sports to which these fowls are devoted, that instances are recorded of men staking not only their property upon the issue of a fight, but even their wives and children. The Chinese are likewise passionately fond of this pastime; as, indeed, are all the inhabitants of the Indian countries professing the Mussulman creed.

The Romans introduced the practice into Britain, in which country the earliest recorded cock-fight dates back to about the year 1100. In Mexico and the South American countries it is still a national amusement.

The varieties are numerous and there are many sub-varieties, often having but a local celebrity. So the English, Irish, Malta, Cuban, Mexican, Spanish, all claim special celebrity, while in the South the Georgian are held to be the most superior in point of plumage, shape, carriage, hardiness and courage, as they are generally admitted to be superior in the quality of the eggs and flesh. Among fanciers for the pit the Derby and Duck-wing Games are regarded as among the best of the Games.

The Brown-Reds have long been most perfect in outline; but the following description will apply to a perfect bird of any breed:

The beak should be strong, curved, long and sharp; the comb single, small, and thin, low in front, erect and evenly serrated: it is usually red, but sometimes

darkish red; head long and sharp, with the face and throat lean and thin; ear-lobes small and red, never whitish; neck long, strong and well arched; the hackle short, hard, close, firm, and broad in the feather; back short, and very hard both in flesh and feather; broad at shoulders, narrow at tail, and round at the sides; breast broad and very hard, but by no means too lean or too full,—the last would be useless weight; a good, hard breast is most essential, as it is the most valuable part of the bird; wings very strong, and of a just medium length, well rounded to the body, and carried neither low nor high, but so as to protect the thighs. Very long-winged birds are usually too long in the body, and short-winged birds are too short in the stern. Tail neither long nor short but medium length, and carried erect to show good spirit, but not "squirrel fashion" over the back; it should be well "fanned" or spreading, and the sickle feathers of a good, round, full curve, and standing clearly above the points of the quill tail-feathers. Very long-tailed birds are soft and long-bodied, and short-tailed birds are too short-winged, and often have broad rumps. Thighs short and very muscular, hard and firm; placed well wide apart and well up to the shoulders, in order to give a fine forehand and make the bird stand firm on his legs,—which latter should be sufficiently long, but not too much so, and be placed wide apart as the thighs. Spurs low down, long, sharp, and rather thin; a little curved upwards, and not turned in too much; feet flat, broad, spreading, and thin; the claws and nails long and strong; the back claw especially long and flat to the ground, to give a firm footing. The whole plumage should be very close, short, and hard, with glossy reflections, and the quills or stems strong and elastic. Body in hand short and very hard, and the general carriage upright, quick, fierce and sharp.

The back is best rather curved, provided it be flat crosswise and not hump-backed or lop-sided. Weight for exhibition 4½ to 5½ pounds; for the pit not over 4½ pounds.

The hen should correspond in form, but of course in proportion, hardness of flesh and feather, with shortness of body, being main points. Good hens generally become spurred, and such breed the hardiest and best cocks. The proper weight of the hen is from 3 to 3½ pounds. This breed is illustrated with beautiful specimens of the Black-breasted Red Game on page 519.

GUELDERLAND. The Guelderland fowls were originally imported into this country from the north of Holland, where they are supposed to have originated. They are very symmetrical in form, and graceful in their motions. They have one noticeable peculiarity, which consists in the absence of a comb in either sex. This is replaced by an indentation on the top of the head; and from the extreme end of this, at the back, a small spike of feathers rises. This adds greatly to the beauty of the fowl. The presence of the male is

FIG. 10.—*Brown Leghorns.*

especially dignified, and the female is little inferior in carriage.

The plumage is of a beautiful black, tinged with blue, of very rich appearance, and bearing a brilliant gloss. The legs are black, and, in some few instances, slightly feathered. Crosses with the Shanghae have heavily feathered legs. The wattles are of good size in the cock, while those of the hen are slightly less. Flesh is fine, of white color, and of excellent flavor. The eggs are large and delicate—the shell being thicker than in those of most other fowls—and are much prized for their good qualities. The hens are great layers, seldom inclining to sit. Their weight is from five pounds for the pullets to seven pounds for the cocks.

HAMBURG. Under the name of Hamburgs, which are also called Bolton Grays, Dutch Every-day Layers, Penciled Dutch Fowls, Chittaprats and Creoles, are now collected several varieties of fowls, presenting the general characteristics of rather small size, brilliant rose combs, ending in a spike behind, projecting upwards, blue legs, and beautifully penciled or spangled plumage. None of the Hamburgs ever show any disposition to sit unless in a state of great freedom, but lay nearly every day all through the year except during the molting season; whence they are called Dutch Every-day Layers. They are small-sized, short in the leg, and plump in the make; color, of the genuine kind, invariably pure white in the whole cappel of the neck; the body white, thickly spotted with black, sometimes running into a grizzle, with one or more black bars at the extremity of the tail. A good cock of this breed may weigh from 4 to 4½ pounds; and a hen from 3 to 3½ pounds. The general contour of the body of this bird is well illustrated by the specimens shown on page 520.

FIG. 11.—*White-faced Black Spanish.*

The superiority of a hen of this breed does not consist so much in rapid as in continued laying. She may not produce as many eggs in a month as some other kinds, but she will, it is claimed, lay more months in the year than probably any other variety. They are said to be very hardy; but their eggs, in the judgment of some, are rather watery and innutritious.

HOUDANS. This is one of the French breeds that have been introduced into the United States. In France, the Houdans are bred in as high estimation as are the Dorkings in England, being noted there for the excellence and quantity of eggs laid, and as excellent in their flesh. They are supposed to have descended from the Dorking and Padone fowls, and, like the Dorkings, they should have the fifth toe. This characteristic is not constant, but is required in all fowls for exhibition purposes. The color is white and black, evenly mixed. Occasionally stained feathers will appear, but red ones should never be tolerated. The head is crested, the comb double-leafed, giving the birds a rather fierce look, which is heightened by the whiskers and beard, growing well up on the face of both cock and hen. The legs are spotted leaden gray, and the weight of the fowls medium. Altogether, there are many inferior breeds to this one, and they are certainly as handsome as they are agile and able to take care of themselves. They are represented by a fine engraving on page 521.

LA FLECHE. In appearance this breed resembles the Spanish. It excels that breed, however, in size, the cock weighing from eight to even ten pounds. Both sexes have a large, long body, standing on long and powerful legs, and always weighing more than it appears, on account of the dense and close fitting plumage. The legs are slate color, turning with age to a leaden gray. The plumage resembles the Spanish, being a dense black with green reflections. The look of the head is peculiar, the comb being not only two-

horned much like the Creve, near the top of the head, but also appearing in the form of two little studs or points just in front of the nostrils. The ear-lobes are dead white, like the Spanish, and exceedingly developed, meeting under the neck in good specimens. In fact, no breed could show stronger traces of its Spanish origin. The hen is an excellent layer of very large white eggs, and does not sit. The flesh is excellent. The breed is, however, very delicate, and does not lay well in winter.

LANGSHANS. This is a breed but recently introduced into this country. Those who have bred them are enthusastic in their praise, claiming that for egg production, for table and for hardihood, to say nothing of their magnificent plumage and large size, they are unequaled by any of the Asiatic or large breeds.

LEGHORNS. Those who breed fowls principally for eggs must not expect to have an abundance of eggs and flesh combined in one fowl. The specialty the Leghorns are noted for is mainly eggs; it is not superior as a table fowl; neither are they inferior in this particular. We look to the French, whom we have always credited with fine taste in such matters, and find they consume thousands of Leghorns every week, being shipped from the port of Leghorn to Marseilles. They are bred of various colors, except black, but the White and the Brown are the most fashionable. The White variety much resembles the Spanish in size and plumage, but are their direct opposite in color. They are precisely like the Brown Leghorns except in color.

The Brown Leghorn, p. 523, is the product of Italy, but at present has the colors and markings of the Black-breasted Red Game and the non-sitting traits of the Leghorn. The form and style of comb, wattles and other features were long ago fixed, but it is due to American breeders to have accomplished uniformity in the breed, while possessing gay plumage and lively appearance, which are both pleasing and attractive.

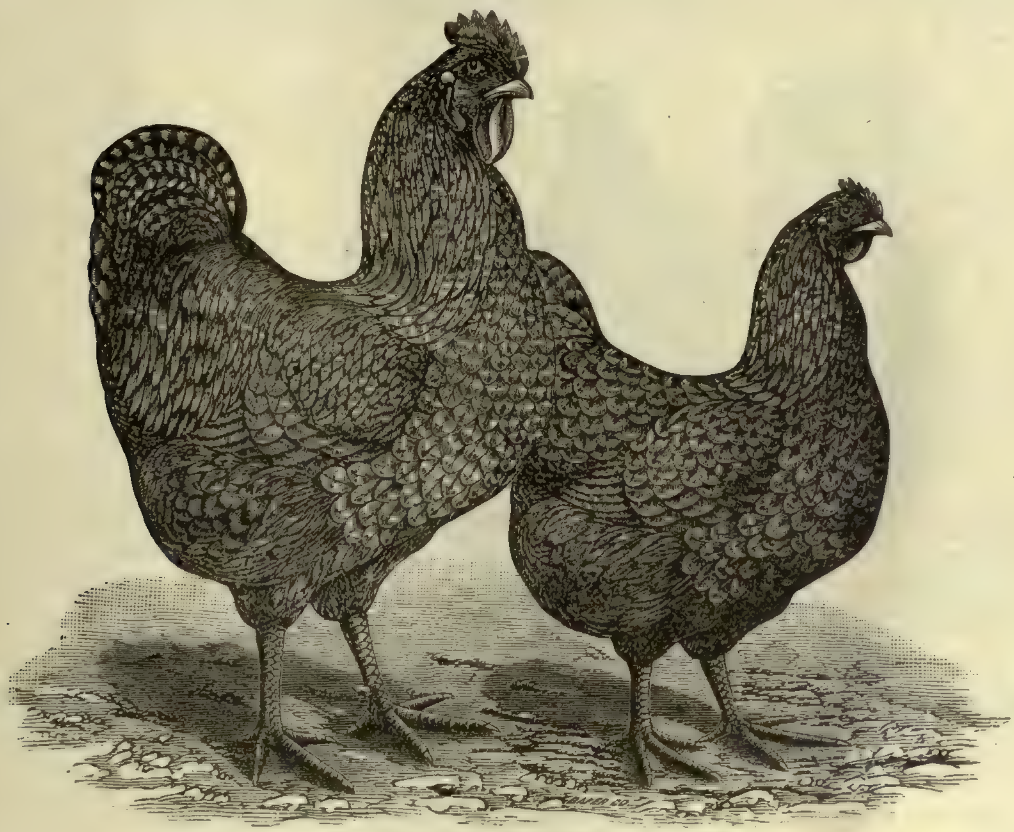


FIG. 12.—*Plymouth Rocks.*

All the varieties of the Leghorn family should possess combs, wattles and ear-lobes of the same shape and color. Preference is given to a comb the tips of which describe a perfect arch. The wattles should be pendulous, and if one edge folds over a little all the better. The ear lobes should be smooth and even and be flat on the face, the lower end should not be too pointed but maintain its width toward the bottom pretty well.

If the Leghorns have warm, comfortable houses in which to put them early in the evening, and not permitted to go out in very cold, freezing weather, but

little trouble need be feared in wintering them successfully. They love freedom, it is true, and are rovers and free-booters by nature. It is their activity, necessarily the healthy exercise they take while on the move in quest of worms, grubs and whatever they fancy, that develops their great productiveness. The pullets mature early; some often lay between four and five months old. The chicks feather out when very young, looking like Bantams, so neat in feathering, lively and precocious. Those who have had experience with Leghorns claim that the little brown hen excels all others in egg productions, coquettish style, and lively carriage.

PLYMOUTH ROCK is one of the most, if not the most, popular breeds of the present day. It combines within itself all of the essential properties that contribute to make a breed pre-eminent, and which are justly sought by both the fancier and the farmer. As to the origin of the breed, nothing definite can positively be said. Much discussion has been engaged in on this point. As a breed they are very hardy and vigorous; as rapid growers, or early maturity, they are perhaps without a rival, when we consider its size and quality of flesh.

FIG. 13.—*Golden Sebright Bantams.*

Another excellent characteristic is productiveness; and as for table quality they rank high. At a little more than a year old the cocks stand from 32 to 35 inches high, and weigh about 10 pounds; and the pullets from 6½ to 7 pounds each. The latter commence laying when five months old. Their eggs are medium in size, and of a rich, reddish-yellow color. In plumage they are rich and variegated. The Plymouth Rock for an all-purpose fowl occupies the front rank. There is, perhaps, no other breed that has so many merits and so few faults. While they are decidedly the farmer's fowls, Plymouth Rocks have more admirers among poultry-fanciers than any other breed. The popularity of this grand bird promises to be lasting. In the accompanying tabulated statement of the chief qualities of poultry, the relative position among fowls occupied by Plymouth Rocks may be easily seen.

The mating of Plymouth Rock fowls to produce that uniformity of coloring desired for exhibition purposes is a vexed point with the average fancier of this breed. The points most desirable to perpetuate and for which all Plymouth Rock breeders are striving to attain are the evenly barred plumage, the yellow legs and beak, the fine single comb, and the size and weight.

The uniform shade of color in both sexes is difficult to obtain. The strong Indian blood which makes the hens so dark must have a share in determining the shade of the plumage. This must be looked for at present in the Plymouth Rock pullets, as the tendency to reversion to the original color comes through one sex, and tend to persist in that sex alone.

It is almost impossible to blot out entirely the dark feathering or shading of plumage which comes from a union between a hawk-colored blue or bluish-gray cock, and a black hen of tropical origin. Fowls of the Dominique plumage have already "black blood" in their make-up; and as the tendency to variation in color is always greater in the male bird, all breeds whose plumage contains an admixture of light and dark markings will naturally produce males whose color will average lighter than the females.

Southern Asiatic fowls of black plumage, mated with any light-colored cock, will usually show the dark pigment in the pullets, while the cockerels may be comparatively free from this coloring.

The Southern Asiatic fowls have sprung from the old Malabar stock, and always had Malay or Papuan influence at work in fixing their characteristic traits and features. Yellow legs and beaks on black or dark fowls are rare, and we assert without fear of contradiction that in the whole Malay Peninsula, excepting perhaps one or two varieties in the island of Singapore (of Chinese origin), not one fowl in a hundred has bright yellow legs and beaks.

The majority of Plymouth Rock pullets have more or less spots or specks on their legs, and many have been exhibited the past two years that had these blemishes, being good or above the ordinary average in color, size and markings. When the pullets come handsome in color their legs usually incline to dusky yellow or greenish where the dark specks occur, and the beaks are similar in shade. The cockerels tend to light plumage from the same mating but usually with a more desirable color of limb and beak clearly and cleanly defined.

Now, what would be the natural course to pursue in mating Plymouth Rock fowls to conform to Standard requirements? The Standard calls explicitly for

yellow legs; yet it is well known that but few of the many pullets reared from this stock show this desirable color. The Standard also calls for a plumage of bluish gray, penciled across with bars of darker blue. We find in matching them in the show coop that the cock and hen must be of the same, or very near the same, shade of color to comply with its requirements. But the general experience of Plymouth Rock breeders is, that matching them for the exhibition room and mating them for breeding to produce the "happy medium" in color and other desired points are two different things.

The Plymouth Rocks are domestic in their habits and not so destructive to gardens as smaller fowls.

They are also among the best in point of laying. The plumage needs no description, being pure white throughout.

Silver Spangled. In this variety the ground color of the plumage is a silver white, with well-defined, moon-shaped black spangles.

Golden Spangled. This breed is similar to the preceding in the black markings, substituting a rich golden ground for the silver white.

Polands have certainly solid merits. They improve in appearance, at least up to the third year. In a favorable locality they are most prolific layers, never wanting to sit, and the flesh is remarkably susceptible of attachment to their feeders. Their great fault is a peculiar tendency to cold and roup—the White-crested Black being the most delicate of all. The dense crest becomes, during a shower, saturated with water, and the fowls are thus attacked in the most vital part. No birds are so affected by bad weather. In exposed or damp situations they will die off like rotting sheep, and it is hopeless to expect any return. They can only be kept successfully in warm, genial situations, on well drained ground, with a chalk or sand sub-soil, and with ample shelter to which they can resort during showers. In such circumstances they will do well and repay the owners by an ample supply of eggs.

POLANDS. Under the title of Polands, or Polish fowls, should be collected all varieties which are distinguished by a well-developed crest, or tuft of feathers on the top of the head.

White-crested Black. This is the most generally known of all the varieties. The carriage of the cock, as in all Polands, is graceful and bold, with the neck thrown rather back towards the tail; body short, round and plump; legs rather short, and in color rather black or leaden blue. There should be no comb, but full wattles of a bright red; ear-lobes a pure white. Plumage black all over the body, with bright reflections on the hackle, saddle and tail. Crest large, regular and full, even in the center, and each feather in a perfect bird we suppose of a pure white; but there are always a few black feathers in front, and no bird is therefore to be disqualified on that account, though the fewer the better. Weight from five to six pounds. Hen very compact and plump in form. Plumage a deep, rich black. Crest almost globular in shape and in color like the cocks. See above engraving.

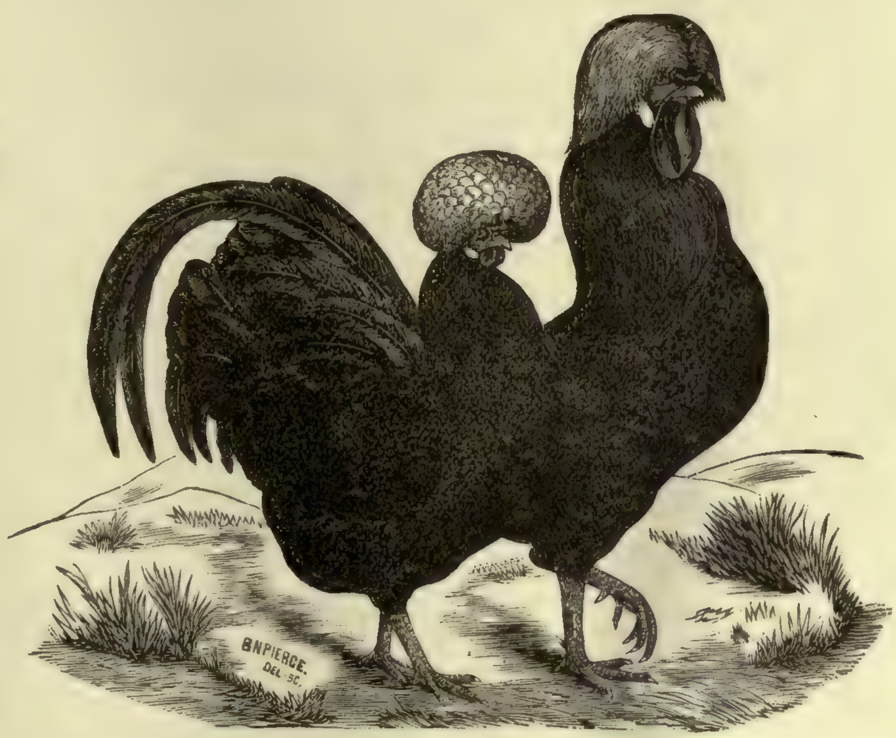


FIG. 14.—*White-crested Black Polands.*

White-crested White. This breed, and those which follow, differ from the White-crested Black Polands not only in greater hardihood, but in having a well-developed beard under the chin, in lieu of wattles. They are large, fine birds, and the crest is finer and more perfect than in most other colors.

SHANGHAE. For all the purposes of a really good

A TABULAR STATEMENT OF THE CHIEF QUALITIES OF FOWLS, DUCKS, GEESE AND TURKEYS.

BREEDS.	Live weight of Cock in pounds.	Live weight of Hen in pounds.	Age at maturity in months.	Cost of raising to maturity.	Annual cost of keeping.	Average number of eggs laid per year.	Average number of eggs to the pound.	Constitution.	As Foragers.	Can they endure confinement?	As Layers.	As Sitters.	As Mothers.	Grain of Flesh.	Flavor of Flesh.	Distinguishing Colors.	Breeders' average prices per trio.	Color of Legs.
Brahmas, light	11½	8	24	$1 50	$ 90	150	7	Average	Poor	Yes	Fair	Heavy	Clumsy	Average	Fair	White	$ 7—15	Yellow
Brahmas, dark	10½	7	24	1 50	90	150	8	Hardy	Fair	Yes	Fair	Heavy	Clumsy	Fine	Good	Black	7—15	Yellow
Cochins, black	10	7	24	1 50	90	170	9⅝	Hardy	Good	Yes	Good	Fair	Fair	Average	Fair	Black	7—15	Yellow
Cochins, buff	10	7½	24	1 50	90	120	8	Average	Poor	Yes	Poor	Heavy	Fine	Coarse	Poor	Buff	7—15	Yellow
Cochins, white	11	9	24	1 50	90	140	8	Average	Poor	Yes	Fair	Good	Fine	Coarse	Poor	White	7—15	Yellow
Cochins, partridge	11	8	24	1 50	90	150	8	Average	Poor	Yes	Fair	Good	Heavy	Average	Fair	Red, black	7—15	
Common	3½	3	12	1 00	75	160	11	Average	Good	Yes	Fair	Good	Good	Fine	Good	None		White
Dorkings	6½	5	18	1 25	90	120	9	Tender	Good	No	Poor	Good	Good	Fine	Best	Diverse	10—15	Yellow
Dominiques, American	5	4	12	1 25	90	170	10	Hardy	Good	No	Good	Good	Good	Fine	Good	Slaty-blue	7—15	Willow
Games, black-breasted red	7½	5	12	1 00	75	170	10	Hardy	Best	No	Fine	Fine	Best	Fine	Good	Red, black	6—12	Various
Hamburgs	4	3	12	80	75	180	12	Tender	Good	No	Good	Non	Poor	Fine	Poor	Diverse	6—10	
Houdans	7½	5	20	1 25	1 00	170	9	Average	Good	No	Fair	Non	Poor	Fine	Best	Broken b'k, white	6—12	
Leghorns, black	4½	3½	12	75	75	200	10	Hardy	Fine	No	Best	Non	Poor	Average	Poor	Deep black	5—9	Yellow
Leghorns, brown	4½	3½	12	75	75	200	10	Hardy	Fine	Yes	Best	Non	Poor	Average	Poor	Golden bay, black	5—9	
Leghorns, dominiqe	4½	3½	12	75	75	200	10	Hardy	Fine	Yes	Best	Non	Poor	Average	Poor	Slaty-blue	5—9	
Leghorns, white	4½	3⅜	12	75	75	200	8	Hardy	Fine	Yes	Best	Non	Poor	Average	Poor	Pure white	5—9	
Plymouth Rocks	8½	6⅝	18	1 50	90	175	8⅝	Hardy	Good	Yes	Good	Fair	Good	Fine	Good	Bluish-gray	6—12	Blue
Polish	5½	3⅜	14	1 00	75	170	9	Tender	Good	No	Good	Non	Bad	Fine	Poor	Diverse	8—15	
Spanish, black	7	6	18	1 00	80	170	9⅝	Tender	Good	No	Good	Non	Bad	Coarse	Poor	Golden-black	6—12	
Dominique, English	9½	7⅝	..								Fair	Heavy	Fair	Average	Fair	Gray		Slate
Creve-coeurs			14				6	Tender		Yes	Fair	Poor		Fair	Good	Black and var		Bl'k or blue
LaFleche	9	7	..			170	9⅜	Tender			Good	Non		Fine	Good	Greenish-black		Yellow
Polands, white-crested	4	3	..				9⅝	Hardy	Good		Good	Non		Fine	Good			Dark slate
Malay			..					Hardy						Average	Good	Various		
Langshans	10		14					Hardy		Yes	Good			Fine	Best			
Ducks, common	3	3	6	75	1 00	90	9	Hardy	Good	Yes	Fair	Good	Good	Fine	Fair	Diverse		
Ducks, Aylesbury	7	6	18	1 00	1 00	80	6	Tender	Good	No	Fair	Poor	Poor	Fine	Extra	Pure white	10—15	
Ducks, Cayuga	6	5⅝	15	90	1 00	100	8	Hardy	Poor	No	Good	Good	Good	Fine	Extra	Lustrous black	7—10	
Ducks, Pekin	6	5⅝	18	1 10	1 00	75	8	Hardy	Poor	No	Fair	Good	Good	Coarse	Fair	Creamy-white	7—13	
Ducks, Rouen	7½	6⅝	24	1 10	1 00	80	6	Hardy	Fair	No	Fair	Poor	Good	Fine	Fair	Variegated	10—15	
Geese, common	8	7	12	1 25	1 50	20	4	Hardy	Fine	No	Fair	Good	Good	Fine	Fair	White		
Geese, African	20	18	24	1 75	2 00	30	4	Hardy	Poor	No	Fair	Poor	Bad	Coarse	Poor	Gray	10—15	
Geese, Egyptian	7	6	12	1 00	1 50	40	4	Tender	Fair	No	Fair	Poor	Bad	Fine	Fair	Gray, black	8—12	
Geese, Embden	18	15	30	1 75	2 00	20	3⅝	Tender	Fair	No	Fair	Poor	Bad	Fine	Good	Pure white	10—15	
Geese, Toulouse	22	20	36	2 00	2 00	40	3⅝	Tender	Fair	No	Fair	Poor	Bad	Fine	Good	Gray	12—20	
Turkeys, common	12	10	12	1 20	1 50	56	7	Tender	Fine	No	Fair	Good	Good	Fine	Fair	Diverse		
Turkeys, black	15	12	18	1 75	1 75	50	6	Tender	Fine	No	Fair	Good	Good	Fine	Fair	Rich metallic bl'k	7—12	
Turkeys, bronze	24	15	36	2 00	2 00	50	6	Tender	Fine	No	Fair	Poor	Good	Fine	Fair	Dark bronze	7—12	
Turkeys, buff	15	12	24	1 75	1 50	50	7	Tender	Fine	No	Fair	Good	Good	Fine	Fair	Pure buff	7—12	
Turkeys, Narragansett	22	14	30	1 75	1 75	50	6	Tender	Fine	No	Fair	Poor	Good	Fine	Fair	Metallic black	8—15	

fowl, for beauty of model, good size and laying qualities, the thorough-bred Shanghae is among the best, and naturally the most profitable of domestic birds. The cock, when full grown, stands about 28 inches high, if he is a good specimen; the female about 22 or 23 inches.

The color is usually reddish-white, flesh-color, or reddish-yellow, mostly covered down the outside, even to the ends of his toes, with feathers. This last, however, is not always the case. The plumage of the thorough-bred is remarkably soft and silky, or rather downy, and is, in the opinion of many, fully as good for domestic purposes as that of the goose. The feathers are certainly quite as fine and soft if not as abundant.

In laying qualities the pure Shanghae equals, if it does not excel, any other fowl. The Black Poland, or the Bolton Gray, may perhaps lay a few more eggs in the course of a year, in consequence of not so frequently inclining to sit; but their eggs are not so rich or nutritious. The eggs are generally of a pale yellow, not remarkably large compared with the size of the fowl, and generally blunt at the ends.

The flesh of the fowl is tender, juicy and unexceptionable in every respect. Taking into consideration the goodly size of the Shanghae, weighing, as the males do, at maturity, from 10 to 12 pounds, and the females from 7½ to 8½, and the males and females of six months eight and six pounds respectively, the economical uses to which its soft, downy feathers may be applied, its productiveness, hardiness, and quiet and docile temper, this variety must occupy, and deservedly so, a high-rank among our domestic fowls, and the more it is known the better will it be appreciated.

The *White Shanghae*. This variety is entirely white, with the legs usually feathered, and differ in no material respect from the Red, Yellow, and Dominique except in color.

SPANISH FOWL is a noble race of fowls, possessing many merits: of spirited and animated appearance; of considerable size; excellent for the table, both in whiteness of flesh and skin and also in flavor; and laying exceedingly large eggs in considerable numbers.

The thorough-bred birds should be entirely black, as far as feathers are concerned; and when in high condition, display a greenish, metallic luster.

The combs of both cock and hen are exceedingly large, of a vivid and most brilliant scarlet; that of the hen droops over upon one side. Their most singular feature is a large white patch, or ear-hole, on the cheek—in some specimens extending over a great part of the face—of a fleshy substance, similar to the wattle; it is small in the female, but large and very conspicuous in the male. This marked contrast of black, bright red, and white, makes the breed of the Spanish cock very handsome.

The merit of Spanish fowls is their production of large white eggs, which are laid in great abundance in moderate weather. They are also of very good quality as table birds. But they cannot be called good winter layers, unless with the aid of artificial heat; and their delicacy of constitution is a great drawback to their otherwise many merits.

TABLE. In the further treatment of the domestic fowl, so much depends on the kind, or variety, that we give on the preceding page a condensed statement of their chief qualities. Only an average is attempted in that chart or table, for the whole country. Different circumstances in the various localities will of course produce various results. The cost of raising and keeping are calculated for large lots of fowls, where all the food and care has to be paid for. It will be observed that for all purposes combined, the Plymouth Rock variety leads, especially in the country, while the Brahma is best for the city, where space is limited. Some prefer the Game; the Light Brahmas, Dominiques and White Leghorns, are next in profitableness. For laying alone, the Leghorns and Hamburgs take the lead; for sitting, the Cochins; for large eggs, the Black Spanish, Houdans, Creve-cœurs; for flesh, the Creve-cœurs and Dorkings; for hardiness, the Brahmas, Houdans, Hamburgs, Creve-coeurs, Spanish and Leghorns; for quietude, Brahmas and Cochins; and for size of birds, Brahmas, Cochins, Houdans, etc.

FEEDING. It has been demonstrated that without the grinding action of the gizzard what is termed the gastric juice in fowls is unable to dissolve the food they eat. Therefore, before the food is prepared for digestion it must be subjected to a grinding process, the gizzard serving as the mill. It is then pressed by the action of the muscles into the intestines. The power of the gizzard to pulverize substances is remarkable. It is sufficient to pulverize hollow globules of glass in a very short time; and solid masses of glass within a few weeks are dissolved. Needles, and even lancets, given to turkeys, have been broken in pieces and voided, without apparent injury to the stomach. It is the prevailing idea that fowls, through some deficiency in the digestive apparatus, are obliged to resort to the use of stones and gravel in order that they may dispose of the food they eat. Some regard the use of these pebbles is to sheath the gizzard in order to prepare it to break up the hard substances which might be swallowed. Some have supposed the action of these to be of a medicinal nature; others that they act as absorbents for undue quantities of acid in the stomach, or as stimulants to digestion, while some have even regarded them as furnishing nutrition. It has, however, been established by repeated experiments that they are not at all necessary to the trituration of the hardest substances they may eat, and of course the ordinary food does not require their aid to bruise it. These stones, however, do serve a useful purpose. When put in motion by the muscles, they produce some effects upon the contents of the stomach; thus assisting to grind the grain, separating its parts, it is more easily acted upon by the gastric juice.

A judicious system of feeding is necessary for the welfare of poultry; fowls will not pay if starved, and if

over-fed they will become fat, lazy and useless both for breeding and laying; besides, when in the latter condition they are more susceptible to disease.

Kinds of Food. There are many kinds of grain used as food for poultry, but in the main, corn seems to be the staple diet used in this country. Through the influence and diffusion of poultry literature, we are taught to regard dietary influences as a matter of real importance, as they affect the health of fowls and also their productiveness. All kinds of grain, if sound, have certain constituent properties, but they differ in nutritive value, which varies with their chemical composition; some tend to growth, some to fattening, and some to egg production. Oats and barley, which are rich in protein compounds, are best adapted to develop muscular tissue and growth in young fowls. Corn, which is specially rich in oils, is best adapted for heating and fattening, and for this purpose has no equal among all our grains. Wheat and buckwheat, being rich in gluten and albumen, are best adapted for egg production. Rye, although a wholesome grain, is not much relished by either young or old fowls, and if used at all, should be ground and combined with other grain. Bran and middlings are largely used as food, but middlings alone is too sticky, and fowls do not like it. Good middlings and wheat bran mixed with oatmeal or corn-meal added, and scalded with boiling water or milk, makes an excellent food, and may be given once a day with good advantage the year through. Milk in any form is good for young or old fowls, and no better use could be made of this valuable article than by feeding it to the young chicks.

The amount fed should be just as much as they will eat up promptly, and no more. The mid-day meals of those which are pent up should be rather light. Their diet, like man's, needs to be constantly varied. The morning meal should generally be meal or middlings and bran, in equal proportions, especially when eggs are wanted. This material should be be barely moistened, so that it will readily crumble as it falls. In winter it should be warm. In the evening the dry grain is generally fed. Soft food is best dealt out in troughs that are protected by cages, the slats being just far enough apart to let their heads through. This measure is to keep the food clean. Feeding from the hand develops affection toward the keeper, but it is thought that the practice leads the fowls to over-eat. Feed young chicks every two or three hours, and at longer intervals as they grow older. Do not feed them meat more than two or three times a week, and this in lieu of insects. More flesh than this is said to make them weak. Hard-boiled eggs are good for chicks.

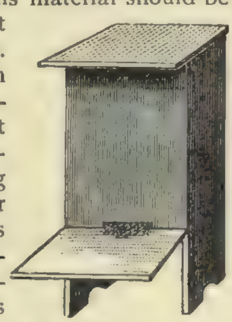


FIG. 15.—*Chicken Feeder.*

Automatic chicken-feeders are in use, an example of which is illustrated by the above cut. Apertures for the outlet of the grain can be made on all four sides of the box. Inclined false bottoms or a pyramid should be placed in the box, so that all the grain put in at one time may be eaten up before replenishment.

Feeding for Rapid Growth. In order to secure rapid growth in the young chicks, it is the common experience of all successful breeders to feed them often, say every two or three hours, until they are three or four weeks old, and at longer intervals as they grow older. Very young chicks cannot consume enough at one time to last them a half day, as their crops are small; their rapid growth of flesh, bone and feathers, and habitual exercise demand material proportionably nourishing and active to develop a vigorous constitution. The feed should be of the very best, not necessarily strong and highly stimulating, but of a kind and quality that will cause a healthy growth. Some breeders feed chopped meat to their chicks very profusely from the shell upward. But this practice has its attending evils. A little flesh meat a few times a week, in the absence of insect food, is good; but if fed too freely to the tender birds when young, it often brings on weakness of the limbs, etc. In addition to their regular diet of grain, green onion tops chopped fine and mixed with their food is highly relished and will be found conducive to their health. Thick sour milk and curds of milk make an excellent food. Pepper and ginger with a little salt occasionally in their soft feed will give to the chicks a relish for their food, variety being absolutely necessary to the highest state of health and the most rapid growth. Chickens, when confined in coops or limited runs, so that they can get no food except what is furnished them, must be supplied with good food, scraps from the table, bone meal and vegetables in variety, as this is a law of their nature, and should not be forgotten by those who expect to be successful in rearing poultry.

FATTENING FOWLS. The best food for fattening poultry is sweet, fresh oatmeal or barley meal, mixed either with scalding milk or water. Cooped fowls should be supplied with fresh food three times a day, namely: at daybreak, or as soon after as possible, at mid-day, and again before dusk; as much as they can eat should be given to the fowls on each occasion, but no more than can be devoured with promptness; should any be left, it should be removed, and given to the other fowls, as if kept it is apt to become sour, when the birds will not eat it freely. Should the birds be required very fat, some mutton suet or trimmings of the loins may be chopped up and scalded with the meal, or they may be boiled in the milk or water preparatory to its being poured over the food, and the fat of fowls so fattened will be found exceedingly firm. In the course of about a fortnight to three weeks at the utmost, a fowl will have attained, under this system of feeding, the highest degree of fatness of which it is capable, and it must then be killed; for if the attempt be made to keep it any longer in that state, it becomes diseased from an inflammatory action being

established, which renders the flesh hard and even unwholesome. When the fowls have arrived at a state fit for killing, they should be kept for twelve or fifteen hours without food or water, in order that the intestines may be as empty as possible; otherwise the bird turns green and useless in a short time.

Water. It is as necessary for fowls to have water constantly as for any other animal. It should be absolutely clean and fresh, and in the winter it should also be warm, say between 80° and 100°. In the winter and early spring it is well to give them copperas water, that is, water with just enough copperas in it to give it a slight mineral taste; or there may be given them the "Douglas Mixture," a teaspoonful to each pint of water in the fountain. This mixture consists of 1 pound of copperas and 1 ounce of sulphuric acid to 2 gallons of water. This is especially good during the moulting season, and is good to keep off the roup and to act as a general tonic. Or, instead of the above, in the spring, one-fourth of a pound of sulphur may be mixed in a pail of feed, and fed once a week.

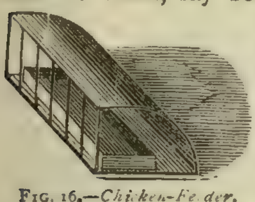


Fig. 16.—*Chicken-Feeder.*

Variety of Food. In either the natural or domesticated state, gallinaceous birds like a variety of food, as it is necessary for the growth of body, bone, and feathers, and also for enriching the blood and developing the organs of production. The habits of fowls in a state of nature are without doubt the best guide. By watching them one can see how industriously they pick up the creeping worm or grub, the flying insect or bug, the tender blades of grass, the seeds and tares, the various kinds of grain or carrion if they can procure them. The constituent properties of the egg, the framework of the body, the mechanical action of the gizzard, the vital organs, etc., are made up and sustained not alone from the nutritious parts of corn, barley, wheat, or oats, but also from other things which we might consider to be trifles. In winter fowls require a varied diet to do well. It must not be forgotten if we expect them in early spring to have full vigor and be productive, that the necessary articles must be provided. The common practice of feeding corn day after day through the winter without its being supplemented with vegetable and other kinds of food is a very injudicious course to pursue. Corn is a cheap and good grain for fattening and keeping up the animal heat, but in other respects it is inferior to good oats, wheat and barley for laying and breeding fowls. Any one kind of grain will not satisfy or fulfill the requirements of the animal economy, and poulterers should strive to procure a liberal supply of different kinds for their fowls, and feed in rotation as they need them.

In addition to their regular food it will be needful that the fowls have a supply of lime in some shape or other to form the shells of their eggs. Old mortar pounded is excellent; so are oyster-shells well-burnt in the fire and pulverized; of the latter they are very fond, and it is an excellent plan to keep a "tree-saucer" full of it in their yard. If this matter has been neglected, and soft, shell-less eggs have resulted, the quickest way of getting matters right again is to add a little lime to the drinking water.

Dust Baths. Fresh earth is one of the greatest of all natural aids in healing stings, venomous bites and cuts, and is known to have a wonderfully purifying effect, and often dispels, absorbs or allays decaying vegetable matter and the formation and emanation of noxious gases which cause sickness and disease.

Fresh earth in the hennery and dust box is indispensable for fowls.. It will cleanse their feathers and skin from vermin and impurities, promote the skin secretions and is materially instrumental in preserving their health. During the fine days of autumn there is no excuse for neglecting to store up a heap of fresh loam for the floor and under the perches to prevent liberation of the ammonia from the droppings, and road dust for the boxes with which to renew them at regular and short intervals when they become unclean and effete.

In winter, when fowls are confined, a good dust bath before the rays of the sun is as enjoyable and beneficial to them as is a weather bath to the genus homo. A quantity of sulphur or carbolic powder thoroughly incorporated with the dry dust will make it more effective in dislodging vermin.

Mating and Breeding. With the fancier this is one of the most difficult, and at the same time most interesting, operations in poultry culture. In mating fowls man seeks to guide and control nature's laws to the elevation of the standard of the breed or to its maintenance. The first requisite in mating fowls for any purpose is to secure birds possessing strength, vigor and stamina. Select stock noted for these characteristics and you can rely upon strong, hardy chicks. Not only should the birds be strong and hardy at the time of maturity, but they should have always been so. In breeding for utility the four main points to be desired are hardiness, early maturity, productiveness and table quality. These are of importance in the order named. Breeders disagree as to the age for breeding birds, but it will generally be found that cockerels nearly or quite a year old, mated to two-year old hens, give the best results. A cock two years of age mated to early pullets will also be found satisfactory. The age of the males and females should vary, and for this reason cockerels and pullets should seldom be mated together. If the cock and hen have been entirely separated during the several months preceding the mating, so much the better, as the added amount of vigor is very beneficial. In breeding for "fancy points" one should understand exactly the object sought, and have a clear idea of the means employed in obtaining that object. If there is a defect in cock or hen it should be counterbalanced by perfection on that particular point in the other. For instance, should the cock's comb be defective in any way, as lop-combed, the hen's comb should stand perfectly erect, and be fine in other respects, in order to

breed out the defect arising from the comb of the cock. No over-fattened birds should be used in the breeding-pen, as non-fertile eggs will abound there if they are.

The respective influence of the cock and the hen has been a fruitful topic of discussion. It has been held by many writers that the cock possesses greater influence over external, and the hen over the interior and living qualities.

In most forms of animal life the proportion of sexes is about even, but in the feathered tribe, when the cock necessarily requires several hens, much culling must be done, and it is certain to be accomplished. No sooner do the cockerels arrive at a suitable age for mating than the question as to who shall be lord of the harem arises. Frequently the battles to determine this question are long and bloody, extending over a period of several days; the result, however, being certain from the beginning. The one possessed of the most vigor and the greatest amount of staying power will win, while the weaker and inferior specimens will either be killed or driven into obscurity. The number of hens allowed with one cock should vary with the object in view. An error is often committed by assigning too many hens to one cock. Not more than five hens should be allowed to associate with one cock when the quality of the breed is a matter of interest. If profit is sought for in the production of eggs alone, one cock, if a stout, young and lively bird, may have as many as 24 hens.

In perfect mating, the sire should possess beautiful plumage, perfectly marked, fine symmetry, and as large size as is compatible with full vigor. The dam should excel in productiveness and size, while the shape and plumage must not be lost sight of.

Incubation or Sitting. In the selection of eggs for hatching, great care must be taken to procure fresh and fertilized eggs. They should be laid by hens which have been running with a cock of the proper breed, and for this purpose the cock should not be allowed more than six or eight hens. In short, every condition should be observed to produce healthy and strong stock. Eggs intended for hatching should be dotted with a lead pencil, and those of the same age as nearly as possible selected for a brood. Eggs that have been laid a month or more are altogether too old to be relied upon, although they sometimes do fairly well at four, five, or six weeks old. Until the eggs selected are put under a hen, keep them in bran, with the larger end down, and never jar them. It is impossible to tell beforehand what sex the eggs are, but the latest theory is that those which are the most wrinkled at the smaller end will produce males.

The hen manifests the desire of incubation in a manner different from that of any other known bird. Nature having been sufficiently tasked in one direction, she becomes feverish and loses flesh; her comb is livid; her eyes are dull; she bristles her feathers to intimidate an imaginary enemy; and as if her chickens were already around her utters the maternal "cluck." At this period first, by a two or three days' trial with an egg or two, see whether the sitting fever is coming upon her in real earnest before you put the eggs under her, lest she sit upon them for a day or two, and abandon them, thus spoiling eggs that may have cost you a considerable sum. Set the hen out of reach of danger but near to the other fowls of the yard, and place under her 13 to 15 eggs, according to her size. Make her nest as hereafter described, or in a box open on one side, at one end of a run-way. An empty flour barrel with the mouth a little lower than the bottom, so the water of rains will not run in, is a cheap and good thing. The run-way should not be more than four or five feet by eight or ten, enclosed by a lath fence two and a half or three feet high. Of course this should be on clean ground, but in a moist place; and her premises should be kept clean. The run-way may be on grass or gravel. When her nest is made in a box or barrel, it is strongly urged that four or five inches of moist earth should be the bedding upon which the straw is laid; and during the whole period of incubation the eggs should be kept moist, either by the rising vapors of the earth underneath, or by daily sprinkling them with warm water. In lieu of this trouble, some take the eggs two or three days before they are hatched and soak them half an hour in warm water, so as to soften the shell for the little ones to pick their way more easily out.

About the eighth evening of sitting, examine the eggs by holding them between your eyes and a lighted candle, and take away all those that still look clear, for they are either not fertilized or are otherwise good for nothing.

The hen should be fed regularly and carefully; and if she sometimes remains off her nest for hours, do not be alarmed, as a cooling of the eggs occasionally will not hurt them in the least. Treat lousy sitting hens with sulphur or pyrethrum, not kerosene. When the chicks are hatched unevenly as to time, it is a misfortune. Take the first hatched away from the nest and wait a few hours, and when a majority are out of the shell, destroy the rest, for they would be only weaklings any way.

Cochins and Brahmas make the best mothers, and the former are good for early eggs and chicks. These early chicks, if well taken care of, will be good for producing eggs the following winter.

The chicks should not be handled more than need be. If it is necessary to help them from the shell, do so very carefully. Do not remove them from the nest until 24 hours old. They need no food during this time, as they are digesting the yolk from which they were hatched. Have their coop in a place well protected from the wind, and where they will get the benefit of the sun. When taken from the nest, give the hen water, and all the corn she will eat. Feed the chicks hard-boiled eggs chopped fine for at least a week. After they are a week old, a little cracked corn and wheat screenings may be fed in connection with the egg. Young chicks should be fed five times a day until ten weeks old. Green food (onion tops chopped fine or lettuce) is excellent for chicks. Never allow

chicks to perch until three or four months old. Let them sit on straw on the floor, or a board ten inches wide about a foot from the floor, thus avoiding crooked breast bones. Do not house them with old fowls, as they peck and worry them, and never, under any circumstances, feed very young fowls with the old birds.

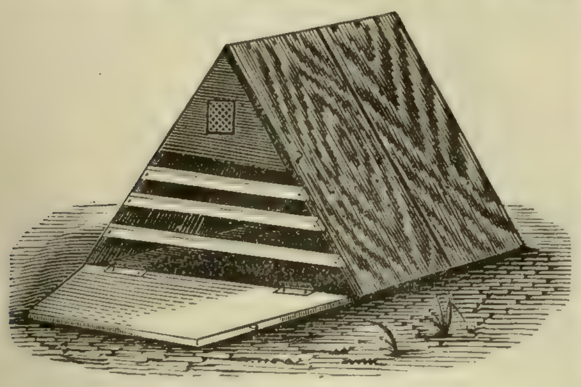


FIG. 17.—*Coop for Hen with Chicks.*

For their home a cheap and good method is to get a large box, such as merchants pack goods in for transportation. Knock one board off the end and place on the top a sash of glass, such as gardeners use to cover over hot-beds; one end will be higher than the other; place the lowest end to the south, so that the sun may fall directly in the box through the glass, beneath which will be placed your chicks. Next cut a small opening at the side or end and place a small box, minus the end, close against the hole. This is for the mother hen to cover her chicks in during the night. Or place the small box inside the large one in one corner, which can be taken out every day and cleaned; though if placed outside as first mentioned, it can be easier cleaned, and it will be more likely to be done. By Figs. 17 and 18 we illustrate two different coops, and, although common and easily made, for all practical purposes doubtless surpass all others.

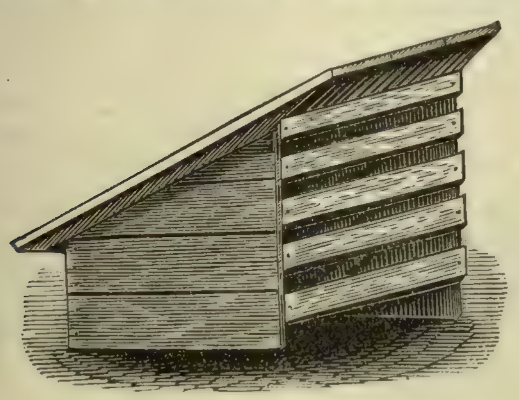


FIG. 18.—*Coop for Hen with Chicks.*

As a general thing, young chicks are quite strong and healthy when the hen first comes off the nest with them, and if left entirely to themselves (that is, to seek their own living), they will thrive and grow much faster and be stronger and healthier than when artificial means steps in and deprives them of their natural instincts by confining them in too small a space and by giving improper food. Plenty of range and exercise are the first requisites to health and strength. When hens are determined to sit at seasons of the year in which there is little chance of bringing up chickens, the eggs of ducks or geese may be furnished her. The young of these may be reared without much difficulty at almost any time of the year. Where, however, it is inconvenient to gratify the desire, one or two doses of jalap will often entirely remove the fever, or shut her up in close confinement with a cockerel for a few days, or in a coop to herself, but in sight of the other fowls, and have pegs about four inches apart all over the ground under her, so that she cannot sit down. At night let her roost with the other fowls.

The period of incubation is three weeks, although chicks are often hatched in 18 days. Should the hen fail to sit closely, during the first few days, or in early spring, it will occasionally be a few hours longer. During the hot months and when the hen is assiduous the time will be a few hours less. Chickens have been known to come out as late as the 27th day.

FEEDING CHICKS. In the early stages of chickenhood hard-boiled eggs seem to be the most natural food for the first week or so, until they become gradually weaned to take to bread crumbs dry or soaked in milk. But although wholesome and nourishing in every way it is not at all indispensable. A cheaper food, alternating with the first week's feeding of eggs and bread crumbs, will answer very well; some breeders make a staple diet of equal parts of coarse corn meal and wheat bran, mixed with milk. But for the first few weeks it is better to have it cooked or baked and fed to them in a crumbly state. When the chicks have passed the first stage, cooked meal, meat, scraps from the table, boiled potatoes and chopped cabbage, fed warm two or three times a day, will help them to grow. This variety is more essential in early spring when there is no green or insect food. In cold, wet weather a dash of pepper may be used in the morning meal with good advantage. Good results have come from feeding a thick mush of oatmeal, cracked wheat and bits of meat during the first month with those already mentioned. Chicks should be fed liberally and often, yet only what is readily picked up clean. Fix a place where they can have ready access to, and where they can get, their food without being troubled by the hens. A box with laths covered on the top and space between the sides for the chicks to run in and out will do. Give them their feed inside this box and they will soon learn to go there when they are in need of something to eat.

INCUBATORS, apparatus for the artificial hatching of eggs. The process has been in vogue in Egypt for many centuries, with success, but in Europe and America the climate is so changeable that it is difficult to compete with Egypt in this line. With the most modern appa-

ratus a skilled hand can succeed tolerably well, but to use it requires constant attention. Absolutely fresh eggs must be selected, the temperature must be kept strictly at 103°, with an allowance of an occasional variation of two or three degrees from this, and moisture must also be very carefully supplied. Artificial hatching, therefore, should never be resorted to except in case of great necessity, and then by the best modern apparatus and under the supervision of a skillful hand. It is claimed that chicks hatched by an incubator excel in growth and development.

Artificial Rearing. An artificial "mother" may be made of a board about a foot square, elevated above the ground about four inches on one side and only two on the other, on stakes. The lower side should be lined with clean wool; generally a lambskin tacked on is the most practicable. The front side should be curtained, the lower edges of the curtain just touching the ground, so the chicks can go in and out at leisure. In short, the whole apparatus should be a substitute for the real hen as nearly as practicable. A few small gimlet holes should be bored through the board, for ventilation. The floor, ordinarily, should be the ground; but sometimes in stormy weather it is a great convenience to have a floor, for the sudden removal of the brood to a place of safety. This contrivance should be set on a clean, new place, near by, every day. In front should be a "run," as described on a preceding page. Part of it should be covered with wire gauze, to protect the young fowls from seizure by larger animals. The feathers are liable to be infested with vermin, and should occasionally be well dusted with sulphur or pyrethrum and smeared in places with a little paraffine. The artificial rearing of chickens in winter is too arduous to be remunerative except in case of very rare breeds. When a chick does not at first take food, tap on the floor where the food is, at the same time clucking like a hen; this method will usually succeed. Nearly all rules and regulations for the successful rearing of fowls are summed up in the three words, *warmth*, *cleanliness* and *regular feeding*.

Poultry House. Every farmer should have a good, convenient poultry house, properly constructed, sufficiently large to contain the number of birds he desires. It should be warm and dry in the winter, well ventilated and kept scrupulously clean. The house should not be over-crowded, but just large enough. Nothing is made by over-crowding the hennery; on the contrary it will prove detrimental. The fowls must be fed regularly and at stated periods. They must have plenty of pure water at all times; this is of as much importance to the health of the brood as proper food. If possible, they should also be given, in addition, a plat of grass for a run.

A poultry house need not necessarily be expensive, but should be arranged with special reference to convenience in caring for the comfort and health of the fowls. In all the planning of the house and its furnishings, have an eye constantly on the conveniences of cleaning whenever filth accumulates; for whatever is inconvenient to be done is sure to be neglected. By having plastered walls and perfect connections at all joints, the house can be made vermin-proof.

In selecting a site for your poultry house and yard, choose a dry location with a southern or eastern exposure, if possible, higher than the surrounding ground, that the water may run off rapidly. A damp location will never do. The soil should be of a porous nature, either sand or gravel predominating. A level clay surface is worse than nothing. If the right location can be had at the south side of some building that will give it protection from cold winds, so much the better. Be the site where it may, be sure that the floor of your house is higher than the ground outside. Do not make the mistake frequently seen of digging down a foot or so in order to make it warmer. Better by far bank it up when the weather requires it. The floor of your house may be dry earth or gravel, or, if economy is not to be studied, concrete is still better. Of whatever material it may be made, the floor should be kept covered with dry earth, renewed weekly, or oftener, as strict cleanliness is absolutely necessary for profit and the well being of the fowls.

A house to accommodate, say 30 fowls—which is about the average usually kept by farmers—should contain at least 150 square feet, or five square feet to each fowl. It has been the experience of every one that has entered into the raising of poultry extensively, that fowls will do much better if in small flocks. Two flocks of twenty-five fowls each will prove more profitable than when allowed to mingle as one. The following plans in this article will be found very convenient, economical and every way desirable. They are susceptible of various modifications to suit location and requirements.

The nest boxes should be twelve or fourteen inches square, and ten or twelve inches deep; they should be open at the top and at one end, except a strip three inches high across the bottom end to keep the eggs from rolling out.

The roosting bars should be horizontal and movable; placed fifteen inches or more from the wall, and ought to be at least four inches in diameter. Large bars add much to the comfort of fowls while at rest, and prevent in a great measure crooked breasts and frozen toes. Under all roosting bars place a movable shelf of sufficient width, and keep it constantly covered with dry earth, muck or plaster. The droppings should be removed every week, at least, and stored under cover outside of the hen-house. Be sure and save them all, as their value often equals a fifth of the whole poultry business. The amount of the accumulation during the year, if properly saved, will astonish you, and in value is nearly equal to the best imported guano. When composted with muck and ashes, and applied to the corn hill at planting time, the increase of the crop will go far towards supplying your fowls with the corn they will require to carry them through the winter.

In a poultry house there may be an upper apart-

ment, which would be admirable for the rearing of chicks, especially those of delicate breeds, as it is dry and airy, the yard affording sufficient run on hot days, when the heat in the closed house is beyond endurance. With very early chickens this is seldom the case. It is well where chickens are thus reared in numbers to accustom them to the outside air by degrees, in order that they may acquire strength and hardiness with their growth. Chicks that are so reared learn to roost under cover, and thus one great difficulty is obviated. It is quite necessary that young fowls are first led to roost in the place where they are to remain, and thus good habits are not broken up. In the upper story is kept a large, shallow box, filled with dry, pulverized earth, intermixed with wood ashes, for the fowls to wallow in. Broken clam and oyster shells and gravel are provided in abundance, as well as green food and fresh water.

Fresh air and cleanliness are of the first importance. The droppings may be received on boards covered with dust and carried out at least once a day, and every August the roosts and nest boxes should be taken out and scalded by pouring boiling water on them; then whitewash the house inside, also the nest boxes and roosts; add an ounce of carbolic acid to a gallon of whitewash. This will rid the house of lice if there be any in it. The dusted board should be so pegged that the fowls will not wallow on it and

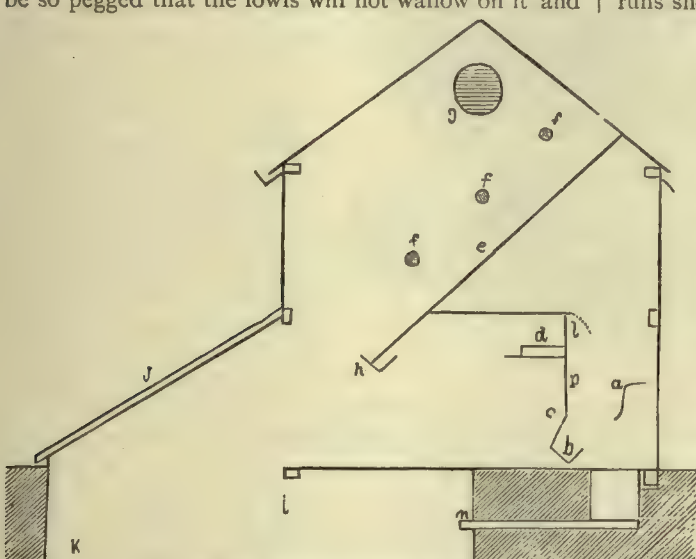


Fig. 19.—*Plan for Fig.* 20.

throw the dust off. The covered run should be raked over two or three times a week, and dug over whenever it shows signs of stagnation. In fact, three or four times a year the soil to the depth of two or three inches should be removed and new put in its place.

The "run," or open yard, should be as large as you can spare the ground for. One side should have a shed with roosts, and furnished with a heap of dry dust or sifted ashes for the fowls to wallow in, and

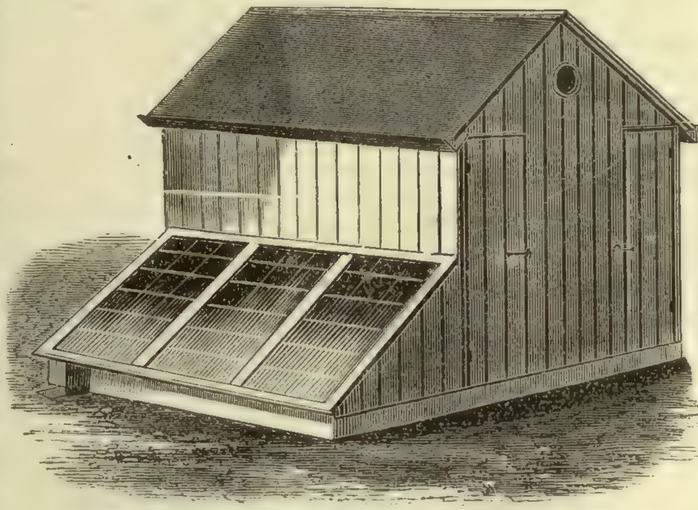


Fig. 20.—*Poultry House.*

should be renewed whenever it becomes damp or filthy from use. A walk in front of the sheds should be graveled, and the rest of the open yard kept in grass, which, if well rooted first, will bear small fowls upon it several hours a day, but should be renewed in the spring by re-sowing, wherever needed. The runs should be enclosed with wire netting, two-inch mesh, which may be conveniently stretched on poles 1½ inches square, driven two feet into the ground and set five feet apart. The height of the fence depends upon the breed to be protected. Cochins and Brahmas are easily retained by a netting a yard high; for moderate-sized fowls six feet high will do; while Game, Hamburgs and Bantams require a fence eight or nine feet high. There should be no rail along the top, as that would be a temptation to the fowls to fly over, as they would see a rest there.

We present two excellent designs for poultry houses, both combining all the modern conveniences, one, however, less pretentious in its proportions and finish than the other, but both susceptible to various modifications.

By Fig. 19 we illustrate the design of a cheap but convenient house. It can be made of cheap material and will cost not more than $25. Fig. 20 shows view of south side and east end, showing glass covering to pit and outlet to yard; also two doors in the end of house, one opening into feeding hall, and the other in front of roosts.

Fig. 19. A cross section, showing feeding hall (a), two feet wide, whole length of the house; feeding trough (b) with narrow slats (c) from inside edge to bottom of partition (p), slats two and one-half inches

apart, one foot long. Nest boxes (d) one foot four inches deep, on shelf 18 wide; with doors into feeding hall at (l); roosts (f) with slanting door (e) to be scraped into trough (h) and carried out through door in end of house; ventilator (g); pit (i) two feet deep, extending half way under house and five feet in front, with glass roof (j) of common hot-bed sash three by six feet; bottom covered with dry sand. Gravel box (k); water (n), four feet long, one foot wide, three inches deep, extending into pit three inches, filled through trap-door in feeding hall.

The water trough is placed about midway of the building and below ground to prevent freezing.

FIG. 21.—*Poultry and Pigeon House.*

The house shown is eight feet wide, nine feet long and six feet high to eaves. Sides of one-inch boards, battened. Roof, floor and slanting floor to roosts, of matched flooring. Walls or pit of brick or boards, cement or asphalt bottom; or in dry soil no floor needed.

The house can be made longer and divided by cross partitions, all being fed, watered, etc., from the same hall. The yards are not shown, but may be added to suit the convenience of the proprietor.

Poultry and Pigeon House, represented above, consists of a center room 8x14 feet with two wings of 10x14 feet, and can be enlarged so as to make it any desired size, and with good light and ventilation. The entire building may be under the control of the attendant, the fowls fed, watered, and eggs gathered from the hall D (Fig. 23) without disturbing the fowls. The entire house, including the pigeon loft, may be heated from the center room if desired. The partitions are of lattice work made of netting, allowing free ventilation and an unobstructed view of the fowls.

The nests I are 28 in number, and are 16x20 inches in size. They are so arranged that hens may enter them from the runs. When you wish to collect eggs from the nests, you draw out the drawer, and when you have collected the eggs, you push it back to its place. When hens wish to sit, you draw out the drawer and leave it in the hall D as represented on ground plan, where they can feed and water at pleasure, and prevent other hens from laying in their nests, in case you are short of nests. Then, when your hen goes to sit, take the drawer and hen and place her in the center room and replace the additional drawer. The roosts C are made of 1 x 6 boards and two feet from the floor, and a sufficient distance from the wall so as to protect the plumage. The yards B may be used for young chicks. The yards A can be enlarged if the grounds will admit. The second floor is intended for pigeons, and can be reached by a step-ladder, which may be dispensed with at pleasure.

The building is made of one-inch boards, sheeted up and down with batten joints, and lined on the inside with heavy tarred paper to prevent all draught and cold in winter, and prevent vermin, in summer, from collecting. The entire building should have a smooth floor and kept well covered with dry earth or sand.

DISEASES. Fowls properly taken care of will scarcely ever be sick, and when one does become afflicted it is often best to kill it immediately, to avoid further infection of the flock, as well as many other troubles. Only in the case of valuable birds do we recommend much attempt at cure, and then only when success is pretty certain. In the treatment of fowls one disease must not be mistaken for another. For instance, the name of "chicken cholera" is quite frequently applied to many ailments that are simple, or merely disarrangements of the internal organs that may be easily remedied by a change of diet or place.

It is easy to tell when fowls are ill. The comb of each fowl is a true index to the workings of their systems. If they be in ill-health the comb will lose color,

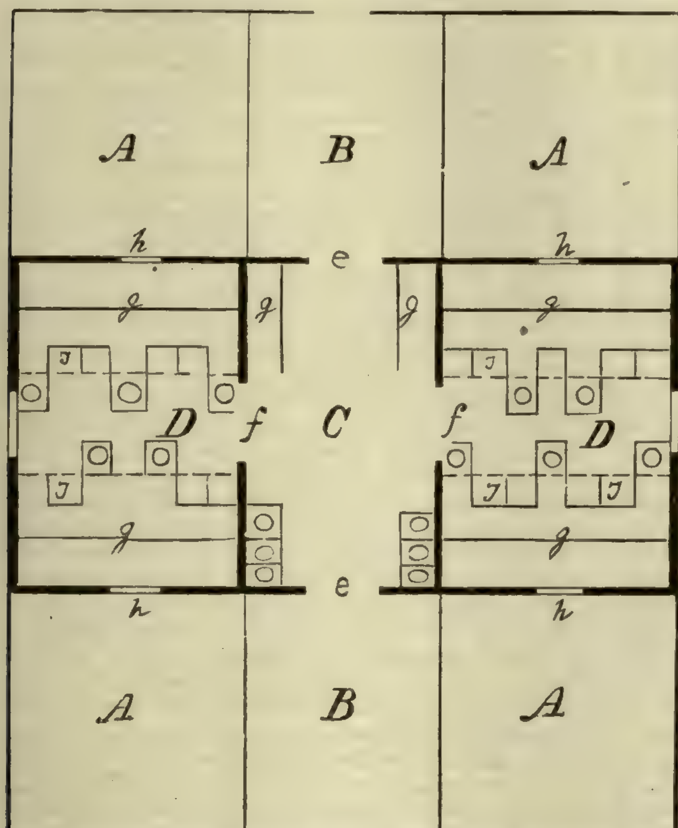


FIG. 22.—*Plan for Fig.* 21.

A. Outside yards or runs. B. Outside yards or runs for young chicks. C. Center room for feeding, etc. D. Halls or passage ways for sitting hens. *e.* Outside doors or windows as preferred. *f.* Lattice door. *g.* Roosts. *h.* Windows. *i.* Nests. Partitions are all lattice.

and will become far less firm in texture as the malady increases, the comb being of a livid dull crimson, or else pale or ashy in appearance. Look at the comb of a laying hen or pullet. She is in the height of health and strength, and carries her unfailing sign of healthfulness on her head in the shape of a blood-red, bright and full comb. A vigorous cockerel will carry the same sign, though not, perhaps, in so eminent a degree as his harem.

If the cholera or any disease should come into the flock, carefully examine the comb of each bird, morning and night, and all those which are wanting in that bright, rich color which denotes perfect health, remove at once from the flock to a place remote, where they should be at once put under medical treatment.

Apoplexy occurs from over-feeding, and can seldom be treated in time to be of service. Bleed the bird from a vein visible on the lower side of the wing near the body and apply cold water to the head. This may recover the case.

Bad Fledging of chicks may be remedied by a diet of meat, and bread sopped in ale.

Bad Moulting. Give stimulating food, warm, every morning, and well peppered, with meat and ale every day, and keep under cover in wet weather. Give also the Douglas mixture (see page 531), and some hemp-seed with the grain every evening.

Bumble Foot. A bruised and pus-puffed condition of the foot, resulting in lameness. Caused by heavy fowls jumping and flying from roosts upon gravel, stones, etc. Treatment: If discovered before the pus congeals, lance the swelling at the front and rear of the foot, press out the pus and inject a solution of carbolic acid and water. When the pus has congealed, use a strong liniment and let the inflammation settle down into a corner.

Chicken Cholera. The first symptoms in the cholera are a drooping of the wings, a sticky slime in the mouth and throat. The fated chicken loses its strength and refuses to eat; the wings droop, the feathers rise until the bird resembles a ball, and the feet grow feeble and tottering. An uncontrollable sleepiness comes over it, and it appears as if narcotized; no sound escapes it, and still drowsy it dies in mute agony. The poisonous excreta has corroded the rump, and the flesh of the bird is one mass of raw sore. There are a host of minor symptoms, not always noticeable to the superficial observer. Among these are a high rise of temperature, and a condition of intense fever; an assumption of a violet color by the comb, in consequence of a perturbed condition of the circulation; rapid progress of the disease; contagiousness shown by spreading of the disease; and more important than all, the apparently highly painful death. In some instances the diseased fowl dies in less than one hour after the attack. Dissolve in one gallon of the drinking water half a teaspoonful of

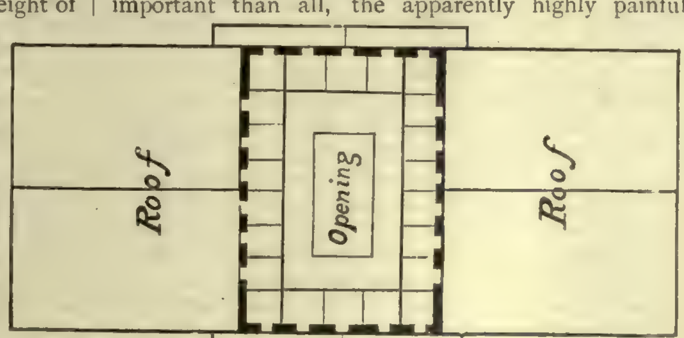


FIG. 23.—*Plan of Roof for Fig* 21.

alum and the same of copperas; at the same time give daily in the soft feed a little sharp sand at the rate of one teaspoonful to a fowl. In severe cases give at once by hand a piece of alum and a piece of copperas, each the size of a pea, mixed in a dough, with one teaspoonful of sand and a little meal and water. Continue the medicated water and sanded feed till all signs of disease disappear. As a preventive, make a paste, as follows: Cayenne pepper one part, prepared chalk one part, pulverized gentian two parts, charcoal two parts, by measurement, mixed with lard. If the disease is in your vicinity, give, once a week, all your fowls an ordinary-sized pill. If a chicken is taken with cholera it should be at once killed, and the rest of the flock taken from the yard where the case occurred. Strict watch should be kept over the flock, lest others become attacked. Meantime the yard should be thorougly cleansed; the manure should be removed, and the roosts, etc., washed in a six-drachm solution of sulphuric acid. After ten days, if no further cases have occurred, the birds may be returned to the yard. This is the only treatment admissible, but it is effectual.

Chicken Pox. An extremely contagious, watery eruption of the comb, face and wattles. Symptoms: Yellowish-white rash, appearing as above, bleeding profusely when the crests are removed. It takes from five to seven days to run its course. Treatment: Remove the crests and bathe in hot water and carbolic acid. When the bleeding ceases, apply citrine ointment; take off the scales after sixty or seventy-two hours. Each morning give a pill made as follows: Tablespoonful each of common flour and flour of sulphur, teaspoonful cayenne pepper, sixty grains hyposulphite of soda, and milk enough to mould into twenty pills. Dissolve four grains quinine in two-thirds of a pint of milk, and give in three equal doses during the day. Feed boiled onions and rice mixed with oat-meal.

Diarrhea, a morbidly frequent evacuation of the intestines, the scourge of young chicks in early spring. It is caused by improper food and lack of corn. Give chicks nothing but scalded milk for drink, and none but cooked food. For older fowls, a tablespoonful of castor oil, and ten drops of laudanum are effectual. Feed bread soaked in scorched milk and black pepper, and supply plenty of burned bones and charcoal.

Diphtheria or Canker. Take tincture of aconite, six drops; bichromate of potassa the size of a large pea; the same amount of iodide of mercury; put into six drops of water. Put six drops of this mixture into one quart of water and stir into it meal and feed.

Diseased Feet. We frequently see fowls which are troubled more or less with their feet, especially after arriving at maturity. The feet and legs of birds are extremely sensitive, and this is manifested in many ways. Sometimes a bird wrenches a nail from the toe. This is often the case with turkeys in cold weather when the ground is frozen. The blood flows profusely, and a slight lameness is occasioned. Indeed, if it be a middle toe, the fowl will always limp more or less. Turkeys usually seek a high roosting place in the fall of the year, and alighting therefrom when the ground is frozen they injure the feet. Common fowls in alighting strike more on the soles or heels. Hence come so many "bumble feet" among the barnyard fowls, which, if it does not effect or injure the fowl to any great extent, is unsightly. When fowls are confined in filthy places and obliged to tread over ground covered with their own droppings, more or less disease of the feet is occasioned from the dirt remaining in the wrinkles on the toes. They need a run over the grass at least once a day to clean the feet. Fowls do not want wet or damp standing or walking places. The moisture soaks the feet and makes them tender. Where fowls run daily on sand or gravel there will often be found bunches on the feet or toes. Sometimes the gravel or dirt works under the skin and forms a hard lump that increases in size until suppuration sets in, and the fowl gets relief by opening it. Sometimes the lump cannot be removed. Either of these cases is unsightly, and hurts the looks of the bird. During the moulting season the legs undergo the same process of change, and a new skin grows, which, if the legs be without scurf, will appear bright and fresh like a chick's. There is nothing more unsightly than scurfy legs. This is in part hereditary, and in part brought on by filth. None but white and yellow-legged birds are affected with it to any extent. Although scurfy legs may be cured by the use of carbolic soap and an ointment prepared of lard and sulphur, it is better, if possible, to avoid the trouble by breeding and careful cleanliness. To shun bumble-footedness and bunchy toes, or lumps on the web, train the birds to low roosting poles, and keep their walks comparatively clean.

Distemper, an affection of the head and throat of young fowls; a cold; incipient roup. Symptoms: Fowl listless and quiet, remaining on the roost in the day-time; face and comb quite red, and puffy under the eyes; no appetite. A white froth appears in the corner of the eye the second day. Treatment: Wash the head and beak clean, and clear the tear tube by blowing down through the nose into the throat; then bathe the head and wash the throat with a solution of carbolic acid—one part of acid to ten of water. Keep quiet and allow nothing but water for a day or so. In aggravated cases, steam the head and throat, give a dessert-spoonful of castor oil, and repeat the carbolic acid treatment at short intervals.

Soft Eggs are generally caused by over-feeding, the lack of limy food, or fright.

Dropping Good Eggs on the ground away from the nest is probably due to filth or vermin in the nest.

Egg-Eating. Some hens will eat eggs most persistently. Have their nests small and in a remote, dark place, feed soft food and cut off the tip of the beak, just touching the "quick."

Feather-Eating. Change the diet and give them larger liberty. If this does not succeed, cut off the tip of the beak, as for egg-eating.

Gapes are thought by some to be infectious At

least they are epidemic. The disease is usually the result of drinking foul water, exposure to wet or want of nourishing food. It consists of small worms which infest the windpipe and cause the chicken to gasp for breath. To cure gapes put camphor in the drinking water, and give the chicken a piece of camphor about the size of a grain of wheat, every day, or a very small quantity of turpentine may be given daily in meal. Of course the chicken must be well taken care of, and if it has been neglected in the least, the neglect must not continue. If the case has been allowed to progress until it has become fully developed, the worms must be removed, which is done by introducing a loop of horse hair into the trachea, and turning it around while introducing it. This operation should be continued until all the worms are extracted. Sometimes a feather stripped almost to the top may be used instead of the horse hair.

Leg Weakness is due to too rapid growth of the body. Give a greater proportion of meat, and daily three or four grains of ammonium citrate dissolved in water. If the weather is warm, the legs may be dipped daily for a few minutes in cold water.

Loss of Feathers is almost always caused by want of green food or of a dust bath. Anoint with sulphur and creosote; but you will have to wait until after the next moulting for good feathers.

Pip is a foul, thickened tongue, indicating bad digestion, roup or some other evil.

Roup, a kind of contagious influenza, the chief symptoms of which are lassitude and an offensive discharge from the nostrils and eyes. It is more to be dreaded than all other diseases, and is generally induced by damp drafts, and confinement in filthy, badly ventilated coops or small yards. Musty, moldy, and poor food, together with impure and stagnant water to drink, are also among the causes. As it is a contagious disease, such as are apparently healthy should be removed to a distant and clean place, and be prevented from again having access to their usual habitation. When the disease is far advanced, treatment is out of the question. Such animals should be destroyed and immediately buried deeply in some secluded place. When taken in hand in the beginning of the disease, dry and comfortable lodging and stimulating, nutritious food, are the first essentials to recovery. The eyes and head should be frequently bathed with warm water, and remedial agents applied to the diseased membrane. This is somewhat difficult on account of the nostrils being closed up, but may be overcome by inserting the point of a small syringe into the slit in the roof of the mouth and turning it rather to the outside for each nostril. A small portion of a solution of 10 grains of sulphate of copper to each ounce of water, may thus be brought into the nasal cavity. As an internal remedy, may be used half a teaspoonful of castor oil; thereafter, give every morning and evening a pill of the following composition: Take 1 ounce of balsam copaiba, ½ ounce of powdered liquorice, 1 drachm of piperine, and enough of magnesia to make a mass which will divide into 60 pills. Fresh drinking water should be provided twice daily, in previously cleaned vessels, and to the water may be added a few drops of tincture of iron. Good, clean and well ventilated quarters, free from drafts, ample range of liberty, good nutritious food, ashes and sand to roll in, a little tincture of iron occasionally added to their drinking water, and a little flour of sulphur added to soft food, once or twice a week, will be found of great benefit, and go far towards preventing the appearance of this scourge of poultry.

Lice. The whole feathered tribe seem to be peculiarly liable to be infested with lice; and there have been instances when fowls have been so covered in this loathsome manner that the natural color of the feathers has been undistinguishable. The presence of vermin is not only annoying to poultry, but materially interferes with their growth and prevents their fattening. They are, indeed, the greatest drawback to the success and pleasure of the poultry fancier; and nothing but unremitting vigilance will exterminate them, and keep them exterminated. Therefore, whitewash frequently all the parts adjacent to the roosting-pole, take the poles down and run them slowly through a fire made of wood shavings, dry weeds, or other light, waste combustibles. Flour of sulphur, placed in a vessel and set on fire in a close poultry-house, will penetrate every crevice and effectually exterminate the vermin. When a hen comes off with her brood, the old nest should be taken out and a new one placed; and dry tobacco-leaves, rubbed to a powder between the hands, and mixed with the hay of the nest, will add much to the health of the poultry.

Flour of sulphur may also be mixed with Indian meal and water, and fed in the proportion of one pound of sulphur to two dozen fowls, in two parcels, two days apart. Almost any kind of grease, or unctuous matter, is also certain death to the vermin of domestic poultry. In the case of very young chickens it should be used only on a warm, sunny day, when they should be put into a coop with their mother, the coop darkened for an hour or two, and every thing made quiet, that they may secure a good rest and nap after the fatigue of greasing them. They should be handled with geat care and greased thoroughly; the hen, also. After resting, they may be permitted to come out and bask in the sun, and in a few days they will look sprightly enough.

Carbolic acid and kerosene are the two most effectual antidotes to all sorts of vermin. The acid should be one to two per cent. in strength, and sprinkled occasionally on all the wood-work around the roosts with a brush or broom. The kerosene is to be rubbed on those parts of the fowls which are most liable to be attacked with lice; but sitting hens should not be treated with it, as it would be likely to get on the eggs and ruin them.

To guard against vermin, however, it should not be forgotten that *cleanliness* is of vital importance; and there must always be plenty of slacked lime, dry ashes and sand, easy of access to the fowls, in which they can roll and dust themselves.

We wish to speak in particular of two varieties of lice that infest fowls, and of which we give very fine and accurate illustrations.

Gutscher's Cholera Louse. We give by Fig. 25 an enlarged view of a parasite, almost microscopic, that infests fowls. This is so small that many would deny that there were any lice on their fowls or in their houses, when in fact there might be millions, both on the fowls and in the houses. The engraving shows the louse magnified 1,200 diameters, or 1,440,000 times larger than it really is. It is so small that it takes good eyes to see it unless it is in motion. It is the opinion of some eminent scientists that it is not, as Mr. Gutscher says, the cause of cholera in fowls. These parasites are easily got rid of by the application of Persian Insect Powder and coal oil.

Fig. 25.—*Gutscher's Cholera Louse.*

Probably no subject is of more interest to the student of natural history than that of the parasites. They are omnipresent, in some form or another; we find them on every hand. Man harbors a great number of them, as the tape-worm and the thread-worm. The little black spots on the face indicate the presence of a parasite that lives in the sebaceous follicles of the skin. The disgusting disease known as "the itch" is caused by an acarus closely allied to this louse. This parasite is one of a few which infest poultry. You will notice that it has four pairs of legs; this distinguishes it from the insects and gives it a closer relation to the spider family. In common parlance it is a "mite."

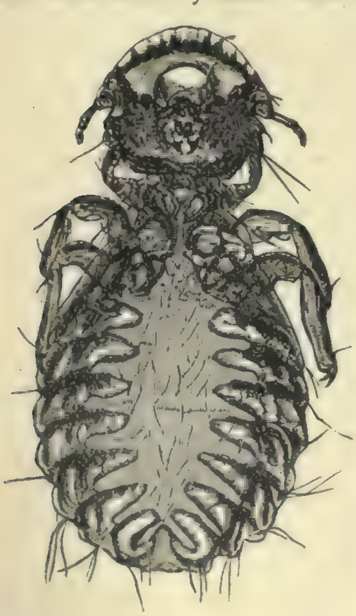


Fig. 26.—*Female Louse.*

In size the body is about one-fiftieth of one inch in length. As seen on the fowl it appears as a minute speck; and were it not for its moving it would escape the keenest eye. It has no brains or eyes, though it does possess a nervous system. At the end of each leg is a sucker with two minute hooks attached to it. This enables the mite to walk on a smooth surface and to cling with great tenacity. In front between the *palpi* you will notice a minute sharp organ. This is at once a lancet and a sucker and comprises his armament of torture. They are extremely prolific and multiply with great rapidity, in some species the female laying fertile eggs without the interposition of the males; this parthenogenesis, according to Parker, having been noticed in several species. They are very tenacious of life. The one from which the drawing was made showed signs of life after having been submerged for over an hour in camphor water.

Fig. 27.—*Male and Female Chicken Lice.*

As these are most generally found in cholera-infected fowls, the question has been mooted as to whether they have anything to do with the case of the disease. Prof. Atwood thinks not, but thinks their presence a concomitant rather than a cause of the disease. When the fowl is filthy and diseased the parasite flourishes and with no resistance from the languid fowl.

Chicken Louse (*Goniocotes Burnetti*). The following article on the chicken louse was prepared by Prof. H. F. Atwood, and appeared in the *American Poultry Journal*, November, 1878. By all scientists and microscopists it is regarded as a fine article and the cuts as exceptionally accurate.

"In complying with my promise to give some cuts and a short description of the louse,—the parasite found on poultry,—I am able to present cuts from three different varieties of fowls. Fig. 26 is from a Black Spanish chick. This and the two following, which are from some Light Brahma chicks—were from the heads of chickens and are I believe called by fanciers 'ticks.' Fig. 28 is from a

Fig. 28.—*Louse From Light Brahma Fowl.*

native fowl of the Light Brahma breed. The male and female are both shown in Fig. 27. They belong to what is called the "skin-biting lice," or Mallophaga, and are of this family the most closely allied to the Pediculus, to which family belong the various kinds of human lice. They are called the *Goniocotes Burnetti*, Pack. That they are terribly in earnest about picking up a living, any one who has attempted to dislodge them from the head of a young chick can testify, their entire head sometimes being buried in the tender skin of their victim. Rather than to take the trouble of picking them off when so intent on their work, it is just as effective and far less work to use lard as ointment, and rub it well over the head and neck of the affected chicks. This, while being no inconvenience to the chicks, is a very serious matter to the parasite, as we shall presently see.

"No doubt many fanciers, not well versed on the subject, may wonder why an application of lard should tend to rid their fowls of lice. An elementary lesson in this branch of natural history may not be amiss, and I will endeavor to discribe why so harmless an article should prove so deadly to the louse.

"The system of breathing in an insect is carried on in a peculiar manner; the air enters through little apertures on either side of the abdomen; these are called spiracles, and connected with them are the *tracheæ* or tubes which by their intricate and exhausttive ramifications convey the air to every part of the body where needed. The action of the lard is to close these spiracles of an insect and the result of this is of course fatal.

"By referring to the cuts we see a vast difference in the morphological characteristics of the three specimens. The one from the Black Spanish is much larger and darker than the matronly appearing one from the Light Brahma. It is not fair to suppose that we have here an exemplification of what Darwin terms incipient species? Has not the principle of natural selection tended toward the development, say of the darker color of the specimen from the Black Spanish? Being nearer to the color to the feathers of the fowl on which it lives, it has an advantage in the great struggle of existence. The specimen from the Light Brahma, on the contrary, is of a light color corresponding closely to the prevailing color of this particuar fowl.

"The cuts show the insects magnified a little more than 30 diameters, or, in popular language, they are shown a thousand times larger than they really are."

General Remarks and Practical Suggestions. In preparing fowls for exhibition, it is a common but a reprehensible practice to over-fatten them with a soft, starchy diet, in confinement. Such a condition of the birds misleads ignorant judges at fairs, and renders the fowls of but little value afterward. In preparing for exhibition, it is well to shut up together for a few days beforehand those that are to be shown in one coop, so that they will get used to each other; else, on the journey they will pick and disarrange one another's feathers. Away from their rural haunts, also, they get homesick, which fact must be taken into consideration at the fair.

Fowls do not look well with their wings cut, and their flying power can be fully crippled by simply plucking out the first or flight feathers, which operation is not visible when the wings are closed. Trapdoors between all departments should be supplied, so that the birds can all be kept in one while another is being renewed or repaired.

Eggs should be collected regularly if possible twice every day, and if any chickens are to be reared from the home stock, the owner or attendant should learn to recognize the egg of such particular hen. There is no difficulty in this, even with a considerable number; nearly every egg, to the accustomed eye, has a well-marked individual character; and if there be any hens of value, it may save much disappointment in the character of the brood to know the parentage of those selected for hatching.

Where a considerable number of fowls are killed annually, the feathers also become of value, and should be preserved. They are very easily dressed at home. Strip the plumage from the quills of the larger feathers and mix with the smaller ones, putting the whole loosely in paper bags, which should be hung up in the kitchen or some other warm place for a few days to dry. Then let the bags be baked three or four times, for half an hour each time, in a cool oven, drying for two days between each baking, and the process will be complete. Less trouble than this will do, and is often made to suffice; but the feathers are inferior in crispness to those so treated, and may occasionally become offensive.

In raising poultry or stock it should be the aim of every one to keep it healthy and improve it. You can do it very easily by adopting some systematic rules. These may be summed up in brief, as follows:

Construct your house good and warm, so as to avoid damp floors, and afford a flood of sunlight. Sunshine is better than medicine.

Provide a dusting and scratching place where you can bury wheat and corn, and thus induce the fowls to take needful exercise.

Provide yourself with some good healthy chickens, none to be over three or four years old, giving one cock to every 12 hens.

Give plenty of fresh air at all times of the year, especially in summer.

Give plenty of fresh water daily, and never allow the fowls to go thirsty.

Feed them systematically two or three times a day, and scatter the food so they can't eat too fast or without proper exercise. Do not feed more than they will eat up clean, or they will get tired of that kind of feed.

Give them a variety of both dry and cooked food; a mixture of cooked meal and vegetables is an excellent thing for their morning meal.

Give soft feed in the morning, and the whole grain at night, except a little wheat or cracked corn placed

in the scratching place to give them exercise during the day.

Above all things keep the hen-house clean and ventilated.

Do not crowd too many in one house. If you do, look out for disease.

Use carbolic powder in the dusting bins occasionally to destroy lice.

Wash your roosts and bottom of laying nests and whitewash once a month in winter.

Let the old and young have as large a range as possible, the larger the better.

Don't breed too many kinds of fowls at the same time, unless you are going into the business. Three or four will give your hands full.

Introduce new blood into your stock every year or so, by either buying a cockerel or sittings of eggs from some reliable breeder.

In buying birds or eggs, go to some reliable breeder who has his reputation at stake. You may have to pay a little more for birds, but you can depend on what you get. Culls are not cheap at any price.

Save the birds for next year's breeding and send the older to market. In shipping fancy poultry to market, send it dressed.

For the manner of killing, packing, shipping, etc., of fowls, see Poultry. For mode of Caponizing, see article on that subject.

To Cook Fowl. *To Boil.* They should be cleaned and stuffed as for roasting. A young fowl requires an hour; if tough and old, three hours. A chicken will boil in three-quarters of an hour. They may be served with oyster, caper or egg sauce.

Roast Fowl. It is picked, nicely cleaned and singed, the neck is cut off, the fowl washed. It is trussed, and dredged with flour, and when put down to roast, basted with butter. A good-sized fowl will require above an hour to roast. Make a rich gravy from the drippings, add butter, a little thickening, and the inwards nicely chopped, after you have boiled them soft. An hour is enough for common-sized chickens to roast. A smart fire is better than a slow one; but it must be attended closely. Slices of bread, buttered, salted and peppered, make excellent filling.

Stewed Chicken. Divide a chicken into pieces by the joints, and put into a stewpan with salt, pepper, little parsley and thyme; pour in a quart of water, with a piece of butter; and when it has stewed an hour and a half, take the chicken out of the pan. If there is no gravy, put in another piece of butter, add some water and flour and let it boil a few minutes. When done, it should not be quite as thick as drawn butter. For dumplings, take 1 quart of sifted flour, 1 teaspoonful of salt, 2 of cream tartar and 1 of soda; mix well with milk and form into biscuit; place them upon a tin in a steamer over the kettle where the chicken is boiling. They will steam in 20 minutes. You can rub a little butter in the flour if you wish them very nice.

Chicken Fricassee. After preparing a couple of nice chickens, joint them, dividing the wings, side, breast and back-bone, and let them lie in salt and water ½ an hour; remove them then to a stewpan, with ½ a pound of good, sweet, salt pork, cut up in pieces; barely cover with water and simmer on the top of the stove or range for 3 hours; when sufficiently tender, take out the chicken, mix a tablespoonful of flour smoothly with cold milk, and add a little fine dried or chopped parsley, sage and thyme, or summer savory and stir gradually into the liquor; keep stirring till it boils; season with pepper and salt to taste; and then put back the chicken and let it boil up for a few moments in the gravy; garnish with the green tops of celery.

Chicken Pot Pie. Divide the chicken into pieces at the joints; boil until part done, or about 20 minutes, then take it out. Fry 2 or 3 slices of fat salt pork, and put in the bottom, then place the chicken on it with 3 pints of water, 2 ounces of butter, a tablespoonful of pepper, and cover over the top with a light crust, made the same as for biscuit.

Fowling, the killing or taking of birds for the sake of their flesh, feathers, etc.

Fowling Piece, a light gun for shooting fowls or birds.

Foxed, discolored or stained: said of timber and of paper in printed books.

Fox Evil, a kind of disease in which the hair falls off. See Hair and Baldness.

Fracture, a break or separation in the bone of an animal, from external violence. When the impaired bone is simply cracked or broken through, the fracture is simple; where the bone is bruised, crushed, or broken into splinter or fragments, the fracture is compound; and when the bone is merely pushed out of its socket, without being cracked or splintered, the injury is a dislocation. When a simple fracture occurs near a joint, it is liable to be mistaken for a dislocation. The chief cure for a simple fracture is to adjust the broken parts accurately to each other, and fix them in their position by means of wooden splints and strong bandages; the chief cure for a compound fracture is to saw away projecting splinters, clean and close the wound, adjust the chief parts of the broken bone, soothe with fomentations and support with soft bandages till cicatrization be effected, and then proceed as in simple fracture; and the chief care of a dislocation, unattended by crack or splinter, is to bring back the displaced bone into the socket, and apply either plaster or bandage.

The reduction of a fracture in any important bone of the horse is so very difficult to be effected, and so uncertain in its restorative effects, and would be followed by so long a period of inactive and expensive feeding, that horse-owners scarcely ever think of attempting it, but consign the animal to destruction. Yet many a fracture which condemns a horse to death would be cured if the proper surgical skill could be obtained. See Horse.

Free-Martin, the seemingly female twin of a bull

calf. The majority of apparent heifers which have been produced as twins of bull calves are more or less hermaphrodites; and some possess an almost equal balance of the peculiar organisms of male and female; and all these are necessarily and irremediably barren; but a few have a sufficiently distinct and full development of all the female organs to be true heifers and fully capable of becoming productive cows. Thoroughly hermaphrodite free-martins have a lumpish appearance proper to neither cow nor bull; and if they belong to a good breed, they are excellent fattening animals for the market.

Freezing Mixture, WITH ICE OR SNOW. Mix ⅔ snow or pounded ice with ⅓ muriate of soda. This will reduce temperature to 5° below zero. A mixture of 12 parts of snow or pounded ice with 5 each of muriate of soda and nitrate of ammonia will reduce to 25° below zero. Snow or ice with common table salt reduces to 4° below zero.

WITHOUT ICE OR SNOW. Equal parts of water and nitrate of ammonia reduce the thermometer to 4° above zero. Five each of nitrate of ammonia and nitrate of potash with 16 of water lowers the temperature to 10° above zero. Muriate of ammonia and nitrate of potash, 5 parts each, sulphate of soda, 8 parts, with 16 of water, reduces to 4° above zero. Sulphate of soda, 8 parts, to 5 of muriatic acid, reduces to zero.

Freezing Point, denotes the point or degree of cold shown by a mercurial thermometer, at which certain fluids begin to freeze, or, when frozen, at which they begin to thaw again. On Fahrenheit's thermometer, the one generally used in this country, this point is at 32° above its zero point, for water, and at 40° below for quicksilver, these fluids freezing at those two points, the process of freezing being due to the cold air absorbing its warmth. Water, therefore, freezes from the surface downward. The property of nearly all liquids is to contract as they grow cold; but amongst the exceptions to this rule is water, which contracts only until it reaches the temperature of 40° Fahrenheit, below which it expands or becomes lighter, being converted into crystals which pack less closely than the particles of water do. It is by virtue of this most important quality that a day's frost does not suffice to turn all our river and lake water into vast masses of ice, which could never be dissolved. At a small depth water always retains a temperature of 40°, because when its temperature sinks below this point, it ascends to the surface, and there freezing remains until it is melted. A piece of ice—frozen water—is lighter than the same bulk of water in a liquid state, because of its expansion by freezing. It is to this expansion of water that we owe the bursting of water-pipes, water sewers, and the splitting of tiles, stones and rocks. To it is also due the refreshment of the earth by the admission of dew, rain, and gases favorable to vegetation. Extreme cold causes water to expand, as we have already explained that extreme heat does. Running water freezes more slowly than still water, and shallow water freezes more readily than deep water. Salt water never freezes until it is four or five degrees below the freezing-point of fresh water; for which reason salt dissolves ice. Some lakes rarely freeze, because their water is supplied from the bottom by springs. Water may be frozen artificially by wrapping a bottle of it in cloths kept constantly saturated with ether. There are various ways of freezing water, however, the most curious of which is perhaps that by which it may be frozen even in a red-hot vessel. This vessel should be of platinum. When it has been made red-hot, pour into it first a little water, and then some liquid sulphurous acid. Turn the vessel over and the ice will fall out.

MELTING POINTS. Mercury melts at 39°; ice at 32°; tin, 421°; lead, 594°; zinc, 740°; silver, 1,850°; brass, 1,900°; gold, 1,980°; copper, 2,160°; cast-iron, 2,700°.

FREEZING AND BOILING POINTS. Brandy freezes at 7°; ether boils at 98°; alcohol boils at 174°; linseed oil boils at 600°; mercury boils at 630°. Iron is bright red in the dark at 750°, and at twilight, 850°; red-hot by day, 1,050°.

Fresco, a method of painting on walls, with mineral and earthy pigments on a freshly laid stucco ground of lime or gypsum. The pigments unite with the ground and become durable. The fancy figure work requires more skill than any one except a painter could exercise, and therefore the average farmer would rather employ a professional painter to do this kind of work than to undertake it himself. Frescoing is generally done on the lower portion of walls, and around the edge and in the center of the ceiling.

Fricassee (frik-a-see'), a dish of fowls or other small animals cut into pieces and dressed or fried; also, to dress such meats in this style.

Fritter, a small pancake of fried batter, or a piece of meat fried.

BATTER FOR FRITTERS. Mix 8 ounces of fine flour with about ½ pint of water into a smooth batter, dissolve the butter over a slow fire, and then stir it by degrees into the flour. Then add the white of 2 eggs whisked to a stiff froth, and stir them lightly in.

ARROW-ROOT FRITTERS. Put 2 pints of milk, in a good-sized stew-pan, over the fire until it boils; have 10 ounces of arrow-root ready mixed, and stir it into the milk as quickly as possible; add a little vanilla and yolks of 8 eggs; the sugar the last. Stir it for about 20 minutes over a quick fire, then put it into a deep cutlet pan, and bake it about 10 minutes in a quick oven. When it is quite cold, cut out the fritters with a round cutter, and egg and bread crumb them, glaze and send them up quite hot.

APPLE FRITTERS. Beat and strain the yolks of 7 eggs, and the whites of 3; mix into them a pint of new milk, a little grated nutmeg, a pinch of salt, and a glass of brandy. Well beat the mixture, and then add gradually sufficient flour to make them a thick batter. Pare and core 6 large apples, cut them in slices about ¼ of an inch thick, sprinkle pounded sugar over them,

and set them by for an hour or more; dip each piece of apple in the batter, and fry them in hot lard about 6 minutes; the lard should not be made too hot at first, but must become hotter as they are frying. Serve with sifted sugar over them.

CAKE FRITTERS. Cut a stale cake into slices an inch and a half in thickness, pour over them a little good cream, and fry them lightly in fresh butter, and when done place over each slice of cake a layer of preserves.

BREAD FRITTERS. To a quart-basinful of stale bread broken small, put a quart of boiling milk; cover it for 10 or 15 minutes. When quite soft beat it with a spoon until it is smooth, add 2 well beaten eggs, ½ a nutmeg grated, a tablespoonful of brandy, 1 of butter and a little salt. Beat it light; make an omelet-pan hot, put in a small piece of butter and when dissolved pour in sufficient batter to run over the pan; let it fry gently. When one side is a fine brown, turn the other, put butter and sugar with a little grated nutmeg over, lay on the other, cut them through in quarters, and serve them hot.

BLACKBERRY FRITTERS are made by mixing a thick batter of flour and sour milk, or cream, as for pancakes, only quite stiff. If cream is used allow one more egg than for sour milk, then stir thick with berries. Have ready a kettle of hot lard, dip a tablespoon into the lard, then take a spoonful of batter and drop it into the boiling lard; the grease will prevent the batter from sticking to the spoon and will let it drop off in nice oval shape. Eat with syrup.

CORN FRITTERS. To a dozen ears of corn, grated, add two eggs and a teaspoonful of salt. (If the corn is old add a little milk.) Fry in hot butter and lard, half of each.

HOMINY FRITTERS. Two teacupfuls of cold boiled hominy; add to it 1 teacupful of sweet milk and a little salt; stir till smooth, then add 4 tablespoonfuls of flour and 1 egg; beat the yolk and white separately, adding the white last. Have ready a pan with hot butter and lard (half of each), drop the batter in by spoonfuls and fry a light brown.

OYSTER FRITTERS. Bread some good-sized oysters, make a thick omelet batter with 4 eggs and a tablespoonful of milk, dip each oyster into the batter, and then into grated bread, fry them a nice color, and use them to garnish fried fish.

PARSNIP FRITTERS. Boil 4 or 5 parsnips until tender, take off the skins and mash them very fine, add to them a teaspoonful of flour, 1 egg, well beaten, and a seasoning of salt. Make the mixture into small cakes with a spoon, and fry them on both sides a delicate brown in boiling butter or beef dripping. When both sides are done, serve them up very hot.

RICE FRITTERS. Take 1 cup of cold rice, 1 pint of flour, 1 teaspoonful of salt, 2 eggs beaten lightly, and milk enough to make this a thick batter; beat all together well and bake on a griddle.

Frog, IN FARRIERY, an elastic, horny substance growing in the middle of the sole of a horse's foot, at some distance from the toe, dividing into two branches and running toward the heal in the form of a iork.

Frost, frozen dew; the act of freezing; ice frozen throughout a porous substance. "Black frost," cold so intense as to freeze vegetation and cause it to turn black without the formation of white or hoar frost.

Frozen limbs or parts; **Frost-Bite.** When the part is frozen, hold snow, ice or cold water to it until it is thawed out, keeping the patient in a cold room. Give no intoxicating liquors, for while such stimulants seem generally to hasten the warming up of the system and all the parts, it is at too great expense to the vital forces of the body. When, however, the whole body is simply chilled and no part really frozen, the sooner the sufferer can be put into a full warm bath the better. Else warm him up by a fire and much severe hand-rubbing. Free the bowels by a warm injection, and give a bowl of warm gruel to drink.

Fruits. The earliest fruits mentioned in history are the grape, the apple and the fig, the former being cultivated about the time of the Deluge. The almond is mentioned repeatedly in the sacred records, nearly 4,000 years ago; and Theophrastus, who lived about 300 years before the Christian era, remarks "that it was the only tree in Greece that produced blossoms before the leaves;" hence we may safely infer the peach was then unknown. The fact that the Jewish history nowhere speaks of the peach, indicates that it was not a native of Persia, a country long inhabited by that people. It was known to the Romans, at the height of their power, and the nectarine was spoken of by Columella and by Pliny as an admired fruit of their time. The apple and pear were well known in the days of Pliny, who speaks of 22 varieties of the former and 36 of the latter. The cherry, a native of Pontus and some parts of Europe, was introduced among the Romans at the time of the Mithridatic war. The plum was known both to the Greeks and the Romans; and Pliny asserts "that they were grafted upon apple-stocks, producing what were called apple-plums, and upon almond-stocks, yielding both fruits, the stone being like that of an almond." And Virgil, with equal absurdity, speaks of grafting apples on plums, of adorning the wild ash with the blossoms of the pear, and represents swine crunching acorns under elms; nor is it very long since a few equally singular notions were held by a few moderns.

The cultivation of fruit in Great Britain began to receive attention with other rural improvements. The earliest British writer on this subject was Richard Arnold, who published a chapter in his "Chronicles," in 1502, on the craft of grafting, planting and altering of fruits as well in color as in taste. He was succeeded about 1538 by Tussier; in 1559 by Gerard; in 1629 by Parkinson; in 1658 by Evelyn; in 1724 by Miller; in 1791 by Forsythe; soon after which the great improvements introduced by Mr. Knight and followed by Lindley, Thompson, and others, formed a new era in the cultivation of fruit in England.

In the United States the growing of fruit has kept pace with the rapid progress in other branches of in-

dustry. The cultivation of almost all the fruits are as universal as husbandry itself. Nearly every farm, however small, has its orchard and fruit garden, while many large farms are devoted exclusively to fruit. Within the last 40 years in this country more excellent varieties have been given to the world than in all ages before. Varieties are now propagated adapted to early and late ripening, etc. One of the greatest difficulties yet remaining, is the confusion in the names of varieties. The very slight shades of difference in many; the impossibility of accurately defining these shades in written descriptions, and the change produced in them by soil, situation, climate and culture have largely contributed to this difficulty. It has also been increased by looseness, carelessness, and want of precision in descriptions, and especially the almost total neglect of a classification of flavors, usually the most unvarying and great decisive point of distinction in varieties. Some individuals who have cultivated fruit, or studied extensive collections of pears and plums, may know at sight a considerable number of varieties, but in general very few sorts are known by one individual; and in the great majority of cases a professional gardener can speak with confidence regarding those sorts only which are under his care. The reason of this is, that the shades which distinguish varieties are so fleeting as not to be retained in memory, or retained only to a very limited extent. An apple may be distinguished from 20 other apples all very much alike, when the whole 20 are placed together before the eye; but any one of the 20, taken apart, and delineated and described, however perfectly, will hardly present any marks sufficiently distinct to be remembered, and by which it may be recognized with any degree of certainty. The great number of names given to one fruit either from ignorance or to promote its sale have added to the confusion.

Fruits ripen by absorbing oxygen and evolving carbonic acid, a process chemically opposite to that performed by leaves, and strictly analogous to that of animal respiration; they generally conduct this process with a vigor and amplitude proportioned to the play of sunshine which they enjoy; and during the whole of its progress they acquire grape sugar either from the transmutation of a portion of their acid or from other sources. Their ripening, therefore, comprises a change from a sour to a sweet condition; and this change is always more complete in sunny than in cloudy seasons.

The chemical nature of the process of ripening suggests how that process may be either accelerated or retarded, how the fresh state of delicate fruits may be prolonged, and how the air operates on mature fruits to make them decay and rot. The grand art of preserving freshness is to pull the fruit before they are quite ripe, and close them up from the pressure of free or atmospheric oxygen. In some cases, simple immersion in carbonic acid is sufficient; and in all, the laying of a paste of lime, copperas and water, at the bottom of jars to absorb oxygen, the placing of the fruit in the interior of the jars, but out of contact with the paste, and the thorough covering or cementing of the jars so as to exclude the air from without, are eminently successful. In this latter way, peaches, apricots, prunes, and several kinds of plums will keep quite fresh from 20 to 30 days; and pears and apples will keep quite fresh for three months and more. The process of decay, like that of ripening, absorb oxygen and evolves carbonic acid, but instead of adding to the sugar, it destroys and dissipates all which previously existed.

The most profitable market varieties of fruit. The chief requisites in all fruits for market purposes are firmness, color, quality and size, in the order named. Take for instance the apple; a bright red is the most popular color; hence Steele's Red, Winesap, Willow-Twig, Jonathan, Baldwin and even the Ben Davis are preferred to a better apple of a poor, dull, or rusty color. Take the Baldwin when it is of a bright color, it will sell at fifty per cent. better price on the same date than when it is shown of a dull color. There are many points to be considered in relation to the profitableness of certain varieties, even when the best qualities in their best color are presented on the market, which fruit-growers should consider. Among the varieties for profitable planting are the Baldwin, Steele's Red, Willow-Twig, Spitzenberg, Wagner, Newtown Pippin, Jonathan. Next in order would be the Pennock, Greening, Spy, Bellflower, Maiden's Blush, Red Astrachan, Ben Davis, Seek-no-further, Snow, Golden and Rox. Russets. Let it not be understood that the list should be limited as above. Those serve rather as types of the most profitable varieties. The apple list would not be complete without naming at least two crabs. The Hyslop and Transcendent are at the present time most salable of all the crabs, the Hyslop proving the most salable from the fact that Transcendent comes on our market too early for the demand; hence the Hyslop proves more profitable. See Apple.

Among pears, at present, and probably for the next generation, the Bartlett takes the highest rank as a market pear, and more of that variety can be profitably disposed of than all the other varieties put together. Clapp's Favorite, Flemish Beauty, Seckel, Louise Bonne, and Duchesse d'Angouleme are among the most salable on the long list of pears.

Cherries. The Black Tartarian is the most salable of all sweet cherries, with the Early Purple Guigne, Gov. Wood, and Napoleon Bigarreau following closely, with Early Richmond and May Duke as the leading sour or cooking cherries.

Plums. The Lumbard, Washington, and Green Gage for dessert, with Wild Goose for cooking.

Peaches. The yellow-fleshed varieties have the preference over the white, such as Crawfords, Jaques' Rareripe and Smock's Free, with a notable exception in favor of the Old Mixon, one of our best shippers.

Grapes. The Concord and the Delaware are the market grapes *par excellence*.

Currants. The Cherry takes the lead.

Red Raspberries. The Brandywine is the best at this date, for late, among new berries. Reeder's Seedling for early. Next comes the Kirkland or Highland Hardy, with the Herstine and Turner, the latter proving not of sufficient firmness for reshipment.

Black Raspberries Doolittle, Miami and Mammoth Cluster.

The Strawberry being produced in the largest quantities of all our market berries, it is proper to occupy more time on this fruit. Therefore we give a list of varieties and pronounce on their merits solely in their relation as shippers to the markets. We name them in their alphabetical order:

Varieties.	Color.	Flavor.	Shipping Qualities.
Agriculturist.	Crimson	Good	Near market.
Boyden (Seth)..........	Dark Red	Sweet	"
B. Scarlet	Scarlet	Good	Worthless.
Capt. Jack.............	"	"	Good.
Chas. Downing....	Light	Medium	Poor.
Champion	Dark Crimson	Good	Home market.
Crescent Seedling......	Bright scarlet	Poor	Worthless.
Col. Cheeney...........	Light scarlet	"	Near market.
Cumberland Triumph..	"	Medium	
Duchess................	"	"	"
Endicott No. 2.........	Dark red	"	"
Forest Rose	Bright red	Good	"
Glendale	Dull red	Poor	Worthless shippers.
Green Prolific..........	Scarlet	"	Near market.
Great American.........	Dark crimson	Medium	"
Jucunda................	Glossy "	Good	"
Kentucky	Scarlet	Fair	"
Lenning's White........	Light	Best	Too light in color.
Monarch of the West...	Light scarlet	Good	Near market.
Pres. Wilder	"	Best	"
Sharpless.........	Glossy red	Good	"
Triomphe de Gand......	Glossy Scarlet	"	Good.
Wilson's Albany..	Scarlet	"	"

The last two named on the list should be placed first as to order of merit when viewed in the light of market berries, for the following reasons: First, the Triomphe de Gand is the best of all the large varieties in combining all the requisites of a good shipping berry—size, color, flavor and firmness. Last, but not least, the Wilson's Albany, our old reliable and well-tried friend.

Keeping Fruit. If the following simple rules are observed fruit may be kept in a good condition for a long time.

1. As the flavor of fruit is so easily affected by heterogeneous odors, it is highly desirable that the apple and pear room should be distinct.

2. The walls and the floor should be annually washed with a solution of quicklime.

3. The room should be perfectly dry, kept at as uniform temperature as practicable, and be well ventilated, but there should not be a through draught.

4. The utmost care should be taken in gathering the fruit, which should be handled as little as possible.

5. For present use, the fruit should be well ripened; but if for long keeping, it is better, especially with pears, that it should not have arrived at complete maturity. This point, however, requires considerable judgment.

6. No imperfect fruit should be stored with that which is sound, and every more or less decayed specimen should be immediately removed.

7. If placed on shelves, the fruit should not lie more than two deep, and no straw should be used.

For the growing, varieties, marketing, keeping, etc., of the various fruits, see under their respective heads, and Orchard. See also Canning, Drying, Preserving, Pickling, etc.

Dessert Fruits. In America we have some wild fruits which are excellent for dessert, as the blackberry, raspberry, strawberry, huckleberry, cranberry, etc.; but we are mainly dependent upon cultivated fruits for our fancy or dessert dishes. We will here notice each in its alphabetical order, with remarks on their dietetical qualities and manner of using them, premising that all fruits consist mainly of water, and dietetically are but little more than a drink. They all contain also sugar, acid and mucilage. The different berries, as a general rule, contain a larger proportion of free acid than stone-fruit or apples and pears; and their acidity is the more obvious to the taste from their containing relatively small quantities of gum and pectine.

Those persons who use little or no salt in their food prefer sweeter fruits than others do, and those who use an excess of salt can scarcely satisfy themselves with fruit acid. To digest and assimilate the more abundant nutrition, therefore, from sweet fruits, without salt or cream, belabors the system much less than the method most in vogue in Europe and the United States. This, more than anything else, controls the matter of taste with reference to fruit-eating.

Apple. Apples of the very best variety are sometimes of poor quality, owing to adverse circumstances connected with their growth and ripening. For example, one eats a good apple of the Æsopus Spitzenberg variety, likes it, and afterward he is on the look out for more fruit of that kind. In the course of time some apples are offered him as Æsopus Spitzenberg, he eagerly seizes one, anticipating a rare treat; but alas! it tastes somewhat different in nearly all respects and very poorly in one or two, and he suspects they are not of the variety represented. In regard to nearly all fruits we are subject to such disappointments. Hence we are under the necessity of "sampling" a lot before purchasing or selecting, and even then, in filling a dish for the table we incur the risk of throwing in some poor apples. It appears that the "variety" brand of an apple is no more a guaranty of its intrinsic quality than the trade brand of manufactured products is a guaranty of them.

Previous to cooking, the apple consists of a large number of minute cells and vessels, which hold the pulp and the acid, which we term the juice. The application of heat causes these cells to expand and burst, and as the temperature increases the water partly evaporates in the form of steam. In this condition they are most wholesome, and therefore apple pie, if not over-spiced, is rightly regarded as highly nutritive, and at the same time easy of digestion. The aroma of apples, to which their various kinds of flavor seem intimately allied, is supposed to act as a mild stimulant and to aid digestion, and therefore those apples which have the finest flavor are esteemed best. The harder varieties, such as the pippins, having in a

greater degree the woody-fiber element, are less desirable as food. The dry, mealy kind of apples are highly nutritive. The watery apples are generally crude, cold, and ill adapted to weak stomachs till cooked, when all apples become wholesome and good for food. By the process of cooking the freed acid and pulp appear to enter into union, and the pulp containing saccharine, also disengaged by the heat, mixes with and modifies the acid. Ripe, sweet, mealy apples have a laxative effect on the bowels, but the sour, astringent fruit is to be avoided, especially by those who follow sedentary pursuits, or those who indulge freely in wine or spirits. Costiveness, griping, and flatulency are then likely to result from eating them.

Banana. This has more available nutriment than any other fruit in the world, and more nutrition per acre can be raised in bananas or plantains than in any other vegetable product, either fruit, grain or vegetable. But as many persons do not like them it is scarcely proper to serve them as dessert at a fashionable meal. Their quality is never so good after they are shipped to distant countries. The papaw of the United States is similar to the banana in odor, taste and other qualities, but they are far inferior as an article of diet. A taste for these two fruits, like that for tomatoes, is seldom inherited, but has to be cultivated.

Blackberry. This is a first-class fruit for dessert. Being somewhat astringent, many persons cannot eat many of them with perfect impunity. They are in their best edible condition when they have hung upon the bush about as long as they will, and are soft and mellow. Like black grapes, they are too liable to be picked as soon as they turn black, and long before they are sufficiently mellow. The flavor of the blackberry in pies is unsurpassed, if the cook is not so unskilled as to injure it in some way.

Cherry. Those kinds which contain the largest proportions of water and sugar, fermenting easily, are apt to produce flatulence and colic; but others, which contain a large portion of water and acid, being slightly stimulating, are more wholesome and digestible; but the best are the pulpy, mucilaginous kind. Cherries may be eaten without fear when they are quite ripe. The kernels of cherries contain a small proportion of prussic acid. Care should be taken to guard against the accidental swallowing of cherry stones, as they sometimes lodge in the bowels and produce obstructions.

Cranberry. This fruit, though unfit to be eaten raw, is, when cooked and thoroughly sweetened, one of the most popular desserts in existence, on account of its fancy flavor. The main objection to them is, they, like gooseberries and currants, require a great deal of sugar to render them eatable. Cranberry sauce is generally eaten with roast fowl.

Currant. The black variety is the most bland and nutritious, but is not so universally liked as other kinds. The red Dutch is the most popular as to flavor, and both this and the white Dutch are the best to raise in the United States. The white is not so acid as the red, nor indeed so rich; both are beautiful enough. In cooking them they require an immense amount of sugar. Either cooked or uncooked they are appropriate as dessert. The cherry currant is the largest, but most difficult to raise. The acid of the currant and gooseberry is said by the physicians of the day to be somewhat injurious to those who are given to weakness in the urinary system.

Date. Dates constitute an appropriate dessert fruit, both stewed and unstewed. They are fine when cooked with tart apples. They vary in quality, as found in the American markets, according to their price, all the way from five to forty cents a pound, the cheaper kinds being wormy and dirty.

Fig. Excellent, both raw and cooked; are very fine when fresh from the tree. They are nutritious, and contain a large portion of sugar without acidity or oiliness, but require a longer time for digestion than most fruits do.

Gooseberry. About like currants. The skins are indigestible and should not be eaten. Ripe gooseberries are far more bland and wholesome than green.

Grapes and Raisins. The pulp of grapes constitutes the best sauce for invalids in the world. The "grape cure," so called, is increasing in popularity. This fruit, in its fresh state, is also fine for dessert at the most fashionable tables. It exceeds all other fruit in its amount of sugar, which is seldom less than 12 and sometimes reaches 26 per cent. In good kinds and in favorable seasons, the ratio of the sugar to the acid is as 29 to 1. When the ratio falls to 10 to 1 the grapes are unripe and acid. In other fruits this would be a high ratio and they would be called sweet. The anomaly may be thus explained: In unripe grapes the skins are very thick, and contain an extremly acid juice, which overcomes the sugar contained in the interior of the berry. The peculiar acid of grapes is denominated "tartaric," which, combined with potash, forms "cream of tartar." Raisins are certain semi-tropical varieties of grapes, dried in a peculiar manner. The skins and seeds are indigestible, and the seeds, particularly, should not be eaten at all. It is not fashionable to pass raisins around as dessert except with nut kernels.

Huckleberry (or whortleberry). This fruit, stewed, makes a good dessert. It is also excellent for pies and to eat uncooked. Very digestible. The blueberry variety is the largest and generally preferred. It is a botanical curiosity that the blueberry and the cranberry are set down by scientists as belonging to one genus, while the huckleberry is placed in another. These fruits are easily shipped to great distances, and all the farmers in the West can have them in perfection.

Lemon. This is too well known to need description. Although it is not strictly a dessert fruit, its juice and its rind are the most popular flavoring elements in fancy dishes. The acid of lemons and oranges is regarded as not only wholesome but also highly

corrective of vitiated conditions of the stomach and even of the whole system.

Melon. Muskmelons and watermelons are strictly dessert fruits, and in their season are proper at fashionable tables. The neatest way to eat them is

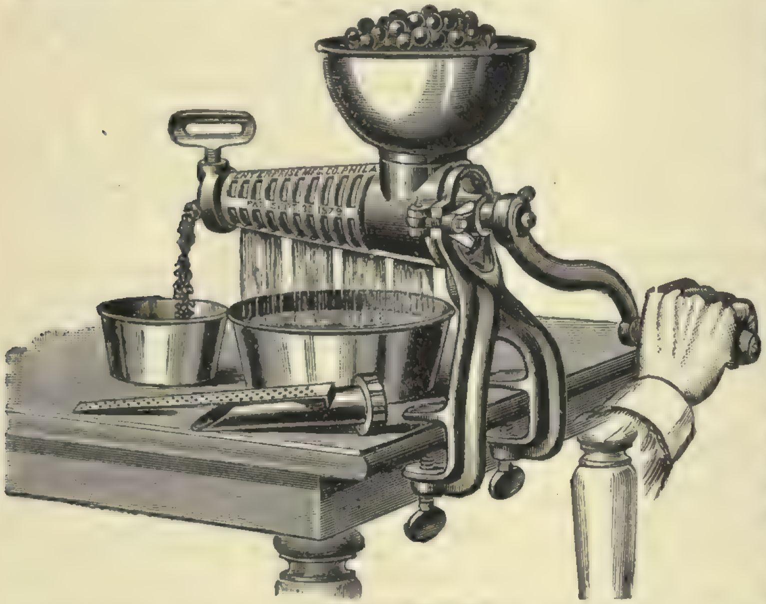


Fig. 1.—*Fruit Press.*

with a teaspoon, from the rind, their natural dish, but this is not in accordance with etiquette at the present day. About 95 per cent. of the watermelon is water, and the largest portion of the remainder sugar. On account of the organic character and dietetic purity of the water, the lacteals absorb more of it than the system needs, and the surplus passes off by the urinary organs. Hence it is called a "diuretic."

Orange. A first-class dessert fruit. The peel (rind) is excellent for flavoring, but the oil which it contains is strictly an unassimilable drug, like any other spice. Both the outer and the inner (the white) rinds should be removed before eating. Orange juice, without the fiber, is particularly excellent for invalids as a substitute for the usual beverages.

Peach. This fruit is esteemed both for its tender flesh and its powerful but delicate aroma, although it requires longer time for digestion than most fruits. It is characterized, chemically speaking, by prussic acid, which abounds in its congener, the almond; but, as with all chemical elements, when organized in a first-class article of food, it is as different, dietetically, as air is from nitric acid, these two substances being composed of the same elements. Peaches, like apricots, consist almost entirely of juice, their solid constituents, after the removal of the stone, being only one or two per cent.

Pear. This is one of the sweetest of fruits and very nutritious, but is not so digestible as the apple. Unlike most other fruits, autumn and winter pears should be gathered from the tree before they are fully ripe and kept in the house until they are soft or mellow. They must, however, be kept warm, as cold destroys all their best qualities and renders them hard and tough.

Pine-apple. Although the acid and peppery qualities of this finely flavored fruit render it difficult of management by weak stomachs, it constitutes, when pared, sliced and saturated with the best sugar, a fancy dessert. It is not the fruit of a tree, but of a moss-like plant.

Plums and Prunes. Perfectly ripe plums are good to eat in considerable quantities, are very digestible and somewhat laxative. The same may be said of nectarines and apricots. Sometimes these stone fruits are ripe on the side exposed to the sun while unripe on the other, in which case only the ripened side should be eaten. Prunes bear the same relation to plums that raisins do to grapes, and are probably the most digestible of all dried fruits, while they are as wholesome as any.

Strawberry. The acme of dessert fruits. It is the aroma that we chiefly prize. The sweeter the more wholesome, as cream and fruit acid together form a kind of indigestible cheese in the stomach. Special pains are required to furnish them free from sand and dirt.

Watermelon. See Melon, above.

Fruit House, a house for the preservation of fruit in its natural state. It is either the ice-house itself, with a room underneath for fruit, or a conservatory built upon the principle of the ice-house, to preserve fruit during the winter season. These are eminently profitable, and those who are raising fruit

Fig. 2.—*Fruit Press Taken Apart.*

in large quantities should provide themselves with a house especially adapted for their preservation.

Fruit Press, an apparatus for pressing out the

juice of fruits. Every family should have one. Fig. 1 represents the kind made by the Enterprise Manufacturing Company, of Philadelphia. Fig. 2 represents the same taken part. It is easily taken to pieces, for the purpose of washing, drying and oiling. The apparatus is screwed to a table like a small sewing machine or seam-holder, the fruit put into the hopper, and as it is pressed, the skins and seeds are neatly held within the tube until they are passed out at the smaller end. The stone fruits should first be pitted; all other fruits, as well as pumpkin, and all pulpy matter, can be run right through without any previous preparation.

Fuel, combustible substances used for the production of heat. In this country fuel is generally understood to mean either coal, wood, charcoal or coke. Throughout the northern portion of the United States coal is the fuel in most general use. In timbered sections, and where coal is not a local product, wood is used either in its original state or in the form of charcoal.

COAL. There is no possible doubt that the general origin of coal must be referred to the vegetable kingdom. Some species of coal are merely fossil wood (or lignite) impregnated with oily or bituminous matter. The branches, trunks and roots, although closely pressed together, are scarcely altered in texture in some places, while in others they gradually lose every vegetable feature; and the substance in color, luster and feature resembles pitch.

Coal is indeed the vegetation of former ages, the product of their sunshine and showers, treasured up for succeeding generations. The chief difference between the various kinds of coal which are applied to economical purposes arises from the proportion of bitumen they contain. What is called bituminous yields about 40 per cent. When burning it swells, agglutinates, and emits much smoke and gas, which inflame at a certain temperature. Cannel coal has only 20 per cent. of bitumen, and does not agglutinate or cake. It burns with a bright flame like a candle, from which circumstance it takes its name, cannel being the common pronounciation of candle in the north of England. The third sort is called anthracite. It contains little or no bitumen. It neither cakes nor flames, and gives out very little smoke. But as there are several varieties of coal between these principal species, much confusion has taken place in their names. The fact is that almost every mine affords a coal differing in some respects from that of others. The different manner in which coals burn deserves notice, and if any arrangement of the varieties of coal is to be made this affords the best ground for it. The difference does not depend wholly upon the proportion of bitumen, but partly upon the kind, whether it is more or less volatile, and whether it is more or less easily separated from the earthy base.

Anthracite is in general, geologically the oldest form of coal, and is the hardest and most dense. It generally contains upward of 90 per cent. of carbon. It is an admirable fuel, but requires that stoves and grates should be expressly adapted to its use. This coal is not found west of the Middle States. The soft or bitminous coal is soft and friable, which is therefore more wasteful. It is very rapid in its combustion.

Coal is said to be about twice the value of wood as fuel, weight for weight, in its heating power. The great value of all fuel resides in the degree of heat it gives. The heat-giving constituent of coal, carbon, varies from 75 to 95 per cent. Coal radiates more heat than charcoal. One pound of good pit-coal will upon an average heat 60 pounds of water. Small coal gives out three-fourths of the heat afforded by large coal.

CHARCOAL. Different charcoals afford under equal weights equal quantities of heat. One pound of charcoal will, on an average, raise 73 pounds of water from the freezing to the boiling point. If exposed to the air, charcoals acquire moisture, and are then inferior in the heat-giving property. Such charcoal may be known by its burning with flame, as pure charcoal does not. Charcoal radiates heat in the degree of one-third to the whole of the heat it emits.

COKE. The heating power of good coke is to that of pit-coal as 75 to 69, and is equal to nine-tenths of that of wood charcoal.

TURF OR PEAT. One pound of this fuel will raise from 25 to 30 pounds of water from the freezing (32° above) to the boiling point, 212°. Its value depends upon its compactness and freedom from earthy matter. Its radiating power is as one to three of the whole heat it emits in burning. Peat is not common in the United States on account of the rarity of the peculiar swamps where it is found. In northern Indiana, and in some portions of Wisconsin, there are rather extensive bogs of peat.

WOODS of various kinds, if burnt under the same conditions of weight and dryness, are found to afford equal degrees of heat. The pores of dry wood are filled with air (oxygen). Dryness is an essential quality of good fuel, as the presence of moisture prevents the oxygen of the air from penetrating the material burnt. If a piece of wood is damp, heat is wasted in the evaporation of the water it holds, and the combustion is also slower and more imperfect. A piece of wood containing, say 25 per cent. of water, contains only 75 per cent. of fuel, while the conversion of the water into steam will require one 28th part of its weight. Hence, damp wood is of less value as fuel by 28 parts in 100. According to their different natures, wood still contains from 20 to 25 per cent. of water 12 months after it has been felled and cut up. Even when it has been kept for a long time in a dry place, it never contains less than 10 per cent. of water, although this may, of course, be reduced by heat. If dried too much, its value as fuel suffers from another cause, namely, the commencement of carbonization, or loss of hydrogen. It has been assumed that 1 pound of artificially dried wood will raise 35 pounds of water from the freezing to the boiling point.

Taking shellbark hickory as the highest standard of our forest trees, and calling that 100, other trees will compare with it in real value for fuel as follows:

Shellbark Hickory	100
Pignut Hickory	95
Black Jack (Oak)	97
White Oak	84
White Ash	77
Dogwood	75
Scrub Oak	73
White Hazel	72
Apple Tree	70
White Beech	69
Black Birch	65
Hard Maple	65
Black Walnut	62
Yellow Oak	60
White Elm	58
Red Oak	56
Red Cedar	56
Wild Cherry	55
Soft Maple	55
Yellow Pine	54
Chestnut	52
Yellow Poplar	51
Butternut	43
White Birch	43
Pitch Pine	43
Hackberry	42
White Pine	30
Anthracite Coal, 1 ton	100
Bituminous Coal, 1 1-5 tons	100

The other sorts of ash, the elms, butternut, sycamore, willow, basswood and buckeye have but little substance, although they all burn well enough when dry. Green elm is the poorest of all, and next to it green water oak and the soft woods. By the foregoing one can calculate which is the cheapest and best fuel in his community from the price it brings there. Sometimes, in the West, even corn has been the cheapest fuel; sometimes sunflower stalks, and other things. Perhaps the best and simplest way of discovering the respective heating powers of various kinds of fuel is by testing them with ice, thus: One pound of good coal liquefies 90 pounds of ice; one pound of good coke liquefies 95 pounds of ice; one pound of good wood charcoal liquefies 94 pounds of ice; one pound of wood liquefies 52 pounds of ice; one pound of peat liquefies 19 pounds of ice; one pound of hydrogen gas liquefies 370 pounds of ice.

Fulcrum, the support upon which a lever is rested.

Fumigation, or disinfecting the air, the artificial diffusion of medicated smoke or pungent gas through a house or apartment for the neutralizing of infection or destroying insects. There is no doubt that, in limited spaces, as in crowded ships, jails and hospitals, and particularly where cleanliness is neglected, or in confined apartments where infectious fevers exist, the atmosphere is loaded with certain exhalations, germs, fumes or vapors which are the cause of contagion. For rooms, etc., muriatic acid and nitric acid fumes have been used with success. To employ muriatic acid, put some common salt into an earthen dish and pour upon it some sulphuric acid; immediately whitish fumes will arise, which consist of muriatic gas; they will blend with the air and become invisible, but their presence will be perceived from their suffocating smell. Place a two-ounce vial full of the fuming nitrous acid, with the stopper out, on the mantle-shelf in the rooms which it is wished to guard from infection. Another method to remove close, unpleasant smells from apartments, is to put one spoonful of common salt and a little powdered manganese in a flat earthen saucer, and add at four or five different times a wineglass of strong sulphuric acid. Place this on the floor of the room, retire, and close the door.

For out-door purposes, chloride of lime and chloride of soda are the substances now used as the most convenient and effectual remedies for the purpose of disinfecting. Tobacco smoke, camphor, and vinegar are also good. See also Disinfectants.

Fungus (plural, fungi), mushroom growth of any kind, including nearly all the microscopic vegetation.

To the botanist the fungi are a most interesting class of plants. Their seeds (spores) and many of the resulting plants are so small that they must be examined with the microscope to bring out their character. What are understood as fungi by the ordinary observer, are toad-stools and puff-balls. Smut, mildew and rust are generally termed blight; yet they all belong to the larger class of fungi, the more minute forms below those of mildew being largely in excess of those larger than mildew. Fungus attacks all plants, especially those in a more or less diseased or disorganized condition. Fungus sometimes does attack apparently healthy trees. It attacks all living trees, and also is one of the means of the decomposition of dead plants. It is propagated by spores, minute grains which perform the function of seeds.

FUNGI AS A CAUSE OF DISEASE. Much has been said and written of late years of minute fungi being the cause of disease. Dr. Lassaure has made experiments with penicillum, etc., and concludes from them that fungus is not a cause, but an accidental presence. "In contradiction of Hallier, and," says Prof. McClure, "I might truthfully say of many other persons, it has been shown that nothing is to be gained in the study of the causes of disease by cultivating microscopic fungi, and it cannot be regarded as a contagious element until we have succeeded in producing disease from art."

Furniture, TO CLEAN. Take a quart of stale beer or vinegar, put a handful of common salt and a tablespoonful of muriatic acid into it, and boil it for 15 minutes; it may be kept in a bottle and warmed when wanted for use. Having previously washed the furniture with soft hot water, to get the dirt off, wash it carefully with the above mixture.

Very nice furniture, as a piano, should be treated as follows: Wash in very nearly cold water with a very clean, soft rag, and wipe dry; next, rub it all over with sweet oil and let it stand an hour or more; then rub off all the oil with a towel.

To Restore. The best mixture we can find is, 3 parts linseed oil and 1 part spirits of turpentine. Put on with a woolen cloth. It restores wood to its original color and leaves a luster upon the surface.

To Take Bruises out of Furniture. Wet the bruises with warm water, place a brown paper folded four or five times upon it and apply a warm (not hot) iron to it and the bruise will rise to the surface.

To Polish. Take 2 ounces of beeswax and ½ an ounce of alkanet root; melt them together in an earthen pot; when melted take it off the fire, and add 2 ounces of spirits of wine, and ½ a pint of spirits of turpentine. Rub it on with a woolen cloth, and polish it with a clean silk cloth.

Another: Shave 1 cent's worth of beeswax into thin slices, put it into a gallipot and pour on it 3 cents' worth of turpentine; melt in an oven, take it out and let it stand until cool; apply it briskly to the furniture with a piece of flannel, rub with a soft duster, and finally polish with an old silk handkerchief. Good also for cleaning oil-cloth.

To Varnish. White wax, 2 ounces; oil of turpentine, 1 gill; melt the wax and gradually mix in the turpentine. Lay on evenly, with as few strokes of the brush as possible and with haste, as varnish "sets" quickly, and is only roughened with the brush after setting.

Furrow, the long narrow trench made by the plow in tilling land. It means sometimes the temporary trench made by each line or bout of plowing, more generally the permanent trench which divides two ridges, and occasionally the narrow surface drain which is formed across the ends of these, and which receives and carries off their discharge of water; and in the first of these senses it may be called the plow-furrow, in the second the ridge-furrow, and in the third the cross-furrow. The operation of furrow-draining is designed to draw off surface water by means of the ridge-furrows and the cross-furrows; and a somewhat analogous operation draws off surface water from tilled clay lands by means of small and narrow spade-cuts, called water furrows. See the article Draining. A furrow-slice is the strip of soil cut out and turned over by the plow in each bout of plowing. The *rationale* of turning of furrows by the plow is not understood by one farmer in ten, even by those who profess to be plowmen. Very few of the ordinary hands of the farm understand how to turn furrows so they shall lap evenly, or fall beside each other, in lap-furrowing, in contradistinction to lying flat, and at the same time close together. So, in turning under stubble and other trash, sufficient care is not taken in cutting the furrows so the vegetation will be distributed evenly, and not in lumps, thus allowing the furrow to be smooth and evenly disintegrable throughout. The subject will be found treated of in the article Plowing. Furrows are known as "flat" when they lie level, and as "lapping" when they partly lie upon one another.

Furrow Slice, the strip of earth thrown out by the plow at one passing.

Furs. To Tan Skins with the Fur on. Cut off the useless parts, soften the skin by soaking, remove the fatty matter from the inside, and soak in warm water for an hour. Mix equal parts of borax, saltpeter and Glauber salts, in the proportion of about ½ ounce of each for each skin, with sufficient water to make a thin paste. Spread this with a brush over the inside of the skin, applying more on the thicker parts than on the thinner; double the skin together, flesh side inwards, and put it in a cool place. After 24 hours wash the skin clean, and apply in the same manner as before a mixture of 1 ounce sal soda, ½ ounce borax, and 2 ounces hard white soap, melted slowly together without being allowed to boil; fold together again and put away in a warm place for 24 hours. After this dissolve 4 ounces alum, 8 ounces salt, and 2 ounces saleratus, in sufficient hot rain-water to saturate the skin; when cool enough not to scald the hands, soak the skin in it for 12 hours; then wring out and hang up to dry. When dry repeat this soaking and drying two or three times, till the skin is sufficiently soft. Lastly, smooth the inside with fine sand-paper and pumice stone.

To Clean Furs. Strip the articles of their stuffing and binding, and lay them as much as possible in a flat position. Give them a very brisk brushing with a stiff clothes-brush. After this any moth-eaten parts must be cut out, and be neatly replaced by new bits of fur to match.

To Clean Dark Furs. Sable, chinchilla, squirrel, fitch, etc., should be treated as follows: Warm a quantity of new bran in a pan, taking care that it does not burn, to prevent which it must be actively stirred. When well warmed, rub it thoroughly into the fur with the hand. Repeat this two or three times, then shake the fur, and give it another sharp brushing till free from dust.

To Clean Light Furs. White furs, ermine, etc., may be cleaned as follows: Lay the fur on a table, rub it well with bran made moist with warm water; rub till quite dry, and afterward with dry bran. The wet bran should be put on with flannel, and the dry with a piece of book-muslin. The light furs, in addition to the above, should be well rubbed with magnesia or a piece of book-muslin, after the bran process. Or dry flour may be used instead of wet bran. Ermine takes longer to clean than minever. They should be rubbed against the "lay" of the fur.

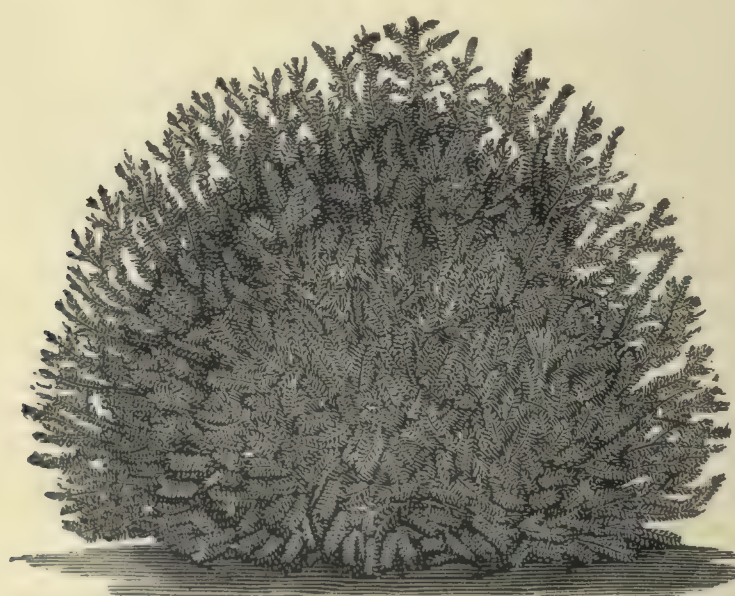
Preserving Furs from Moths. It is not the moth, but the maggot of the moth, that does the mischief with furs and woolens. The instinct of moths leads them to deposit their eggs at the root of the fine hair of animals. No sooner is the worm hatched than it eats its path through the fur and continues increasingly destructive until it arrives at its full growth, and

forms itself a silk covering, from which in a short time it again emerges a perfect moth. To effectually preserve furs from these insects thoroughly beat the furs with thin rattans, air them for several hours, then carefully comb them with a clean comb, wrap them up in newspapers, perfectly tight, put them away in a perfectly closed chest, lined with tin or cedar wood. Take them out and examine in the sun at least once a month, thoroughly beating them. This, indeed, is the secret of fur dealers in preserving their stock. Camphor, which is so much used to preserve furs, impairs their beauty in turning them light. The printing ink on the newspaper is just as effectual as camphor, being very distasteful to the moth. Keeping them in perfect darkness is considered by some to be sufficient. Another cause of the decay of furs is the moisture to which they are so often exposed and by allowing the skin to remain damp, from which the delicate structure of the fine fur is sure to receive serious damage. This fact makes the leather manufacturer wet his skins and keep them in a damp cellar, in order to facilitate the removal of the hair, which can then be readily pulled out. It follows, therefore, that for the preservation of furs, dryness is essential. After exposure to damp or rain, furs should be dried at a moderate distance from the fire. Before putting furs by for the summer they should be carefully combed and beaten with a small cane. During the summer they should be taken out occasionally to be dried, if at all damp, and again well shaken, combed and beaten.

TO IMPROVE FURS BY STRETCHING. Furs are usually much improved by stretching, which may be managed as follows: To one pint of soft water add 3 ounces of salt; dissolve. With this solution sponge the inside of the skin (taking care not to wet the fur) until it becomes thoroughly saturated; then lay it carefully on a board with the fur side downwards. Then stretch as much as it will bear, and to the required shape, and fasten with small tacks. The drying may be quickened by placing the skin a little distance from a fire.

Fusel Oil, known also as potato spirit, is a frequent impurity in spirits distilled from fermented barley, potatoes, rye, corn, etc., to which it communicates a peculiar and offensive odor and taste, and an unwholesome property. Any spirit which produces a milky appearance when mixed with four or five times its quantity of water may be suspected to contain it. To free alcohol from it, filter the alcohol through alternate layers of sand, wood charcoal, boiled wheat and broken oyster shells. This will remove all other impurities as well. Another method is to add a few drops of olive oil, shake thoroughly and decant; the olive oil dissolves and retains the fusel oil.

Fustian (fust'yan), a kind of coarse twilled cotton stuff, including corduroy, velveteen, etc.



G

GABLE (ga′bl), the vertical triangular end of a house or other building, from the cornice or eaves to the top. A "gable roof" is the sloping roof which forms a gable. A "gable window" is one which is in a gable, or pointed at the top like a gable. The entire appearance of a residence, barn or other building may be beautified by simply ornamenting the gable; but care should be taken to avoid the common error of making such ornamentations too heavy.

Gadfly. The gadfly or bot-fly family belongs to the order of two-winged insects, which have their antennæ very short and inserted in two little holes upon the forehead; head large, eyes small, with large space between them; wings large, covering the balancers, and the hind body of the females with a conical tube bent under the body, and with which they deposit their eggs while flying. The larvæ inhabit various parts of the body of herbivorous animals. They are thick, fleshy, without feet, tapering towards the head, which in most cases is armed with two hooks, and the segments of the body are also armed with hooks or prickles. More than twenty species of this family are known; and several are found in this country.

Horse Bot-fly. There are three species which infest the horse. The large bot-fly, which lays her eggs upon the fore legs of the horse; the red-tailed bot-fly, which lays her eggs upon the lips, and the brown farrier bot-fly, which deposits her eggs under the throat. By biting the parts where the eggs are laid, the horse gets the larvæ into his mouth, swallows them, and to the coats of the stomach they cling and remain until they have attained their full growth. They then loosen their hold and are carried, together with the food, through the interior of the animal, fall to the ground and immediately begin to burrow. They remain under ground until they have undergone their metamorphoses and then emerge in the shape of the perfect insect.

Ox Bot-fly. This is the parasite found under the skin of cattle along the back, and is also known as the skin bot-fly. The fly is black and densely hairy, with thorax banded with yellow and white. They deposit their eggs in a place on the back of horses, and especially cattle. Accompanying the eggs is a small quantity of acid. The eggs hatch and live on the integuments under the skin, emerging in the spring. Where the egg is deposited a little tumor is formed, which is kept open until the grub or larva forces itself through the aperture during June or July of the following year. These tumors are called "warbles," and at first throw the animal into a wild agony, causing it to rush for water, if there is any attainable, regardless of driver, plow or vehicle. Animals dread these flies, and the appearance of a single one has been known to create a stampede in a herd. These grubs may be felt in the winter as hard lumps. The opening should be slightly enlarged with a lancet, and the grub squeezed out by pressure on each side. Then wash the wounds clean with a tincture of aloes and myrrh, and the abscesses will soon heal. The gadfly always selects the best-conditioned animal. The damage it does arises from the suffering it inflicts, and injury to the hide in case the animal be slaughtered.

Sheep Bot-fly. This genus of the gadfly lays its eggs in the nostrils of sheep, and the larvæ crowd into the cavities of the bones of the forehead, and in many cases produce death. It is composed of fine rings; is tiger-colored on the back and belly, sprinkled with spots and patches of brown, and has striped wings. It most commonly deposits its eggs in July, August and September. At this time the sheep collect in close clumps, with their heads inward, with their noses thrust close to the ground and into it, if any loose dirt or sand is within reach. During the ascent of the larvæ up the sinuses, the sheep stamps, tosses its head violently, and often dashes away from its companions over the field. The larvæ remain on the sinuses, feeding on the mucus secreted by the membrane, and apparently creating no further annoyance, until ready to assume their *pupa* form in the succeeding spring. They then crowd down the nose, creating even greater irritation and excitement than when they originally ascended, drop on the ground and rapidly burrow into it. In a few hours the skin of the larvæ has contracted, become of a dark brown color, and it has assumed the form of a chrysalis. This fly never eats. The male, after impregnating two or three females, dies, and the latter, having deposited their *ova* in the nostrils of the sheep, also soon perish. See Sheep.

Gaff or Gaffle, an artificial spur put on cocks when they are set to fight. Also, a large hook with handle for securing fish after having been brought to hand with a rod.

Gage, or Gauge, a measure or standard; also, to measure.

Gaggle, to make a noise like a goose; cackle. In

hunters' parlance it means a large collection of wild geese, generally applied to those gathered on land.

Galipot (gal'i-pot), white resin from pine trees. When purified it is called "Burgundy pitch."

Gall (gaul), a bitter fluid secreted by the liver in a sac called the "gall-bladder;" an excrescence on plants, produced by insects (see Gall-fly); to fret and wear by friction, as to gall a horse's back; to harass and annoy, etc. Wind-galls are little tumors about the heels of horses over-driven. The proper treatment for galls on horses is to wash the galled places with a solution of sugar of lead, or to keep them clean with a plaster of common ointment, or dressing with simple cerate, and allowing no further pressure on the part until healed.

Gall-fly, a fly which punctures plants and produces galls. The innumerable and curious excrescences which are seen on the leaves, branches and roots of trees, are all the productions of different kinds of insects. Some of these excrescences have within a single cavity, in which several insects live together. Others have a number of small cells, with communications between them; others, again, have numerous distinct cavities. These productions are of various sizes, form and consistence, some being spongy, and others, like the gall-nut, extremely hard. All these apparently monstrous productions are occasioned by the puncture of insects when depositing their eggs. The ancient opinion concerning the animals found in these receptacles was, that they were spontaneously produced from the rotten wood. Afterwards it was believed that the roots of plants had the power of sucking up, with the sap, the eggs of insects, and that these were animated as soon as they arrived in a proper situation. There are a multitude of insects which form these excrescences, the principal of which is the Cynips. That which attacks the oak is of a burnished brown color, with black antennæ, and chestnut-brown legs and feet. The wings are white. It is small and hymenopterous. The excrescences are called gall-nuts. Like others of the genus, the female pierces a branch and deposits an egg in the interior, around which, in the course of a few days, the excrescence is thrown out, affording nourishment to the young insect, and protecting it from external injury until it has attained its full size, when, after having undergone metamorphosis, it penetrates the sides of the excrescence and comes out into open air. The oak, which bears the gall-nut of commerce, does not attain a greater height than four or five feet, and usually has very numerous, straggling branches. The leaves are oblong, sinuate, and smooth on both sides. The acorns are elongated, and sessile or subsessile. The galls are hard, woody and heavy, about the size of a marble, usually round, and studded with protuberances. Those which are gathered before the departure of the insect are most esteemed, and have a bluish color. The whitish are cheapest and are sometimes dyed blue, but the deception may be detected by the hole made by the insect in its exit. Gall-nuts are powerfully astringent and are frequently employed in medicine, as also in dyeing or making ink. An infusion is an excellent test of iron. They are imported from Smyrna, Tripoli and other places in the Levant, especially from Aleppo, to which place they are brought by the Koords from the western bank of the Tigris.

Gallon, the standard unit of wine measure, which contains 231 cubic inches. One gallon of pure water weighs nearly eight and one-half pounds avoirdupois; hence a pint weighs about a pound. The beer gallon, which contains 282 cubic inches, and formerly used in measuring beer, ale and milk, is now seldom used. The Imperial or British gallon contains 277.274 inches of distilled water at 62° Fahr.,—equal to ten pounds.

Gallinaceous Fowls. An order or very natural family of land birds, represented by the domestic cock and named from its scientific designation, Gallus. The gait of these birds is heavy; their power of flying is comparatively small; their bill is of moderate size, and has its upper mandible arched; their nostrils are partially covered by a soft and inflated scale; their toes, for the most part, are indented on the edges; their crop is very large, and their gizzard very powerful; their food in general is grain; and, with one exception, all lay and hatch their eggs on the ground, or on a slight carpeting of straw or grass. This order comprises the domestic cock, pheasant, the quail, the pigeon, turkey, peacock, guinea-fowl and some others of less importance or not so well known.

Gallop, the most rapid pace of the horse. It is sometimes, though improperly, regarded as included in the amble or canter, while the gallop and canter are entirely different paces, the former being a succession of short leaps, and the latter a movement of the front and hind legs successively. The transition from one to the other is so gradual that it would be difficult to exactly fix it. The style of riding in both paces is very much the same.

The gallop is of two kinds, the hand gallop and the full gallop. The hand gallop has an intermediate character between the amble and the full gallop; and though apparently simple in its progress is elaborate in its commencement. The horse simultaneously elevates his fore-quarters and throws forward his fore-legs; but he raises the right limb a little higher, and carries the right shoulder a little further forward than the left, so as to make the action, not the leap, but a pace. During this first elevation, and in some instances preparatory to it, the right or off-hind foot moves slightly forward, but only sufficient to gain a true center, and to correspond with the increased forwardness of the right shoulder; the near hind-leg, it must be remembered, yet remains fixed. The fore extremities now reach the ground, the near fore a little before its fellow, the off fore doubling over it, and placing itself a little beyond it; and the slower is the gallop, the more considerable will be the distance between the placing of the fore-legs. As soon as the near fore-leg has met the ground, and before the off

fore has yet taken its full bearing, the hinder legs are moved in the following manner: the near hind elevates itself; and, as it reaches the ground, the off hind passes it and becomes placed also. It is now that the horse begins to be "all in the air" in this pace; for on the next spring that the hind-quarters make, the fore-quarters being already elevated from the last impulse, the animal is of necessity completely detached from the ground.

The full gallop is a very simple affair, and consists merely in a succession of leaps. The fore-legs are thrown simultaneously forward, the hind-legs are quickly and almost simultaneously brought up; and the extension of all the limbs in the air during the interval between one bound and another, occupies vastly more time than the efforts of the leap. But the full gallop requires so different a center of gravity from walking, and demands so powerful and general a play of the muscles at its commencement, that it cannot be begun except through the medium of the hand gallop, and always presuppose the acquirement of a momentum of a progressive increase of speed.

Galloway, a breed of Scotch cattle, and also a breed of small horses. See Cattle and Horse.

Gallstone, a concretion formed in the gall-bladder. It causes great pain, especially while it is passing out. Scarcely anything can be done to relieve it, although it is believed that some system of dieting and hygienic regimen may prevent its formation.

Galoche (ga-losh′), an over-shoe; a gaiter made to cover the leg and upper part of the foot.

Gamboge (gam-booj′ or gam-boje′), a vegetable juice or gum resin, of several kinds, from the East Indies, used in paints and in medicines. It is of a reddish-yellow color, and taken internally it is a strong and harsh emetic and cathartic. Poisoning by it produces an acid and bitter taste, a choking sensation, dryness of the throat, retching, vomiting, purging, pains in the stomach and bowels, difficult breathing and death. As antidotes, give emetics of salt and water or mustard, followed by large draughts of warm milk or other bland fluids; foment the belly, and give strong coffee.

Gambrel, the hind leg of a horse; a stick crooked like a horse's leg, used by butchers in suspending slaughtered animals for the purpose of dressing or weighing. A "gambrel roof" is a hipped roof, a mansard or curb roof.

Game, wild animals which are hunted for food. To keep game fresh and sweet till it can be conveyed home from a distance or transported to market, clean it by wiping off the blood, cover the wounded parts with absorbent paper, wrap up the heads, and sprinkle ground coffee over and among the feathers and fur, as the case may be; pack up carefully, and the game will be preserved fresh and sweet in the most unfavorable weather. Game sent open and loose can not be treated in this manner, but all game packed in boxes or barrels may be deodorized as described. A teaspoonful of coffee is sufficient for a brace of birds.

Birds may be preserved in a fresh state for some time by removing the intestines, wiping the inside out quite dry with a towel, and then flouring them. A piece of blotting paper, on which one or two drops of creosote has been placed, is to be put inside the bodies, and a similarly prepared piece of paper tied around them. They should then be hung up in a cool, dry place, and they will be found to keep nicely for some time.

Game to be shipped to market should be packed in barrels or boxes, clean straw being the best packing material. In cool weather game is often shipped short distances openly, tied together in bunches. In freezing weather this is done largely and safely.

We may here give our epicurean friends a gentle hint on game-eating. In eating game those parts are the most tender and delicious which are exercised the least by the locomotive habits of the bird. For instance, in the woodcock and snipe the legs, which are merely used as their supporters, are juicy and tender, while their wings and breast (pectoral muscles) being abundantly exercised, are more tough, dry and strong.

When birds are tainted, pick and draw them as quickly as possible, and immerse them in new milk. Allow them to remain in it till next day, when they will be sweet and fit for cooking. Throw the milk away afterwards, as it is in an unfit state for any other use whatever.

Roast Wild Fowls. These fowls require a brisk fire, and should be roasted till they are a light brown, but not too much, otherwise they lose their flavor by letting the gravy run out. The flavor is best preserved without stuffing. Put pepper, salt and a piece of butter into each. Wild fowl require much less dressing than tame. A rich brown gravy should be sent in the dish; and when the breast is cut into slices, before taking off the bone, a squeeze of lemon, with pepper and salt, is a great improvement to the flavor. To take off the fleshy taste which wild fowl sometimes have, put an onion, salt, and hot water into the dripping-pan and baste them for the first ten minutes with this; then take away the pan and baste constantly with butter.

Prairie Chickens. Skin the chickens, which makes them sweeter; cut them open on the back and through the breast; fry them in butter, with salt and pepper to the taste; cook them to a nice brown.

To Truss Woodcock, Snipes, etc. Pluck and wipe them very clean outside; truss them with the legs close to the body, and the feet pressing upon the thighs; skin the head and neck, and bring the beak around under the wing.

Roast Pigeons. When cleaned and ready for roasting, fill the bird with a stuffing of bread crumbs, a spoonful of butter, a little salt and nutmeg, and 3 oysters to each bird (some prefer chopped apple). They must be well basted with melted butter, and require 30 minutes careful cooking. In the autumn they are best, and should be full grown.

Quails Roasted with Ham. After trussing and

stuffing, cover with slices of ham, and cover all with a sheet of white paper; keep well basted with butter and water, and roast three-quarters of an hour with a good fire; remove the paper and brown quickly. The slices of meat and the paper must be fastened down with thread.

GAME PIE. This may be made of any of the birds named in the foregoing receipts. Prairie chicken and quails together make a delightful Christmas pie. Clean and wash the birds; cut the quails in half, the prairie chicken into 4 pieces; trim off bits of the inferior portions, necks, lower ribs, etc., and put them with the giblets into a saucepan, with 1½ pints of water, if your pie requires 6 birds; while this is stewing make a good puff-paste and line a large pudding-dish, reserving enough for a lid at least ½ an inch thick; when the livers are tender, take them out, leaving the gravy to stew in the covered saucepan; lard the breasts of the birds with tiny strips of salt pork, and mince a couple of slices of the same with the livers, a bunch of parsley, sweet marjoram and thyme, also chopped fine, the juice of a lemon, pepper, and a very small shallot; make a force-meat of this, with bread-crumbs moistened with warm milk; put some thin strips of cold corned (not smoked) ham in the bottom of the pie, next to the crust; lay upon these pieces of the bird, peppered and buttered, then a layer of the force-meat, and so on, until you are ready for the gravy; strain this, return to the fire, and season with pepper and a glass of wine; heat to a boil, pour into the pie, and cover with the upper crust, cutting a slit in the middle; ornament with pastry leaves, arranged in a wreath about the edge, and in the middle a pastry bird, with curled strips of pastry about it; these last should be baked separately and laid on when the pie is done, to cover the hole in the middle; bake 3 hours if your pie is large, covering with paper if it threatens to brown too fast.

Venison is prepared for the table like beef, veal or mutton, and rabbit and squirrel like fowls, domestic and wild. Game of all kinds is canned by various establishments in the West; and although such goods are not yet known to be adulterated, there is great danger of bad meat being put up occasionally, or of careless canning, as well as of poisoning from the solder of the cans.

To capture game, see Hunting, Guns and Gunning, and Birds.

Game Fowl, a species of the domestic fowl. See page 522.

Gammon, smoked ham; backgammon; humbug.

Gander, the male of the goose.

Gangrene, a putrefying state of an organ or part of a diseased animal. It is the same as mortification. It constitutes the last stage of the most violent kind of local inflammation It arises from the rupture of the local blood-vessels by the congestive action of the inflammation, and consists in the decomposition of the effused blood and the ruptured tissues. The discharge from a gangrenous organ is dark-colored and has a peculiar and very offensive smell. The attendant symptoms indicate sinking, debility, and excessive danger. Gangrene in an important organ is incurable, but external gangrene, arising from a wound or a contusion, may in the case of a horse be successfully scarified, fomented and dressed with digestive liniment, oil of turpentine, or camphorated spirit of wine.

Gape (gap), to open the mouth wide; to yawn; to open as a gap. Gaping, except in some diseased conditions, is indicative of a want of the usual amount of exercise. As to "gapes" in chickens, see Fowl, page 538.

Garden, a piece of ground laid out for the cultivation of fruits, flowers and kitchen vegetables. Fruit-garden is where the small fruits and dwarf-trees are cultivated. A vegetable garden is where the various kitchen vegetables are grown. Although the term is now generally understood to mean either of these,—fruit, flower, or vegetable garden—yet it may be properly applied to other uses, as landscape garden, herb garden, etc.

The situation of the garden with respect to the residence will be found discussed in Landscape Gardening. The various vegetables and fruits of the garden are treated under their respective heads, and in Vegetable Garden, while the flowers may be found in Floriculture.

Garden, Vegetable. This is that very interesting branch of agriculture where kitchen vegetables are cultivated. There are many considerations of importance to be weighed in selecting the location of the garden. The shelter, water, soil, etc., all have an important bearing upon this point, and he who would ignore them will certainly fail of realizing ordinary success as a gardener, or have the pleasure of gathering abundance of excellent fruit or vegetables.

Shelter is, in our climate, a primary consideration. This may in part be derived from the natural shape and situation of the ground. Gentle declivities, as the base of the south or southwest side of hills, or the sloping banks of winding rivers, with a similar exposure, are therefore very desirable. It is a rule that there should be no tall trees on the south side of the garden, to a very considerable distance; for during winter and early spring they fling their lengthened shadows into the garden at a time when every sunbeam is valuable. On the east, also, they should be sufficiently removed to admit the early morning rays. The advantage of this is conspicuous in the spring months, when hoar-frost often rests on the tender buds and flowers; if this be gradually dissolved no harm ensues, but if the blossom be all at once exposed to the powerful rays of the advancing sun when he overtops the trees, the sudden transition from cold to heat often proves destructive. On the west, and particularly on the north, trees may approach nearer and be more crowded, as from these directions the most violent and coldest winds assail us.

The best general exposure for a garden must evidently be toward the south; and a gentle declivity in that direction, equal perhaps to one foot in 30, is deemed very desirable, effectual draining being in this case easily accomplished.

In selecting ground for a garden the plants growing naturally on the surface should be noted, as from these a pretty correct opinion may be formed of the quality of the soil. The subsoil should also be examined. If this be radically bad, such as an iron-till mixed with gravel, no draining, trenching or manuring will ever prove an effectual remedy; if, on the other hand, the subsoil be tolerably good, the surface may be greatly meliorated by these means. In every garden, two varieties of soil are wanted, a strong and a light one, or in other words, a clayey loam and a sandy loam, different plants requiring these respective kinds. For the general soil, a loam of middling quality, but partaking rather of the sandy than the clayey, is accounted the best.

The improvement of the soil naturally becomes an object of great importance at the first formation of a garden; and its subsequent management, or "keeping in heart," as gardeners term it, is a matter of equal interest. A mixture of clay and sand is called loam, and according as the one or other of these earths predominates, the soil is denominated a clayey or sandy loam. When oxide of iron prevails, and renders the clay hard and of a dark brown or red color, the soil is called ferruginous loam, or more commonly till. Boggy or heathy soil consists of ligneous particles, or the decayed roots, stems and leaves of various carices, heaths and sphagnums, and the coaly matter derived from these, generally with a slight mixture of argillaceous earth and sand.

The soil of a garden should never be less than two feet and a half deep; the best gardeners prefer having it fully three feet. The natural soil therefore, however good, is seldom of sufficient depth. If it be not two feet, a quantity of earth from the field is carried in. The cleanings of roads and grass-turf of any kind form valuable additions to garden soil. In the course of trenching, a portion of the subsoil is brought to the surface, and gradually meliorated, but to bring up much of it at once is very injurious. Soil of the usual depth may be trenched two spadefuls deep; and if this be done every third year, it is evident that the surface which has produced three crops will rest for the next three years, thus giving a much better chance of constantly producing healthy and luxuriant crops, and with one half the manure that would otherwise be requisite.

It is agreed on all hands that nothing contributes more to the preserving of the soil of a garden in good condition than exposing it as often as possible to the action of the sun and air. It is a rule, therefore, that garden ground, when not in crop, should regularly be dug rough, or if possible ridged up, and left in that state to the influence of the atmosphere. If it be allowed both a winter and a summer fallow, the oftener a new surface is exposed the better; after it has lain ridged up during winter, therefore, repeated diggings are given in the spring and summer months. Whether some noxious matter be exhaled, or some fertilizing substance be imbibed, or what may be the precise nature of the operation that goes on, we do not here inquire. The fact is certain, that aeration, as it is sometimes called, is of the greatest advantage to garden soils. A common reason why farmers of moderate means have not had better kitchen gardens is that they have not learned how to cultivate them at little expense. Going through once a week, to keep the crops clean, and in the best growing condition, could not be performed by hand. Many are imitating the practice of the large market gardens, and do the work by horse labor, and with the drill, plow and cultivator. There are a few crops that need planting in beds, and a small portion of the garden may be devoted to these. All the rest may be arranged for horse work. The great advantage here is that no care or skill is required in laying out. All that is needed is a turning ground at each end, 12 feet wide, for the horse. This may be a smooth grass walk. Rows of currant, gooseberry and raspberry bushes and dwarf fruit trees may occasionally extend across the garden parallel with the rows of vegetables. After the plants have a fair stand the horse will do nearly all, and the garden may be kept cleaner than ever before at a tenth of the cost. By passing once a week, and keeping the ground constantly mellow the crops will make a fine growth.

To have a deep, rich, sandy loam on a slope toward the south or the east, protected from the violent winds of the southwest, with good under drainage, seems to describe in general terms about all the essentials of a good situation for a vegetable garden. When one cannot have such a situation exactly, the nearer he can come to it the better. The two greatest faults in this respect in the West are flat, undrained ground and a poor, washed-out hillside. Valley lands are so low that frosts are apt to injure the crops. On the north and west sides it is well to have a high board fence or a very high hedge and a curtain of trees outside. As to walks and ornamental arrangements, see Landscape Gardening: see also Drainage. As to plowing, digging and subsequent cultivation, of course it is very important that it be all done when the ground is comparatively dry and perfectly friable. Ridging on an extensive scale is done by back furrowing with the plow; sub-soil plowing is done by one plow, longer geared, following another, geared short; trench plowing is done by having the second plow with a longer mold-board, to throw the earth up high; spading is generally done by taking two thick slices; the spade-slice should not be thicker than half its length.

A good appendage to a garden is a small garden house, in which to keep garden pots, compost for choice plants, tools when not in use, to do indoor work during rain, etc., etc.

A pit is a sunken frame-work covered with glass, protected by shutters or mats, for wintering half hardy and tender plants, and for blooming roses and other

flowers earlier and later in the season than would be practicable in the open ground. It may be partially filled with leaves from the woods, sawdust, sand or spent manure well pulverized. It should have light, and a little air admitted about noon of every bright winter day that is not very cold. Keep mice and insects out of it. It may be divided into compartments, to suit different plants.

A garden frame is a movable box having glass for the upper side like a hot-bed and can be set over a hot-bed or elsewhere as occasion requires; in the latter case it is a cold bed, and may be in the sunshine or in the shade. For the construction and use of the Hot-bed and Cold Frame see articles on those subjects.

For the collection of kitchen slops, etc., to make liquid manure, a hogshead pitched on both sides and sunk into the ground is the best thing; it is called a tank. A tight cover should be kept upon it.

A hillside garden can scarcely be made too rich by over-manuring; and a yellow clay or very sandy soil can receive to advantage a mixture of all kinds of manure, as decaying animal matter, guano, poudrette, stable manure, green crops or rowen, swamp muck, leaf mold, plaster, lime, ashes, kitchen slops, and the fertilizers, as salt, phosphites, etc., etc. A cold clay soil, such as characterize our flat Western prairies, need sand and the fertilizers. It being composed of burnt grass, which has been accumulating for ages, it serves as a basis for corn, wheat, hay, and other plants of the grass order, rather than for root crops and fine garden vegetables. Salt is especially recommended for the soil, as it is so effectual in destroying insects.

In the selection of varieties, the following principles are of some value: The globular form for cabbage heads and the turnips are better than other forms; the egg form is an improvement upon the heart-shaped in roots that have not yet been brought to better forms; in rutabaga, the obtuse egg form is considered the best; of cabbage, the heart-shaped for early and the cheese form or globular, for winter cabbages, and of lettuce the screw and the globe form are regarded as the best; carrots should be of an orange color instead of light lemon; beets should not be streaked with white; and yellow turnips are richer and sweeter, other things being equal, than white. As in general farming, rotation of crops should be observed, except that onions do better continued on the same ground. Some crops are so favorable to the growth of weeds that if continued long upon the same ground the labor of cultivation is much increased. Crops planted continually in the same soil are more subject to the ravages of insects peculiar to the crop planted. Different plants derive their principal nourishment from different depths of soil. Deep-rooted plants, as beets, carrots, parsnips, etc., should be followed by the shallow-rooted—onions, lettuce, cabbage, etc.

In the saving of garden seeds for next year's planting, it is best to select those of the middle part of the cropping season; those which are earliest matured tend to bring forth earlier fruit, but smaller, while those latest matured tend to produce later and deteriorated crops. Hence, we are apt to let our stock of beans and peas degenerate by saving for seed only those latest ripened. Some of the products of planting improper seeds are supposed to be new varieties, but they are debased, or in some way undesirable; as, for example, "early peas," which are late and unprolific, or "six-weeks beans" that in sixteen weeks may possibly ripen a scanty and scattering crop. Likewise the biennial vegetables, as the turnip, cabbage, beet and carrot are made sometimes to go to seed the first season, and thus a tendency in the wrong direction is established. The climate also has an influence to deteriorate those plants not natural to it; for example, heavy oats cannot be long raised in a hot, dry climate; cabbages become leathery and worthless; radishes mere sticks, etc. If lettuce seed is sown too late in the spring the heat of summer will prevent its heading finely.

It is more important to obtain seeds of good stock than seeds that are certain to grow. There is also some risk in depending upon seeds raised in private or market gardens from which vegetables are gathered for use or sale; so that it is best to obtain them from seedsmen of reliable character.

To prevent deterioration in the garden, vegetables of different varieties of the same species should be planted at a distance from each other, else they will mix, as cucumbers, melons, pumpkins, squashes, corn, etc. See Varieties, Fertilization and Fertilizers.

In sowing very fine seed, it is better to mix it with sand or ashes so that it can be scattered more evenly over the ground; a tablespoonful of cabbage seed, for example, might be mixed in a half bushel or peck of sand or ashes. The time of sowing and planting varies according to the nature of the vegetable and the period at which it is desired to bring forward the crop for use; for example, we want early peas and later, and there should therefore be several sowings of them. Those vegetable crops intended for winter feeding to cattle, and those of the same kind intended for the table, should not be sown at the same time, a large crop being the main object in raising the former, and excellence chiefly desirable in the latter. All crops for winter use should be sown late enough to avoid the summer heat upon the half matured crop; those intended for feeding to cattle as early as possible, consistently with indispensable rules; while those for table use should be deferred to as late a period as may in any way consist with the probability of their maturing before winter.

Whenever root vegetables, having attained one-fourth to one-half or more of their ordinary growth, experience a check from any cause, it is almost impossible to start them anew so as to obtain either handsome or well-tasted roots; they will in general be either hollow or stringy and necked, or have an alkaline taste, or all of these may combine to render them worthless for the table and of but little value for any purpose. Even if the check occur while they are quite small they are scarcely ever recoverable.

It is therefore necessary so to time the sowing the winter root crops as to carry them clear of the summer heat well into the autumn, that they may just attain their growth before freezing weather sets in. In a well cultivated garden it is generally safe to allow about 12 weeks for the growth of winter vegetables, counting from the time that their third leaves are about an inch long; though turnips, or bush beans for salting, will be ready for use in a shorter time.

As to the depth of sowing, the best general rule is just deep enough to be in constant moisture, and the nearer the surface this is, the better. Small seeds must always go on the surface and merely raked in lightly. In dry, hot summer weather it is needful to plant deeper than in early spring.

As to transplanting, of course one can raise a little larger and better plants if he sows the seed in the first place where he wishes the vegetables to grow to maturity; but this method is altogether too tedious where transplanting will do nearly as well. The tap-rooted plants, as beets, parsnips, carrots, etc., cannot bear transplanting well, and it is therefore needful to sow them thick in their final place and afterward thin them out; but the fibrous-rooted plants, as cabbage, tomatoes, sweet potatoes, etc., bear transplanting so well that we can take advantage of the fact and economize both time and labor by starting them in beds and transplanting them to the open ground at the proper time.

The final transplanting should leave the plant a little deeper in the ground than it was in the seed-bed. To put out the plants rapidly and well, it is advised to use the dibber. Holding several plants in the left hand, with the right hand make a hole of the proper depth with the dibber, set a plant in, and then with the dibber strike down about two inches away, and directing underneath the plant as if to take it up, bring the dibber into a perpendicular position in such a manner as to crowd the earth up to the plant, from the bottom up. After little practice one will be able to set out five to ten plants to the minute. Water the plants as they are set out. Then watch for cut-worms and other insects, and hoe within two or three days after setting the plants out, to keep up a good circulation in the surface of the ground.

Ridging is often remunerative, especially in wet grounds, or in ordinary good ground during wet seasons, if only, in the latter case, a dry enough time can be improved before the wet weather sets in. Where land is valuable and time cheap, one can do many things that would not otherwise pay; and deep ridging is one of these things. What we mean by deep ridging, is a ridge of earth that is made loose and mellow down to a considerable depth. Many ridges are carelessly made by drawing loose earth up over a ridge of unbroken ground. For large plantings level cultivation is best. Hilling is about the same as ridging so far as the plant is concerned, with these few small advantages: more thorough tillage is given, more new earth brought to the roo ts, and in case of pole beans, one pole will serve for several vines. With most vegetables the hill should be flat and low, with the earth a little higher a few inches distant from the plants, as if to guide the rain-water toward the plant.

By a little ingenuity two crops in one season can be raised on the same ground, sometimes together, as corn and pumpkins, or potatoes with corn in alternating rows, or winter crops of turnips, cabbage, radishes, celery, etc., on ground which in the first part of the season was occupied by early peas, beans, radishes, greens, etc. Beets, carrots and parsnips can be alternated with onions, and vegetables of many kinds can be raised between the rows of small fruit, etc. But in general the crops will be somewhat smaller than the average unless the ground is of extraordinary richness and well managed.

Bedding of plants is the first transplanting, when the young shoots are set only two or three inches apart, or at such distances as will prevent their being drawn up and weakened by crowding one another, as well as to afford them room to form good roots. Then, when the time for final transplanting arrives, they will have a mass of small fibrous roots which will hold together a quantity of earth,—a great advantage in their favor.

Potting is a second removal of the plant before setting it in the open ground. This process is followed especially with the egg-plant, the tomato, etc. After they have grown in the pot until the earth in it is about full of their roots, they are taken from it by carefully turning the pot upside down with one hand, catching the earth with the other hand, with the plant extending between the fingers.

Grouting is the drawing of the roots of plants, from which the earth has fallen, through soft, thin mud, made by mixing good, rich soil with water, to which cow dung may be added.

Hoe often and deep, is the motto of the successful gardener; but refrain from watering, except in extreme cases where it is necessary to keep the plants alive. Instead of watering a little and often, water only in extreme cases of dry weather, and then give a thorough soaking every week or ten days, in the evening, with rain or pond water.

Plant lice are more apt to attack sickly or poorly cultivated vegetables; hence a cultivation that keeps the vegetable a strong grower is one of the best preventives. Showering with tobacco water, or strong brine, or sowing dry ashes or slaked lime or plaster is still recommended as effectual in many instances.

The striped cucumber bug, the jumping beetle and the turnip bug cannot be certainly exterminated by any proposed remedy, but only temporarily disturbed by the lime, ashes, dust, sulphur, soot, snuff and sand so often recommended. Vigorous cultivation of the vegetable is the only, at least the best, preventive.

The pea bug or weevil is avoided to some extent by selecting those varieties of the pea which it does not greatly infest. Scalding the peas slightly just before planting, or soaking them until they sprout, or planting only two-year-old peas, keeping them in tight barrels and sifting out and destroying the weevils in the

spring or summer of the first season, are methods for destroying the pea bug.

The squash bug has to be caught by hand in the cool of the morning and killed.

The cucumber borer has to be disposed of by destroying him and the vine altogether, by scalding or burning.

The cut-worm must be hunted up individually early in the day, by his usual signs of a cut leaf and wilted plant, and dug out and killed.

The hop worm should be treated to an occasional shower bath of soap-suds or solution of whale-oil soap.

The root worms of the turnip, radish and onion are to be destroyed by scalding or burning of the diseased plant. Preventive: timely sowing and good culture.

Moles and a few insects not mentioned above sometimes do a little harm to western gardens, but so little it is scarcely worth while to combat them.

As to further details in the art of vegetable gardening, see the articles on the respective plants in their alphabetical order in this volume. See also Floriculture, Landscape Gardening, Transplanting, etc.

Garden Seeds. In the raising of garden seeds, the most important/item to look after is the stock. Not only the best variety, but even the best strain and the best developed in each should be selected. The next thing is to keep allied species and varieties so far apart in the field that they cannot mix. Especial care must be taken with vines, as pumpkins, squashes, melons and cucumbers seem to surpass all other vegetables in mixing, and a very little mixture of pumpkin spoils a melon. Cabbages, turnips and radishes will cross to some extent and become deteriorated; so will the different varieties of corn, carrot, onions, celery, lettuce and potatoes. Bush beans, peas, parsnips and tomatoes are not very susceptible to mixture. A high, tight fence between two varieties is a pretty good protection against crossing, but it is safer to have allied varieties a quarter or a half mile apart.

The vitality of seeds prepared for keeping is more frequently injured by excessive drying than by any of the ordinary accidents to which they are liable. All dealers in seeds, especially grass seeds, have to complain of this. When damp they will not keep, and are generally put on the top of a kiln to dry off the external moisture; but if the process be suffered to go beyond this, and the natural moisture of the seed is much trenched on, it will be as white and fine and full of farina as before, but it will not grow. Onion and other seed kept over the year loose in drawers or in paper parcels will not vegetate. When kept in this way, even for a few weeks, onion seeds have been known to lose in weight more than an ounce in the pound. Most gardeners have noticed that after a long continuance of hot, dry weather the best of seed will either not germinate at all or will do so very weakly. These facts prove that seeds are much injured by the drying action of the air; and when set aside for preservation in our cool climate, they should be excluded from the air as much as possible, and not exposed in vessels pierced with holes for the admission of air, as is commonly done.

In the selection of seed from year to year, the earlier and better developed are the best, as such a choice tends in a general way to improve the stock. We must give a short notice of each vegetable in detail.

Bean. Seek a thrifty crop, and in no case save as seed the scattered pods left from a crop used for the table. Sort over and pick out all imperfect seed.

Beet. Set out early in spring, in deep, rich soil, and as it commences to grow, break off all seed stalks but the main one from the center of the crown. The seed does not ripen evenly, but when the earliest are ripe the stalk may be cut, and after curing a few days all is ready to thresh, which is very rapidly done with a flail. Beet seed in this climate is liable to blast in unfavorable seasons, and since sound seed will remain good for several years, careful gardeners keep a two-years' supply on hand. Don't store it away till it is thoroughly cured and dried.

Cabbage. Select large, hard heads on short stumps, with few loose leaves, and these should be kept over winter with special care, free from frost. As soon as the seed-pods turn purple, cut, and cure by spreading it thinly over a tight floor or cloth; when thoroughly cured thresh out and clean.

Cauliflower seed is too difficult to raise in this country.

Carrot. Treat the same as beets, except that, as the seeds ripen unevenly, the heads must be cut from time to time as they ripen.

Celery. Same as carrot.

Corn, Sweet. When the milk of the kernel begins to thicken, pick the best ears, braid together by their husks, and hang up in a good place to dry. Do not shell until it is wanted for use.

Cucumber. Unless mere earliness in the character is sought for, pick off during the growing season all imperfect fruit, so as to throw all the strength of the vine into the few favored specimens saved for seed. When the latter are dead ripe, but not quite soft, take out the seed with the pulp, let it stand three days, and wash them by stirring them in cold water and pouring the water from one vessel into another; thus the imperfect, or lighter, seeds will be poured off with the pulp. With the use of very clean, white sand the seeds may be washed immediately, without the three days' fermentation. Let the seeds in either case remain spread out until dry as a bone, and then put up in paper packages.

Egg Plant. Peel and slice the fruit, squeeze the seed from each piece into a tub of water, and then pour from one vessel into another, as with cucumbers, never allowing them to ferment. Dry them rapidly or they will sprout.

Lettuce. Select seed from plants which remain longest without running to seed. When ripe enough to shell out, cut, gather upon stout sheets, and thresh with a flail, and winnow by the wind or a fan.

Melon. About the same as cucumber seed, only they need to stand but 24 to 36 hours.

ONION. In cultivation, hill up the stalks as high as the bulb, which not only preserves moisture in time of drouth, but also supports the stalk under the weight of a heavy seed-head. When a few of the seed vessels of any head begin to crack open, it should be cut with a few inches of the stalk and spread in an airy place, not more than four inches deep, and stirred several times a day. Or they might be spread upon lattice-work, and elevated a little, so that the air can circulate freely underneath. In three or four weeks, when thoroughly cured, it can be stored away until convenient to thresh and clean, which is easily done with flail and fan. When the fan does not clean perfectly, sink the seed in water, pour off the chaff with the water, and dry thoroughly the good clean seed which sinks to the bottom.

PARSNIP. Same as beets.

PEAS. These are always buggy in this climate if sown early, and if sown late they are inferior in quality; hence we get our seed from Canada.

RADISH. Plant early, so the seed may ripen during the heat of summer; cull out the sprouts and mongrels; when the seed-pods are thoroughly ripe and dry, cut and thresh out, and after a little more drying, they are ready to put up. It is best to have seeds from radishes which have been for generations American grown and acclimated.

SQUASH. Summer squash may be treated the same as cucumbers, but winter varieties are better kept stored until mid-winter.

SPINACH. Same as lettuce.

TOMATO. Start the plants early, in a hot-bed, with room enough to be stocky, transplant at least twice before removing to the field, select for seed the earliest and best, and then treat as cucumbers. Only they need to ferment but one day.

TURNIP. Store the roots as beets and save the seed as of cabbages. American seed is better than English.

Gardener, a person who performs the routine of work or has the professional management of a garden or of any piece of garden scenery. Gardeners are as different in their qualifications as farmers. A gardener, at one extreme of his profession, may be little more than a spadesman or a day-laborer, and at the other he may be a designer of parks, boulevards, landscapes around State or National buildings,—indeed, a professional artisan of high distinction. One grand attraction of this business is that, while honorable, delightful, and eminently favorable to the highest order of intellectual enjoyments, it may be followed by those of the most limited means. Literary men, philosophers and nearly all truly great men would rather pass their leisure hours working a garden than at anything else.

Garget, a disease in the udders of cows, arising from an inflammation of the lymphatic glands; a disease in hogs, indicated by staggering and loss of appetite; a name of the poke-weed.

Gargil, a distemper in geese, which affects the head and often proves fatal.

Gargle, to wash or rinse, as the mouth or throat, particularly the latter, while the liquid is prevented by an expulsion of the breath from descending the throat; also the liquid itself.

An excellent gargle for sore mouth and throat can be made of sage and privet leaves, 1 handful of each, about half as much golden-seal root and bark of sumac root; boil in 3 or 4 pints of water down to 1 pint, strain, and add 1 tablespoonful of powdered alum and about ½ a teacupful of honey. This is an excellent gargle for ulcerated sore throat, sore mouth, and salivation from mercury. An excellent gargle is made by dissolving chlorate of potash in water; or take some of the crystals in the mouth and let them dissolve.

Garlic, a plant of the onion family. It has been cultivated in Europe since the year 1551, but is very moderately used in this country. The leaves are grass-like, and differ from those of the common onion in not being fistulous. The stem is about two feet high, terminated by a head composed principally of bulbs instead of flowers; the flowers are white, and furnished with tricuspidate stamens; the root is a compound bulb, consisting of several smaller bulbs, commonly denominated cloves, enveloped by a common membrane. Garlic has a strong, penetrating odor and pungent acrid taste. It differs from the onion only by being more powerful in its effects. In warm climates, where garlic is produced with considerable less acrimony than in cold ones, it is much used, both as a seasoning and as a food. When bruised and applied to the skin, it causes inflammation and raises blisters. In the south of Europe, particularly in Spain, it is very much used, entering into the composition of almost every dish, not only among the common people, but among the higher classes of society, and it is everywhere prized by epicures. At all times, however, it has experienced much contrariety of opinion, and has been adored by some nations and detested by others, as by the ancient Greeks. Its cultivation is easy, being a hardy plant, growing in almost every kind of soil, and it is produced by planting the radical or floral bulbs. Plant the bulbs in rich soil, in rows or in ridges fourteen inches apart, and six inches apart in the rows.

Its medicinal virtues have also been much celebrated. It not only forms an excellent expectorant, but has been administered in a great variety of diseases, as hysteria, dropsy, croup, worms, nervous and spasmodic coughs, cutaneous eruptions, obstructions, etc. It may be given in the form of syrup, tincture, or in substance, but the best way to use it when fresh, is to express the juice and to mix it with syrup or other proper substances. The juice of garlic mixed with sweet oil, or stewed in sweet oil and then strained and squeezed out, is one of the very best remedies for deafness, as well as for ear-ache. In cases of the latter a little laudanum should be added. A few

drops upon a warm teaspoon, and dropped into the ear, is the way it is used. The ear should then be stopped with cotton. In cases of severe spasmodic croup, a poultice of garlic, or garlic and onions, prepared by first roasting them, will always give immediate relief, if not effect a cure. A little lobelia (tincture or powder) mixed with the garlic poultice will make it more efficacious. The poultice should be applied warm on the throat or upper part of the chest.

The juice of garlic is a strong cement for broken glass or china. Snails, worms and the grubs or larvæ of insects, as well as moles and other vermin, may all be driven away by placing preparations of garlic in or near their haunts. The virtues of garlic are most perfectly and readily extracted by spirit of wine.

Garnish, to decorate. In cookery many dishes, especially of meats, are garnished with salads, as celery, parsley, lettuce, onion, horse-radish, peppers, pepper-grass or cress, mustard, etc.

Gas. Sometimes persons from the country, retiring for the night at hotels or residences in a town or city, blow out the gas flame instead of turning it off by a little faucet, always fixed near by for the purpose, and endanger their lives. Many persons have thus smothered themselves to death by such a mistake. If the faucet is not tightly closed, the gas continues to flow out into the room unburnt, and in an hour or two smother all life that may be present. A hint to the wise is sufficient.

Gasoline (gas'o-leen), a most volatile form of kerosene and correspondingly more dangerous to handle near a flame. For light and heat it is superior to kerosene.

Gastric, pertaining to the stomach. Gastric juice is the fluid poured out by the stomach into the food which is present, to aid in digestion. Pepsin is its chief element. Dys-*peps*-ia literally signifies a lack of action of the pepsin. Gastric fever, or gastritis, is inflammation of the stomach. The gastric juice does not act indiscriminately on all substances, nor is it the same in all animals, nor does it continue always of the same nature, even in the same animal, changing according to circumstances. It acts with a chemical energy in dissolving food, attacking the surface of bodies and uniting to the particles of them. It operates with more energy and rapidity the more the food is divided, and its action is increased by a warm temperature. The food is not merely reduced to very minute parts; its taste and smell are quite changed; its sensible properties are destroyed, and it acquires new and very different ones. This fluid does not act as a ferment; it is a powerful antiseptic, and even restores flesh already putrified.

Gastritis, inflammation of the stomach. Gastritis, however, does not include the effects of mechanical distension of the stomach, or the irritating action of poisons, acrid substances, or improper food, but is simply idiopathic inflammation of the stomach's mucous surface. This disease sometimes occurs in the horse, yet is generally so combined with enteritis and so closely similar to that disease in symptom, as to be very difficult of detection. A horse attacked with it loathes his food, is extremely restless, evinces great distress, lies down and suddenly rises, has fits of cold perspiration, and seems to suffer prolonged pain after swallowing any food; and he must, in all outward respects, be treated in the same manner as for enteritis, but must receive no internal remedies except such as are eminently sedative.

Gate. A gate has the same relation to a field or other enclosure which a door has to a house; and ought to combine the properties of a good fence with strength, durability, convenience of situation, and the utmost facility of opening and shutting.

Many gates are either so slight as to be easily overleaped, broken through or thrown down; many are so ill-hung and ill-latched that some horses and horned cattle can successfully assail or even readily open them; many are so ill-constructed or feebly poised that they soon decay, or become rickety, or cease to be easily opened and shut; and many are so inconvenient or otherwise so exceedingly faulty as to accomplish very imperfectly, or scarcely at all, the designs of their erection. Nearly all farmers have been more or less plagued with bad gates, and are aware how grievously they occasion injury to land and crops from the trespass of cattle; and they must therefore be glad to know that perfectly good gates differ from abominably bad ones far less in the costliness of either their materials or their workmanship than in the mere skill with which they are constructed.

A gate which is little used, or is commonly kept locked, or cannot conveniently be held open when wanted, may be hung upon hooks or pivots perpendicular to each other, so that it may stand at rest on any line whatever; but a gate which is merely latched and which serves as a part of a fence of a grass-field or a cropped enclosure, ought to be hung on hooks or pivots which give it one determinate line of rest in the direction of the latch, so that, whenever it is opened, it may have a self-shutting action. The carelessness of farm-hands and others, who would rather leave a gate open than take the slight trouble of shutting it, admits of no efficient corrective except to give the gate the power of shutting itself; and any disadvantages which might occasionally result from that power can easily be counteracted by means of either a temporary prop-stone or of a permanently sunk stone with a simple hook or latch on its summit.

Gate-posts ought to be so firmly set in the ground as to resist all tendency to decline from their perfectly upright position. The constant weight of the gate tends to pull the hanging-post inward; the fall of the gate and its frequent infliction of blows in shutting, tend to drive the falling-post outward; and the passing of heavily laden wagons or other wheeled vehicles near the posts tends to disturb the foundation of both posts. A slope of the ground adjacent to the gate-posts, whether the slope be natural or artificial, tends to make them nod in the direction of the slope,

so that the posts of a gate across the ridge or summit of a hill are liable to decline outward, the posts of a gate across the bottom of a hollow are liable to decline inward, and the posts of a gate across a terrace-road upon the face of a declivity are liable to decline, the one outward and the other inward, both stooping in the direction of the declivity. The opposite effects of scorching heat and intense cold, of excessive rain and extreme drouth, aided by the shaking action of vehicles passing along the road, also sink the ground around the settlings, and tend to work the posts toward the natural descent of the surface. These changes from the original position of the post causes the gate to sag. The first object therefore, in constructing a good gate, is to prevent as far as possible its sagging, either by setting in at the bottom a brace from the hinge post to the latch post, which should be at least five feet in the ground, and another within a few inches of the surface of the ground, or by setting the hinge post deep and solid, letting it run eight or ten feet high—the higher the better—and then bracing it backward with a common fence wire, doubled, so that it can be tightened by twisting. One end of the wire is fastened to the top of the hinge post and the other to the bottom of a fence post, or a post set for the purpose, about 20 feet away. The size and style of a gate should depend on the purpose for which it is designed. Most farm gates, however, should be wide enough to admit loads of hay and grain, and for this purpose 12 feet is not too wide, and it will also permit the passage of the wide harvesters now becoming so common.

It is not uncommon for farmers in making large gates to brace them improperly. One frequently sees gates braced as shown by Figure 1. Neither is it uncommon to find them braced as in Fig. 2, and occasionally one may be seen braced as shown by Fig. 3. Now, it may readily be seen that the full power of the brace, as intended, is not obtained. Gates thus constructed will be found sagging in a short time. Nor can they ever be patched up so they will not sag. The proper way to brace a gate of these forms is as shown in Fig. 4. By these illustrations it may readily be seen how a gate should be braced. The cuts themselves, though simple, will forcibly illustrate the right and wrong way to brace a gate. A gate communicating between a field and a public road ought to be comparatively high. Such a gate may properly enough be made double, in the manner of folding doors, and may have its suspension hooks placed exactly perpendicular to each other, so as to make either part of the double gate remain at rest in any one line whatever of the great arc it describes in opening. A gate of communication between field and field is preferred by some persons to be light and high, and by others to be low and heavy; and it is recommended by many to be about 4½ feet high, in order that it may serve as a good fence against horses, having its top rail as high as their wind-pipe, and allowing them to put their head over it, and not provoking them to push or force it with either their breast or their rump. When wood is used for posts, any coarse kind, whether soft or hard wood, which is unfit for other useful purposes, may in most instances be sufficiently good. When stone is used, a single pillar-piece of granite, compact greenstone, or any other hard crystalline rock is best, and if the gate be hung on the front of it, the bands of the hinges, instead of being indented into the stone, ought to be carried through to the opposite side, and there fixed by a bolt or a screw nut. When timber is used for the gate itself, spruce is unsuitable on account of its great liability to break; larch is unsuitable on account of its powerful tendency to warp, and if some kind of soft and cheap wood must be employed, the least objectionable is cedar, but the best, in all respects, is Western catalpa and white oak, not too tough and entirely free from sap. All the mortises of the gate, and the parts at which the uprights and diagonals cross the bars, ought to be carefully coated with white lead; and when the parts of the gate are joined together, the whole ought afterwards to receive two coats of paint.

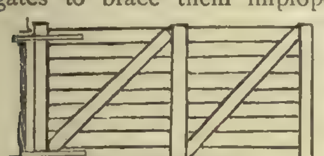


FIG. 1.—*Improperly Braced.*

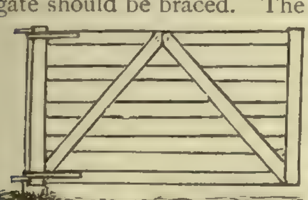


FIG. 2.—*Improperly Braced.*

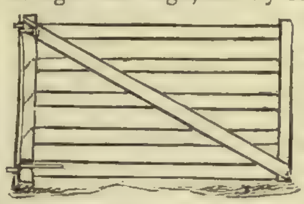


FIG. 3.—*Improperly Braced.*

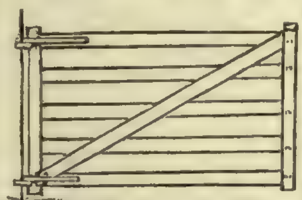


FIG. 4.—*Properly Braced.*

A strong farm gate may be made by taking two pieces of 3x4 scantling 5 feet 6 inches in length, for ends, five boards 1x6 inches, 12 feet long, for bars, and a hard-wood piece 2x4 inches, 12 feet long, for a top bar, and a 16-foot fence board to cut for a brace. Mortise the bars into the end pieces, and fasten with pins or bolts, putting the hard-wood bar on top with the edges, or 2-inch surfaces outward, to give strength; put the brace diagonally across the gate, from the bottom at the hinge, or back end of the gate, to the top, at the front, cutting it to fit against the ends, and under the top bar, and fastening to the other bars with bolts. The gate will be strengthened by bolting a 1x6 board square across the center. In "laying out" the gate, mark for the bottom board, leave a 4-inch space, mark for the second, a 5-inch space, mark for third, a 6-inch space, for fourth, a 7-inch space, for fifth and an 8-inch space for the top bar. Hang the gate well, with strong hinges, let the top one go through the post, and fasten it with a nut.

Fig. 5 represents a gate which is opened and

closed by running a wheel of the vehicle in which one is riding against a double-crank bar just above ground, one on each side of the gate at the distance of 15 to 20 feet. The gate is shown complete with all its appurtenances, and the method of gearing, or principle of action, is shown separately, in three parts. It is one of the most popular of all "self-opening" gates. Some trouble was formerly experienced with these in times of deep snow, by their filling up with water and freezing, etc., but these difficulties are now principally overcome. *Fig. 1* shows the gate in position, *Fig. 2*, the attachments to the gate-post, and *Fig. 3*, the lever that swings the gate. A and A′ are double cranks, against which a wheel of the vehicle is driven, coming from either direction; this action, through the rod B or B′, is communicated to the hinge end of the gate at G and H, which draws the gate back, from the latch post E toward the hinge post F, suffi-

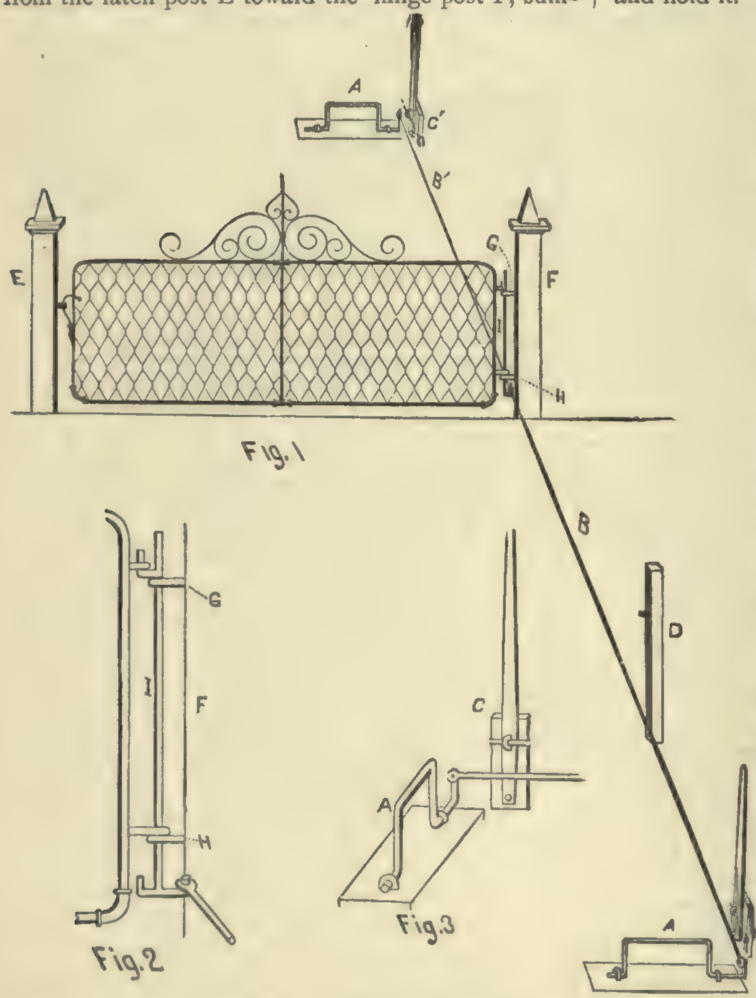


FIG 5.—*Self-Opening Gate.*

ciently to unlatch it, and at the same time inclines the gate so that it swings open. The vehicle striking the elevated portion (shown in Fig. 11) of the other double crank, reverses the position so that the gate swings shut and fastens itself by a spring latch. Whether the gate be opened or closed, one portion of each double crank projects upward and the other lies flat.

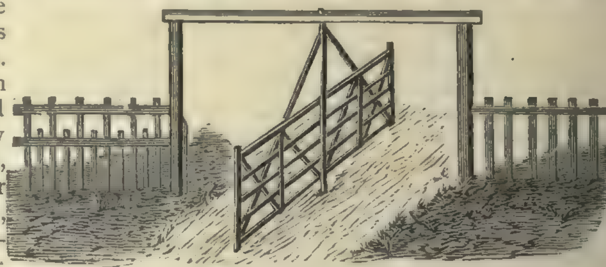


FIG. 6.—*Double Hingeless Gate.*

The post D is to catch the gate when it swings open and hold it. The letters in the detached parts correspond to those in the connected view.

A cheap, hastily constructed and useful gate may be made by bolting the end and middle cross-pieces upon the bars, dispensing with a brace, and hanging it by the second bar from the top, on a pin that passes through and between two posts, or by two cross-pieces. This gate has the advantage of sliding backwards and forwards, making it easy to operate in close quarters.

STOCK GATE. On farms where there are many cattle to be driven to and from pastures, a double hingeless gate, as shown by Fig. 6, will be found very convenient. Two high posts are set in the ground about 20 feet apart, and a scantling is put on, which extends from the top of one post to that of the other. A 2-inch hole is bored in the center of this scantling, and a similar hole in a block of wood that is planted firmly in the ground in the center of the gateway. The middle post of the gate frame is made round at each end to fit these holes, and this post is the pivot on which the gate turns. Those who have driven a number of cows (say 100) through a gate, know that it is a task that takes a good deal of time. With this gate one cow cannot block the passage; besides, there are no leaning of gate-posts, as the weight of the gate is wholly upon the block in the center.

WOOD AND WIRE GATE. Fig. 7 represents an excellent wood and wire gate. To make it, obtain 3 uprights, 3 inches by 1½ inch, 5½ feet long, and 4 strips, 3 inches by 1 inch, 11 feet long. Cut shoulders in the ends of the strips, and saw out correspond-

ing notches in the uprights. Make these 1½ inch, or half the width of the strips. The bottom notch is 2½ inches from the end of the upright, and the upper one 9½ inches from the top end. Fit the strips into the notches. There is then a space of 1 inch between the strips, into which put inch strips, so as to make all solid, and fasten together with carriage bolts. Braces 3 by 1½-inch are inserted, and held in place by bolts or wrought nails. Bore as many holes in the end pieces for ¼ inch eye-bolts as it is desired to have wires. Twist the wire firmly into the bolts on

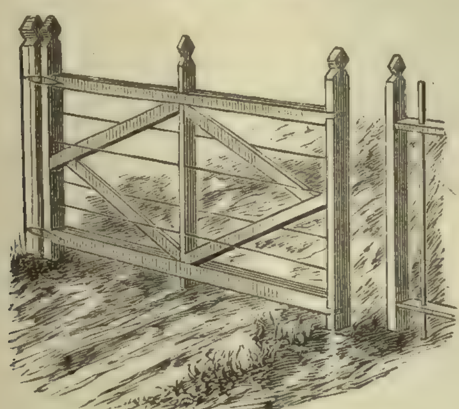


Fig. 7.—*A Neat Gate of Scantling and Wire.*

one upright, and secure the other ends to the corresponding bolts on the upright at the opposite end. In stretching the wires, pass them alternately on opposite sides of the center piece, and fasten in place by staples. This will, in a measure, prevent warping. By screwing down the bolts with a wrench, the wires may be drawn as tightly as desired. The hinges are to be put on with bolts, and any sort of fastening may be used that is most convenient. Barbed or smooth wire may be used. This is a neat gate, and being light, does not sag badly.

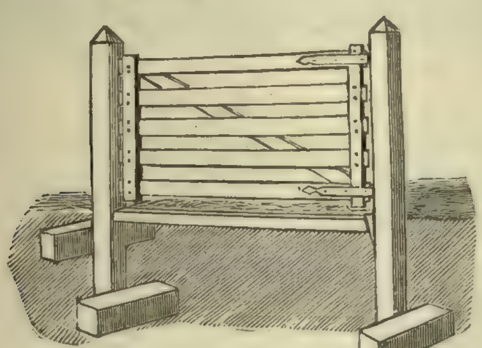


Fig. 8.—*A Substantial Farm Gate.*

Fig. 8 represents a very useful design. It can be constructed entirely of inch boards (fence boards) and 3¼-inch bolts; and any farmer can build it. An excellent method of fastening the bottom of the posts to keep them from leaning, is also shown in the engraving.

Wire Gates. Very beautiful as well as substantial gates are made of wire, woven or otherwise worked into various patterns. Fig. 9 is a model of a standard

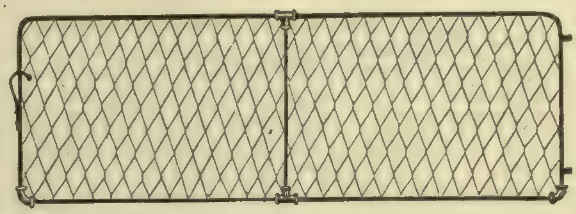


Fig. 9.—*Wire Farm Gate.*

wire farm-gate, and Fig. 10 is a cut of a yard or lawn-gate, and also illustrates the method of putting up a wire fence from the roll.

Gate-hinges ought generally to be greased about once a month,—which chore will be more likely attended to if some grease is kept at hand enclosed in an auger-hole in the post.

The gate represented by Fig. 9, as well as those of Figs. 10 and 11, are made by Sedgwick Bros., Richmond, Ind. By Fig. 11 we illustrate one of the

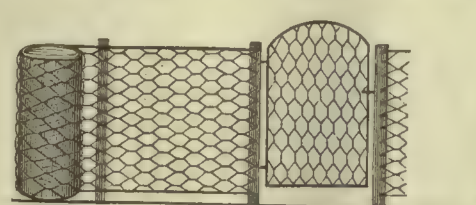


Fig. 10.—*A Wire Lawn Gate.*

latest improved self-opening made by Ewald Over, Indianapolis, Ind.

Lawn Gates. On the subject of lawn and garden gates, etc., there is such diversity of taste and opinion that they are difficult to treat in detail. A farmer, mechanic, or banker, in constructing his hedges, fences or fancy gates, can have his choice from among the hundreds of different styles that at the present time are turned out from the factories, the same as sash and doors, and at a much less cost than they can be obtained elsewhere. The prices of these place them within easy reach, and, while no good business farmer will dispense with a sufficiency of well made, well kept gates, so no man of taste will allow his front yard to be disgraced by a slovenly gate, stile, or bars when a tasteful and ornamental gate is so easy to get.

For a gate that is much used in winter, and liable to be blocked with snow, many varieties of hinges are made, one of the best being an inch bar of iron 5 feet 8 inches long, with 7 inches of each end bent at right angles to the rest of the bar, which is straight. Bore two holes through the hinge head of the gate, from the

back, 4 feet 6 inches apart, insert the bent ends of the bar, and draw up with the nuts until the bar is within about two inches of the head. The parts of the hinge which go through the post are made of iron of the same size, with a round hole in one end of each, through which the bar will pass easily, and a nut on the other to fasten them securely to the post. Bore the top hole through the post at such a height that when the hinge is inserted the top angle of the bar will rest on it and leave the gate hanging at the proper distance from the ground; now bore the hole for the bottom hinge about three feet below the top one. A sliding iron block with a set screw, on the bar between the two post hinges, and the apparatus is complete. The features which principally recommend this style of hinge are, first, its strength and durability; secondly, the ease with which it can be raised, by means of the block and set screw, to a height of 18 inches above its usual position, thus enabling it to pass clear of the accumulating snow. The best materials for gate-making are hard wood for the top and end pieces, and pine boards 1x6 for the rest, and bolts with nuts should always be used instead of nails.

FIG. 11.—*Self-Opening Gate.*

Gathering, the rolling of grain swaths into cocks; the picking of part or whole of a crop of fruit from fruit-trees; the collecting and lifting of unearthed potato or other roots in the drill; the picking up of stones, weeds, or other injurious substances from the surface of the land; the pulling of flowers and the collecting of them into a bouquet; and any one of several other simple rural operations of aggregating a number of individual objects by hand.

Gauze, a very thin, slight, transparent stuff of silk or linen.

Gavel (gav′l), a sheaf of grain or flax not bound.

Gear, clothing; harness or trappings of beasts of burden; a toothed wheel or wheels, in machinery; running gear, the wheels and axles of a vehicle and their attachments, in distinction from the body.

Gearing, harness; connections in machinery for communicating motion. The terms "bevel-gearing," "frictional gearing," "belt-gearing," "spur-gearing," "valve-gearing," etc., are self-explanatory. A "gearing chain" is an endless one, with regular projections like those of a rack, passing like a belt around toothed wheels, and transmitting motion between them.

Gelatin (jel′a-tin), the "jelly" element of animal tissues. It abounds in many of the solid parts of animal bodies, particularly in the skin, the membranes, the tendons, the cartilages and the bones. It readily dissolves in boiling water; it forms a hydrate or solidifying solution, which, when passing from the solving heat to the ordinary temperature of the atmosphere, becomes a tremulous, semi-transparent jelly; and so great and diffusive is its power that a single pound of it will solidify or gelatinize 100 pounds of water. The presence of so much water causes the jelly readily to liquefy on the application of heat, and the gelatinizing power of the gelatin causes it readily

to re-solidify on the return of cold; so that the jelly may many times be alternated between the liquids and the solid conditions, and still retain its characteristic properties. But when the jelly, or any hydrate of gelatine of tremulous consistency, is kept for some time, it acidulates and putrefies; while jelly reduced to a perfect solid state by the expulsion of its water by means of gentle heat, becomes a hard and brittle mass, and may be kept for any length of time without undergoing decomposition or change of properties.

Isinglass, which is made of the air bladders of fishes, when of the best quality, is pure, or nearly pure gelatin, and the purest found in commerce, glue being mixed with fatty and other matter, which are dissolved in combination with the gelatine, and all the jellies of cooks and confectioners being more or less affected with either natural admixtures or artificial admixtures, or both. It used to be taken as food, but was found to be too concentrated an element to be digestible.

Geld, to castrate, or deprive of testicles.

Gelding, the act of castrating; a castrated animal. A gelded (or gelt) horse is sometimes distinguished as a "gelding," or simply "horse," while an uncastrated horse is a "stallion," or "stud-horse;" a castrated bull is a "steer" or "ox;" a castrated boar is a "barrow;" a castrated ram is a "wether;" a castrated cock (rooster) is a "capon;" and a castrated man is a "ennuch."

Gems, Graham: see page 135.

Generation. The time when the phenomena of reproduction first exhibit themselves in animals is termed puberty. Then the reproductive organs, which previously were but slightly apparent, acquire a remarkable development, and in some species obtain certain external characters which remain during the whole course of their lives. Infancy is the period comprised between birth and puberty. It is during the time preceding puberty that the growth of the body chiefly takes place, although it may continue for some time afterward. The length of the period of infancy bears to that of life a certain relation, which may be regarded as almost constant. At the age of puberty, the mammalia assume the characters of maturity. Their height attains its greatest limit, and the distinctive marks of each animal become bold and well-defined. The physiognomy assumes a more animated expression; their voice becomes hoarser or stronger, and the fur handsomer; while the vivacity of their movements marks the impetuosity of those passions which animate them at this epoch. The male becomes distinguished from the female by colors which are commonly darker or browner, and in many species by certain definite external characters. Thus, some male apes acquire a beard and a coat of longer hair; the lion obtains a mane; and stags and roebucks are armed with branching horns, of which the females are nearly always deprived. He-goats and rams are at once distinguished from the females by their horns, their masculine gait and combative disposition. This superiority in the males is most marked among the ruminantia, which are commonly polygamous, and where, each male having several of the other sex to keep in subjection, it becomes necessary to assign him a physical superiority, unnecessary in the monogamous species, where the sexes are always more equal in strength.

Puberty constantly exhibits itself much sooner in females than in males, although the reproductive power remains longer with the latter than with the former. In our climates man attains this condition at the age of fifteen or sixteen and woman at the age of fourteen or fifteen; in warmer climates, it exhibits itself at the age of twelve to fourteen in the former, and ten to twelve in the latter. Dogs are capable of reproducing at the age of nine or ten months; cats from a year to eighteen months. A lioness of the menagerie at Paris was six years old when she exhibited these phenomena for the first time. Rabbits can procreate at the age of five or six months; hares a little later; and guinea-pigs at five or six weeks. Horses produce at two years and a half and mares a little sooner. Camels, according to the ancients, at three years; wolves at two years; cows at eighteen months; bulls six months later; the she-ass from eighteen to twenty months, and the ass two years. It is, however, the interest of the farmer to prevent the domestic animals from procreating before they have attained their full growth. There are certain seasons of the year when most mammalia become susceptible of the instincts of reproduction. This is termed the rutting season, during which the usual character of the animals is totally changed, especially the males. The most timid animals, being excited by the abundance of food and the internal suggestions of instinct, acquire a degree of courage and even fury, which urges them on in a career of madness, which can be compared only to the habitual ferocity of the most formidable species. The females also, at this period, lay aside their habitual reserve, and are seen to provoke the males by biting, teasing, and following them everywhere.

The external signs of the rutting period vary greatly with the several species. In those which are capable of procreating at all seasons, such as man, the monkeys, dogs, cats and horses, no particular sign is observed. It is different with the rodentia. We find, likewise, that all those odoriferous mammalia which are supplied with pouches from which the odors emanate, emit their odors at this time with unusual force. In the great number of animals belonging to the deer genus, and in several antelopes, the larynx or windpipe of the male projects considerably; and it cannot be doubted that the change of tone which his voice undergoes is owing to this cause. It usually happens that the female exhibits the external signs of the rutting season in a milder and more subdued form than the males. Among the mammalia, and indeed in all living beings, the period of puberty and reproduction is one of energy and strength; and all their affections become more ardent and their wants irresistible.

The term rut, from *ruere*, to rush headlong, serves to illustrate the fury which transports these lower animals. Alike ferocious and untamable, they are susceptible at this period neither of fear or any other passion, and seem deaf even to the calls of hunger or sleep. The bull leaves the meadow and rambles everywhere in search of his mate. The forest resounds with the howling of contesting wolves, and the lion, with a deafening roar, defies his rival to the combat.

We may easily perceive the final cause of these contests among the lower animals during the rutting season. Nature ever sacrifices the interests of individuals towards the perfection of species. The most vigorous males always possess the most formidable weapons of attack and defense, while the more effeminate individuals exhibit their feebleness at once in their horns and their want of courage. It is especially among the polygamous races where these combats of the rutting season are more conspicuously observable, because each male fights for several females. In the monagamous species, on the contrary, where the number of the sexes are nearly equal, these battles seldom occur. Again, in the carnivora, when the number of males surpasses that of the females, duels become both frequent and sanguinary. The seals are, perhaps, more polygamous than any other of the mammalia. Each maintains a kind of seraglio or family, composed, perhaps, of one hundred and twenty females, which he defends from the approach of any other male with the utmost jealousy and rage. Other species, less faithful or more complaisant, pass from conquest to conquest, and pay their court to all the beauties of the neighborhood.

The duration of this season varies with different species, but, in general, among the wild animals, it ceases as soon as the females have been fecundated. With most of the latter, the external signs of the rut immediately disappear; the females assume their usual reserve, and repel with rudeness the approaches of the male. There are exceptions in the monkeys, the mare, and in our own species. The female rabbit is likewise an exception, though only an apparent one; as from the peculiar formation of the matrix, she is susceptible of a two-fold impregnation or superfœtation. In some species of domesticated animals, especially in the dog, copulation is maintained for a long time after the emission of the fecundating fluid; whilst among the greater part of the birds, especially in the Gallinæ, the union is instantaneously dissolved. It is always wrong in the former cases to force a separation, which is sometimes attempted, although opposed by the peculiar organization of the sexual organs; the intention of Nature apparently being, by this extraordinary prolongation of the union, to render conception more certain. After conception, as has already been observed, the females, in general, repel the approaches of the male. In all cases where the races are peculiarly ferocious, as in the lion, tiger, panther, and other large cats, the females are the first to solicit the approaches of the male. Had this not been the case, it is difficult to conceive in what manner their races could have been continued. In species of a milder disposition, the males endeavor to please the other sex, and often exhibit a strongly-marked feeling of jealousy toward their own. The monkeys remain attached to one or two females, rarely to more. Their union seems to be a kind of marriage; they require fidelity, are exceedingly jealous, and severely punish their female companions, who are well-disposed to coquetry, on finding them in company with other males. See Gestation.

Gentian (jen′shen), a medicinal plant of Europe. The root has a yellowish brown color, a very bitter taste, and much used in stomach bitters, and to some extent in other medicines, both for man and beast. The several species of gentian in this country are not so good for medical purposes.

Genus (je′nus; plural, gen′er-a), the next natural grouping above species. Each genus comprises one or more species. See Species.

Germination, the act of sprouting; the beginning of vegetation in a seed or plant; also, the time in which seeds vegetate, after being planted or sown.

Gestation, the time during which a female, who has conceived, carries the embryo in her uterus. Among birds and all other oviparous animals, a real gestation can not exist, because the eggs detach themselves from the ovaries as soon as they are grown, and are deposited. With these animals, gestation becomes superseded by incubation, to which it is generally analogous, and the former functions may thus be considered as little else than an internal incubation. The apparent design of nature, in both cases, is to favor the natural development of the embryo or fœtus, the first rudiment of the new animal resulting from conception. It is also observed that the rapidity of growth in the fœtus, whether during the gestation of the viviparous animals or the incubation of the oviparous, always diminishes in proportion as the fœtus approaches the time appointed by nature for its birth. The length of the period of gestation, like that of incubation, varies greatly among the several genera and species. It further obtains certain accidental variations, which appear to depend upon the age of the mother, her state of health, an increase or diminution in the velocity of the circulation, the quantity or quality of the food, and all those causes, derived from the influence of climate, soil, shelter, and the different kinds of treatment which these animals receive from the hand of man.

The period of gestation may also be either shortened or prolonged, according to the temperature which prevails during that interval. It is a matter of common observation among graziers, that two cows, though fecundated on the same day, will yet produce at an interval of several weeks. The variation among sheep under similar circumstances amounts to a few days, but in general this difference among domestic animals of the same species may extend as far as 20 days. It commonly happens in all those species

where the individuals take a long time in arriving at their full growth, that the period of gestation is considerably prolonged; and the converse is equally true, for in all those species which are very precocious, the time of gestation is extremely short. This rule is not, however, without many exceptions. Thus, the goat and sheep are capable of reproducing at the age of two years, and have commonly attained their full growth at this period, while their ordinary time of gestation is about five months.

The duration of gestation seems further to depend upon the comparative volume of the species; this rule, however, is by no means invariably preserved. Thus, the ass and zebra, though less in volume than the cow and buffalo, employ less time in performing this function than the latter species.

It hence appears that the duration of gestation varies in different animals, and the empirical laws deduced from multiplied observations are not without many exceptions. By combining, however, the general organization of the mammalia with the time necessary for each animal to arrive at its full growth, as well as with the comparative bulk of the females, it is possible to obtain a general and definite result; while the characteristics thus obtained may, with propriety, be added to those which commonly serve to distinguish the leading groups of mammalia. Thus in man, nine months is the well known period of gestation. Among the quadrumana it is also nine months for the larger species, but only seven for the smaller. In the carnivora, gestation endures six months with the bear; 108 days with the lion; nine weeks with the Arctic fox; from 55 to 56 days with the cat, the same period with the martens and weasels; from 62 to 63 days with the dog.

Those mammalia which experience the shortest term of gestation are unquestionably the animals belonging to the order marsupialia. Among the large kangaroos, for example, the young are scarcely more than an inch in length when they first attach themselves to the breasts of their mother, although the full-grown animal is at least five feet in height. Gestation is also of short duration in the rodentia, being only four months in the beaver, one of the largest animals of this order. It is still less in the smaller rodentia, being from 30 to 40 days in the hares and rabbits, 31 days in the dormice, four weeks in the squirrels and rats, and three weeks in the Guinea pig. Among the pachydermata, gestation is of much longer duration; it endures with the elephant from 22 to 23 months; it lasts from 11 to 12 months with the horse and ass; in the zebra, for a year and some days; in the tapir, from 10 to 11 months; in the hog and boar, for four months. Further, it endures among the ruminantia, for 12 months in the dromedary; for nine months in the female buffalo and cow; for eight months and some days in the females of the common red deer and the reindeer; five months and a half for the roebuck; five months for the goat, the sheep, the moufflon, and several antelopes. According to observations of M. Teissier, of Paris, in 582 mares, which copulated but once, the shortest period was 287 days, and the longest 419; making the extraordinary difference of 32 days, and of 89 days beyond the usual period of eleven months. The proper age for reproduction (see Generation) of course varies in the different animals, as well as the length of time they carry their young. The mare is usually bred at four years of age, but should she be kept as a breeder it is more favorable that she drop her first colt at three years old, then rest one year, so as to produce the next colt at five years of age, and yearly thereafter. Most mares will receive the horse on the ninth or tenth day after foaling, and this period should never be allowed to pass over without her being shown the horse. The sow will breed at one year old, the ewe at fifteen months, and the cow at two years old. The usual period of gestation with the cow is between nine and ten months, though with a bull calf the cow will go about 41 weeks, and a few days less with a female. Any calf produced at an earlier period than 260 days is considered premature, and any longer than 300 days is considered irregular. Sheep usually bring forth their young in five. Swine usually farrow between the 120th and 140th day, the variations to which they are liable being influenced by the size and particular breed. The bitch is almost universally regular, whether large or small, pupping occurring about the 63d day. The cat produces either on the 55th or 56th day. For a valuable table on this subject, see breeding calendar, page 144.

The accompanying table will be found quite valuable as giving the proper age of reproduction of all domestic animals and fowls, the length of time they continue to reproduce, the seasons, etc. This, in connection with the table on page 144, will be found very convenient and valuable to the farmer:

Kinds of Animals.	Proper Age for Reproduction.	Period of the Power of Reproduction.	Number of Females for one Male.	The most Favorable Season for Copulation.	Period of Gestation or Incubation. Shortest Period.	Mean Period	Longest Period.
		Years			Days.	Days	Days.
Mare	4 Y'rs	10to12	......	May	322	347	419
Stallion	5 "	12to15	20to30	......	......	......	......
Cow	3 "	10	......	July	240	283	321
Bull	3 "	5	30to40	......	......	......	......
Ewe	2 "	6	......	Nov.	146	154	161
Tup	2 "	7	40to50	......	......	......	......
Sow	1 "	6	......	Mar.	109	115	143
Boar	1 "	6	6to10	......	......	......	......
She-Goat	2 "	6	......	Nov.	150	156	163
He-Goat	2 "	5	20to40	......	......	......	......
She-Ass	4 "	10to12	......	May	365	380	391
He-Ass	5 "	12to15	......	......	......	......	......
She-Buffalo	....	......	......	......	281	308	335
Bitch	2 "	8to9	......	Feb.	55	60	63
Dog	2 "	8to9	......	......	......	......	......
She-Cat	1 "	5to6	......	......	48	50	56
He-Cat	1 "	9to10	5to6	......	......	......	......
Doe-Rabbit	6 Mo.	5to6	......	Nov.	20	28	35
Buck Rabbit	6 "	5to6	30	......	......	......	......
Cock	6 "	5to6	12to15	......	......	......	......
Turkey on Eggs of Hen	......	......	......	......	17	24	28
Turkey on Eggs of Duck	......	......	......	......	24	27	30
Turkey on Eggs of Turkey	......	......	......	......	24	26	30
Hen sitting on Eggs of the Duck	......	......	......	......	26	30	34
Hen sitting on Eggs of the Hen	......	3to5	......	......	19	21	24
Duck	......	......	......	......	28	30	32
Goose	......	......	......	......	27	30	33
Pigeon	......	......	......	......	16	18	20
Guinea Pig	8 Mo.	......	......	......	......	21	......

It is evident that the number of births appropriate to each species will mainly depend upon the average length of each period of gestation. On this account the larger species do not produce each year, especially when a long period of lactation also intervenes. The smallest species, on the contrary, multiply most prodigiously, and it may be generally stated that, if we except the rabbit and hog, both the number of births and the number of young ones at each birth are in general more considerable in proportion as the size of the animal is less. The guinea-pig can produce every two months; the hampsters, the rats, the mice, the field mice and the shrews do not produce less than three or four litters in the course of the spring, summer and autumn. The number of young in each litter also bears an immediate reference to the length of gestation. At each birth, man and the quadrumana commonly produce only one, very rarely two or more, and the cheiroptera bear two. Among the carnivora the tiger produces one; the lion three or four; the cat four or five; the arctic fox from five to seven; the badger from three to four; the mole from four to five, and the seals one or two. Among the marsupialia, the opossums produce from eight to ten, but the kangaroos only one or two. Of the rodentia, the beaver bears two or three at a birth; the rabbit from four to eight; the hampster from five to six; the common rat, the mouse, and the brown rat or surmulot, from eight to ten. The agouti bears four, according to Laborde, or only two according to Buffon and d'Azara. The garden dormouse produces five or six young ones at a birth; the common dormouse three or four. Among the edentata, the sloths produce only one, as also the ant-eaters, while the armadilloes bear four at each of their births, which occur pretty frequently. With the exception of the pig the pachydermata produce but few young at a time; thus the elephant, the rhinoceros, hippopotamus, tapir, and all the horse genus, have only one; the peccary has two, while the pig will bear as many as twelve, and even twenty. All the ruminantia produce two or more, excepting the largest species, which have only one. The cetacea produce, in general, but one young one at each birth. It most commonly happens that the first and last litter of each animal are deficient in number, and often also in strength. It thus appears that the largest and most formidable species are far less fruitful than the smallest and weakest. Not only are the former longer in arriving at their age of puberty, but their periods of gestation and lactation are prolonged, and the number of young at each birth is, in general, less. Thus, while the tiger produces only one cub at a time, the wild-cat will bear four or five. In this manner the lower tribes become extremely numerous; and, but for this surprising fecundity, from their natural weakness, they would quickly be extirpated. The breed of mice, for instance, would have long since been blotted from the face of the earth, were the mouse as slow as the elephant. But it has been wisely provided that such animals as can make but little resistance, should at least have a means of repairing the destruction, which they must often suffer, by their quick reproduction; that they should increase even among enemies, and multiply under the hand of the destroyer. On the other hand, it has as wisely been ordered by Providence that the larger kinds should produce but slowly; otherwise, as they require proportionate supplies from Nature, they would quickly consume their own store, and, of consequence, many of them would soon perish through want, so that life would thus be given without the necessary means of sustenance. In a word, Providence has most wisely balanced the strength of the great against the weakness of the little. Since it was necessary that some should be great and others mean, since it was expedient that some should live upon others, it has assisted the weakness of one by granting it fruitfulness, and diminished the number of the other by infecundity.

The young of nearly all mammalia are born with their eyes closed, and do not open them for several days. The mother cuts the umbilical cord with her teeth, and, even without being carnivorous, devours the membranes or after-birth, as in the cow, the sheep, and many others.

Gherkin, a small species of cucumber used for pickling.

Giddiness, a well-known symptom of numerous affections of the brain and the stomach in man and the lower animals; and thence loosely identified by multitudes of the rural population with some specific diseases of the animals of the farm. Apoplectic affections are sometimes called giddiness. Epileptic affections are more frequently called giddiness, and they, at the same time, bear the popular names.

Giddiness is also very often symptoms of hysterics and dyspepsia. Very little danger attends the complaint unless it be caused by too great a fullness of blood in the vessels of the brain. Should this be the case immediate attention should be given it or it may terminate in apoplexy or palsy. When giddiness arises from some disease it will disappear by the removal of that disease.

In treating giddiness ascertain its cause and remove that. Should it, however, be a primary affection, seated in the head, or is from a disordered stomach, a purgative should be occasionally given. An emetic should be given once in a while if the stomach be out of order. If the brain is the seat of the complaint take a podophyllin purgative. The feet should be frequently bathed, and the circulation equalized.

Gilding. The following is a recipe for a good wash for cleaning gilding: Quicklime, 1 ounce; slack with a sprinkling of hot water; gradually add 1 pint of boiling water so as to form a milk; dissolve 2 ounces pearlash in 1½ pints boiling water, mix the two solutions, cover, agitate occasionally for an hour, allow it to settle, decant the clear, put it into flat, half-pint bottles, and cork them down well. It is used to clean gilding, etc., either alone or diluted with water. It is applied with a soft sponge, and then washed off with clean water.

To Remove Gilding From Old China. Take soft water 8 parts, nitric acid 8 parts, common salt 4 parts, sal ammoniac 1 part. Let it boil; put the china into it, and rub with a stiff brush.

To Renew Gilt Frames. Take sufficient flour of sulphur to give a golden tinge to 1½ pints of water, and boil it in five onions, strain, and when cool apply to the parts that require restoring, with a soft brush; it will come out good as new, when dry.

Gilt, a young female pig.

Gin, distilled spirit, flavored with juniper berries. In machinery, an arrangement for tearing green-seed cotton wool from the seeds. It consists of a cylinder closely set with saws which pass through a grating in an inclined side-hopper, and thus drag off portions of the wool. It is also a machine for raising great weights, driving piles, etc. It usually consists of three long legs or spars, which support a pulley at the top round, over which a rope is passed for elevating the weight.

Ginger, an aromatic root from the East Indies, popular in medicine and cookery. It is a grateful stimulant, allaying pain by expelling foul gases from the stomach, and is often given in dyspepsia, flatulent colic and certain feeble states of the alimentary canal. Good for teas to produce sweats, or rather to flavor hot water so that a large portion can be drank without nausea.

Ginger-Bread: see page 171.

Ginger Pop. To make ginger pop, take 2 ounces best white Jamaica ginger root, bruised; water six quarts; boil 20 minutes; strain and add 1 ounce cream tartar, 1 pound white sugar; put on the fire, and stir till all the sugar is dissolved, and put in an earthen jar. Now put in ¼ ounce of tartaric acid, and the rind of 1 lemon. Let it stand until the heat has attained 70°, or till you can bear your hand in it with comfort; then add 2 tablespoonfuls of yeast; stir well; bottle for use, and tie the corks. Make a few days before it is wanted for use.

Ginseng, a plant native in the United States, the root of which has an agreeable, spirituous and aromatic flavor, and has been used a little in medicine. A few persons have contracted the habit of chewing it, as tobacco. Very popular in China.

Girder, the principal piece of timber in a floor, girding or binding the others together; any beam supported at both ends.

Girdling, the removal of a belt of bark from a living tree, with the design of arresting the ascent of the sap, and in consequence killing the tree. This operation is a common method of effecting clearances in our woods, and requires to be performed early in the spring before the commencement of the annual alburnous deposition. It promptly kills most kinds of trees, yet is sometimes baffled for some years by the sugar maple and the entire-leaved tupelo.

Girl: see Children.

Girth, the circumference of the stem of a tree, of the body of an animal, or of any other member of an organized and living being.

Glanders, a contagious and very destructive disease of the mucous membrane in horses, characterized by a constant discharge of sticky matter from the nose, and an enlargement and induration of the glands beneath and within the lower jaw. This has been considered the most formidable disease with which the veterinary surgeon is called to contend, and been said to form the *opprobrium medicorum* of the veternarian's art. It is communicable to man.

Glass. To Clean Windows and Mirrors. Tie up some finely powdered whiting in a small piece of muslin. Dab it over the glass thoroughly; the dirtier the glass the more whiting will adhere to it. Next smear it evenly with a damp rag, and let it remain till perfectly dry; then rub it off with a leather. This is an easy, clean and thorough plan. If alcohol be used instead of water, it will dry in much less time, and polish the glass better. The corners of the window panes should receive particular attention. Ammonia, in solution, is popular for cleaning windows, and soda, kerosene or turpentine is good to aid in cleaning off paint.

Another recipe for cleaning mirrors is to take part of a newspaper, fold it small, dip it in a basin of clean, cold water, and when it is thoroughly wet squeeze it out as a sponge, and then rub it hard over the face of the glass, taking care that it is not so wet as to run down in streams. After the glass has been well rubbed with wet paper, let it rest a few minutes, and then go over it with a fresh newspaper, till it looks clear and bright, which it will do almost immediately. The inside of windows may be cleaned in this way, and they will look brilliantly clear.

To Restore the Color of Window Glass. Window glass constantly exposed to the action of the sun and rain soon deteriorates, as the potash or soda which it contains combine with the carbonic acid of the air. A whitish opaqueness is the result of this action. To restore the pane to its original clearness, rub it with dilute muriatic acid and then clean with moistened whiting. It is said that glass in an extreme state of decomposition may be restored by this means.

To Clean Bottles. Chop up a potato very fine, put it in the bottle with warm water, and shake rapidly until clean. Some use shot and soda, but the potato is the most effectual. Castor bottles can be washed by filling them one-third full of rice and adding warm water. Shake them well and they will be cleansed thoroughly. Bottles and phials that have contained medicine may be cleansed by filling each one with ashes, and immersing them in a pot of cold water, then heating the water gradually till it boils. Afterwards rinse them in soap-suds, then in clean water.

Glassware can be placed in hot water without being broken or cracked, if it is put in edgewise and turned rapidly over a few times.

To Clean Glass Globes. If the globes are much stained on the outside by smoke, soak them in tolerably hot water with a little washing soda dissolved in it; then put a teaspoonful of powdered ammonia in a pan of lukewarm water, and with a tolerably hard brush wash the globes till the smoke stain disappears; rinse in clean, cold water, and let them drain till dry; they will be quite as white and clear as new globes.

To Mend Broken Glass. Dissolve shellac in alcohol to about the consistence of molasses, and with a thin splinter of wood, or pencil brush, touch the edges of the broken ware. In a short time it sets without any heating, which is often inconvenient. It will stand every contingency but a heat equal to boiling water.

Another: A colorless, transparent cement to mend glass can easily be made by dissolving isinglass in spirits of wine. Add a little water and mix gently, over a moderate fire.

To Keep Glass from Breaking when Suddenly Heated. Glass is a very poor conductor of heat, and when hot water is poured suddenly into a tumbler or goblet, it is almost certain to break unless the glass itself is quite warm. Tepid water should be first used, or a little cold water poured into the glass, on which the hot water may be poured. Lamp chimneys frequently break when first placed over the light, especially if taken from a cold room. The proper remedy is to turn up the lamp by slow degrees; this will gradually heat the glass and prevent breaking.

To Remove Glass Stoppers. Rub a feather dipped in oil round the stopper, close to the mouth of the bottle; place the mouth of the bottle towards the fire, about two feet from it. When warm, strike the bottle lightly on both sides, with any convenient wooden instrument, and take out the stopper. Or, a cloth wet in hot water, and applied to the neck, will cause the glass to expand, and the stopper may be removed.

To Break Glass in Required Shape. Dip a piece of worsted thread in spirits of turpentine, wrap it round the glass in the direction required to be broken, and then set fire to the thread, or apply a red-hot wire around the glass; if it does not immediately crack, throw cold water on it while the wire remains hot. By this means glass vessels that have been broken may often be fashioned and rendered useful for a variety of purposes.

To break a glass bottle or jar across the circumference—place the bottle in a vessel of water to the height where it is designed to break it; also fill the bottle to the same level. Pour coal oil inside and out on the water. Cut a ring of paper fitting the bottle. Saturate with alcohol or benzine so that it touches the oil. Pour also some inside the bottle. Set on fire. The cold water prevents the glass from heating below its surface, while the expansion caused by the heat will break the vessel on the water line.

To Cut Without a Diamond. Scratch the glass the shape you desire with the corner of a file or piece of hard stone, then, having bent a piece of wire to the same shape, heat it red hot, and lay it upon the scratch; sink the glass into cold water just deep enough for the water to come almost on a level with its upper surface, and it will break smooth at the line made. With care, a piece of quartz can be used as effectually as a diamond.

To Drill Glass. Glass is drilled by the use of diamond dust or by friction. It is also done by wetting an ordinary drill with petroleum or benzine; turpentine will answer, though not as well; it will then bore common glass nearly as rapidly as steel. If it is intended to bore through, the glass should first be countersunk on each side with a very flat three-sided pyramid. Flint and plate glass are very difficult to bore. It is stated that at Berlin, glass castings are drilled, planed and bored like iron ones, and in lathes, etc., by the use of dilute sulphuric acid.

Glass-Eye. This abnormal condition of the eye of the horse consists in dilatation of the pupil, uninfluenced by light or darkness, and is occasioned by paralysis of the optic nerve and its ultimate expansion.

Glauber's Salt, sulphate of soda; a very common and useful purging salt. See Epsom Salt.

Gleaning, collecting the refuse of the harvest.

Gloves. The simplest and most successful method for cleaning kid gloves is to take a pint of naphtha, wash your gloves in it as if it were water, rubbing the parts soiled most. Wash two or three times in clean fluid, according to the needs of the soiled gloves. The usual care should be taken, as the fluid is highly explosive.

To Prevent Injury from Perspiration. Apply ordinary corn starch (dry) to the hands before drawing on the gloves. Pulverized soap-stone will answer the same purpose.

To Remove Stains from Gloves. Stains may be removed from the most delicately colored gloves by suspending them for a day in an atmosphere of ammonia. Provide a tall glass cylinder, in the bottom of which place a small quantity of aqua ammonia. Be careful to remove from the sides of the jar any ammonia that may have been spattered there. Suspend the gloves in the top of the jar, by the stopper. They must not come in contact with the liquid.

Glucose, a chemical combination of sulphuric acid and starch, which to most persons has a sweetish taste and in a measure takes the place of sugar. Made in large factories, as it is, it necessarily has in it such poisonous substances as free sulphuric acid, chlorides of tin, calcium, iron and magnesia, sulphate of iron, copperas, or lime, in quantities less or greater. Even perfectly pure glucose is not as sweet as cane sugar, the difference being that one pound of the latter will sweeten as much as two and a half pounds of the former. Glucose is being introduced largely into all the sugars and sirups of commerce, and its manufacture is being rapidly increased every year. The dealers hold out to the farmers the inducement that the price of their corn will be greatly enhanced by its conversion into glucose, and of course they are very ignorant or

incredulous concerning its effect upon human health.

Glue, a tenacious cement, principally used by cabinet-makers, joiners, book-binders, case-makers and hatters. The substances from which glue is made are the shreds or parings of hides; the ears before they are immersed in the tanners' vats; the cullings and raspings of horn from the comb-maker and the button-maker; the hoofs and horns of oxen, calves, and sheep from the butcher; the pelts of the hare, rabbit, beaver, etc., from the hat-makers, beaver-cutters, and furriers; and the parings of vellum and parchment from the white leather dresser, glover, etc. These substances are indiscriminately mixed together and are purified from all grease and dirt by a digestion in lime water, the greatest care being taken to remove every piece that is in the slightest degree putrescent.

To Prepare Glue for Family Use. Crack up the glue and put it in a bottle. Add to it common whisky; shake up, cork tight, and in three or four days it can be used. It requires no heating; will keep for almost any length of time, and is at all times ready for use, except in the coldest weather, when it will require warming. It must be kept tight so that the whisky will not evaporate. A tin stopper covering the bottle, but fitting as closely as possible, must be used.

A Strong Glue That Will Resist Moisture. Dissolve gum sandrac and mastich, of each ¼ of an ounce, in ¼ pint spirits of wine, to which add ¼ ounce spirits of turpentine. Take strong glue, or that in which isinglass has been dissolved; put the gums in a double glue pot, add the glue by degrees, constantly stirring it over the fire till the whole is well incorporated; strain it through a cloth, and it is ready for use. It may now be returned to the glue pot, and ½ ounce very finely-powdered glass added. Use it quite hot.

Strong Isinglass Glue. An ounce of best isinglass dissolved in a pint of water. Strain the solution through a piece of cloth, and add to it a proportionate quality of the best glue, which has previously been soaked in water for 24 hours, and a gill of vinegar. After the whole of the materials have been brought into solution, let it once boil up, and strain off the impurities. This glue is adapted for any work which requires particular strength, and where the joints themselves do not contribute toward the combination of the work.

Liquid Glue. Take gum shellac, 3 parts by weight, caoutchouc (India rubber) one part by weight. Dissolve the caoutchouc and shellac, in separate vessels, in ether, free from alcohol applying a gentle heat. When thoroughly dissolved, mix the two solutions, and keep in a bottle tightly stopped. This glue resists the action of water, both hot and cold. Pieces of wood, leather or other substances, will part at any other point than where joined. Or, take a bottle two-thirds full of best common glue, and fill up the bottle with common whisky; cork it up, and set by for three or four days, and it will dissolve without the application of heat.

It will keep for years, and is always ready to use without heat, except in very cold weather, when it may need to be set a little while in a warm place, before using.

To Prevent Glue from Cracking. Add to the glue a very small quantity of glycerine, the quality modified according to circumstances.

To Keep Glue From Souring. Put in a little muriatic acid and it will preserve glue in good condition for a long time. It will neither dry up nor ferment. Liquid glue is made in this way, and sold in bottles. The use of a small portion of the sugar of lead will also prevent fermentation.

Glume, the husk and chaff of wheat and grain plants.

Glut, in mechanical work, a large wooden wedge used in splitting timber.

Gluten (glu′ten), the viscid, tenacious substance which gives adhesiveness to dough. It may be separated from the flour of grain by a current of water, the starch and other soluble matters being thus washed out. Gluten consists of glutine, vegetable fibrine, and caseine, with sometimes a fatty substance. The darker and more nutritious portion of wheat grain is that which gives Graham flour its dark color. Good wheat flour contains from 19 to 24 per cent of gluten. The wheat of warm climates is much richer in gluten than that of colder regions. It is owing to the large quantities of this substance in Italian flour that paste made with it is sufficiently tenacious to be drawn out into vermicelli. Of all vegetable substances gluten appears to be the most nutritious.

Glutton, is a term used by some horticulturists to denote those "water-sprouts" or "suckers" which especially grow upon diseased or over-pruned apple-trees; a very appropriate designation.

Gluttony. As the stomach was never intended to do all the work that ignorance of a depraved appetite so commonly provides for it, the exquisitely perfect machinery soon gets out of order from excessive eating, which is in fact at least as mischievous, if not actually more so, than excessive drinking. If we could see the effects of the former—the crowd of diseases, the myriad ghosts of those who die early, and all the varied horrors which are so frequently associated with deaths and diseases,—we should cry out as loudly against gluttony as we now do, and justly, against drunkenness. Temperance in eating and drinking is, when combined with the judicious selections of food and drink, the real source of health, and those are wise who know this and act upon their knowledge. Happiness consists more largely than many people imagine in eating and drinking wholesome things in proper quantities. The process of digestion ought always to be easy and pleasant, and it is not a bad old rule always to finish a meal before the food has lost its relish. The kind, quantity, and quality of a man's ailment ought to bear a just proportion to the strength of his constitution, the amount of exercise he takes, and the condition of his digestive organs. If he can

immediately after dinner write, or walk, or go about his ordinary business or pleasure; after supper sleep soundly and rise in the morning free from fever, with no bad taste in his mouth, refreshed and cheerful, he may be tolerably sure that his diet is well regulated, and that he has not exceeded, in eating or drinking, the bounds of temperance.

Glycerine (glis′er-in). This is a colorless, viscid, neutral, uncrystallizable, inodorous fluid, of a sweet taste, is soluble in water and alcohol in all proportions, but is nearly insoluble in ether. It is a product of the saponification of the various fats at one time regarded as refuse. The uses of glycerine are numerous. In medicine it is used as a local application in diseases of the skin and ear, and it is used internally as a solvent for many drugs. It is a valuable preservative for small and delicate preparations, and it has been applied to the preservation of meat. As a household article glycerine is valuable for many uses. Applied to the skin it has a softening and healing effect, and is probably the best application known for chapped hands. In cases of wounds, sores, bruises, burns, etc., it is always a handy and effectual antidote. In surgical cases it reduces the secretion of pus, and never adheres to the surface of the wound, which, until the period of cicatrization, is always clean, and therefore does not require washing. In burns, deep abscesses, fistulous passages and ulcerations, glycerine, combined with appropriate medication, assists the internal treatment very remarkably. It has been found serviceable in itch affections. A good preparation for the skin is a mixture of glycerine and collodion, which is supple and adheres closely to the surface.

Glycerine enters into the manufacture of soaps, ointments, balsam, composition for leather, copying ink, lotions, the preservation of fruit, and into other uses, several of which are mentioned in connection with other subjects in this volume.

Glyster: same as Clyster.

Gnats. The best preventive against these annoying little flies is said to be rubbing spirits of camphor over the face and hands; it is also a cure for their bites and stings.

Goad, a pointed instrument formerly used, especially in the East, for driving oxen.

Goat, a genus of quadrupeds of the order Ruminantia. It is nearly allied to the genus of antelopes on the one hand, and genus of sheep on the other, so that it is difficult to define the distinction between them, though the common domestic goat and sheep are of widely different appearance. A marked distinction is that the horns of the goat are directed upward, backward and outward, while those of the sheep are more or less spirally twisted. Another characteristic is the beard on the chin of the male goat, which is wanting in the sheep. A constant character is the straight line of the face in goats, and the tail of goats is much shorter than that of sheep; another the want of a small bit of fatty secretion between the toe which is found in sheep; another, the strong smell of male goats; and also the difference of the goat from the sheep in temper. The horns and beards of female goats are always smaller than those of the male. Goats are found wild in mountainous countries. The Rocky Mountain Goat or Antelope is a specimen of the wild variety. The Syrian Goat, the Cashmere and the Angora Goats are all noted for the length and fineness of their hair. Great variation in the quantity and quality of the hair results from difference in climate.

The wild species of goat inhabit mountains, near the limits of perpetual snow; and even such of the domesticated varieties as live in mountainous districts continue to climb while grazing, till thirst or the love of home recalls them to the valley. All goats leap with precision on very difficult ground, and love to look over precipices, and to climb to the summits of beetling crags and lofty pinnacles; and when two meet on such a narrow ledge of rock as will not admit of their passing each other, the one lies down and the other walks over its back. They are always in motion, ever in search of new objects, constantly fermenting with insatiable curiosity; and though not disinclined to associate with the animals of the farm or with man himself, they are unsteady in their feelings, and continually prone to break bounds and wander. They are acute in sensation, and far-sighted in vision, keen and delicate in the sense of smell, and wayward, audacious and fearless in disposition, and when grazing or passing from place to place in company with sheep, they always take the lead and allow the sheep to follow. None of the species are large in stature, but their structure is robust and their habits vigilant. The chase of them is, therefore, both laborious and dangerous; for every strange object is seen at a great distance, and if suspicious, avoided by a retreat, which defies the skill and industry even of the most intrepid hunter, and often causes his life to be sacrificed by the dangers of the precipices, the ice, or the animal, driven to despair, bolting down upon him, and plunging both headlong into the abyss. The wild species can mount a perpendicular surface, 15 feet high, at three leaps, or rather three successive bounds of five feet each, if the slightest rugosity will suffer the renewals of impending force, while the original impulse is still sufficient to retain the given direction. Between two perpendicular rocks, close together, they mount by alternate bounds from one to the other. In cases of fear, their voice is a short, sharp whistle, stronger than the chamois; at other times it is a snort; when threatening, it is a broken, spluttering sound, and when young they bleat. The females are attentive and affectionate to their young, and will defend them against wolves and eagles. Goats readily find sustenance in situations where bovine animals, or even sheep, would starve, and are so extremely course in their tastes and indiscriminate in their digestion that they will feed on plants, such as the cowbanes and the spurges, which are noxious to

other animals, on the buds and bark of shrubs and trees, and even on such nauseous and narcotic stuff as manufactured tobacco.

Goats and sheep seem to have been among the last of the geological series of animals which appeared upon earth, so as to have preceded by but a link or two the creation of man. Any remains of them which have been found, like the remains of man himself, occur in such perfectly recent deposits, or in such strictly superficial situations, as to prevent them from being regarded, in any ordinary sense of the word, as fossils. Yet though no fossil goats or sheep have anywhere been found, living goats occur, in a wild state, in three, or perhaps four, of the great divisions of the globe, and living sheep occur, in a wild state, in almost every great portion of the world, with the exception, perhaps, of Australia.

The different kinds of domesticated goats, though exceedingly numerous, and diffused over the greater part of the world, and diversified by the influence of different climates and the pastoral usages of different countries, are easily reducible to a single species. But the different kinds of wild goats, though far fewer in number, and not at all affected by artificial circumstances, exhibit very wide diversities, and require to be distributed into several species. Linnæus regards the domestic goat as an original or underived species; but the vast majority of naturalists, though widely disagreeing among themselves in some important particulars, regard it as a modification of some one or other of the existing species of wild goats.

The domesticated goat, in almost any of its varieties, but especially in the best and most common of them, is an animal of great utility to men, and, if properly treated, would in bleak, bare, mountainous districts be more valuable than even the sheep. Its skin, with the hair on, was probably an extensive and long-continued article of clothing among the ancients, and is still so used by some of the peasantry of the Scottish Highlands, and by many of the inhabitants of Brittany and Normandy. Its skin, in a dressed state, particularly the skin of the kid or young goat, is of great importance in the present day to glove-makers, and is said to be more susceptible of dyes than any other kind of skin. The horns are good material for knife handles. The hair of the woolly and silky-fleeced varieties is a material of great mercantile value for the manufacture of shawls and similar fabrics. But even goat-hair, in general, is of much worth. It was anciently combined with the short fur of other animals, and with vegetable gum or animal glue, for the manufacture of a solid kind of felt which was very long and extensively used in Northern Asia; and it formed a chief material of several sorts of fabrics for wearing apparel in some of the Roman provinces before the time of Constantine and among the Scandinavian tribes of the middle ages. The domestic goat in the north and west of the old world preceded sheep for many ages, and predominated while the country was chiefly covered with forests; nor is there evidence of a wool-bearing animal crossing the Rhine or the Upper Danube till towards the subversion of the Roman Empire. The hair of the haunches, where it is usually thicker and longer than elsewhere, brought a high price from perruquiers in the days of general wig-wearing, and is still used for making the wigs of barristers, judges, and other wigged dignitaries of Great Britain.

The flesh of the goat, and particularly that of the kid, was formerly in great and general request as an article of food, but is at present very generally disliked. The flesh of the adult goat, especially of one somewhat advanced in age, is tough and strong-tasted, yet does very well to be salted and made into bacon, and is so treated in Wales. The haunches of the goat, says Pennant, "are frequently salted and dried, and supply all the uses of bacon; this, by the natives, is called Coch yr wden, or hung venison. The meat of a castrated goat that is six or seven years old, which is called hyfr, is reckoned the best, being generally very sweet and fat. This makes an excellent pastry; goes under the name of rock venison, and is little inferior to that of the deer." The flesh of the kid is so tender and well-flavored as not to be surpassed by that of the best lamb, and is as nourishing as it is delicate. Nothing, therefore, but culpable ignorance or absurd prejudice prevents as brisk a demand for goat's flesh in the markets of mountainous districts as for the flesh of sheep and lambs in the shambles of low and extensive plains.

The suet of the goat is said to make whiter, and in all respects better, candles than that of the sheep or the ox. The milk of the she-goat is light, rich and nourishing; it possesses qualities intermediate between that of the cow and that of the ass, being more serous than the former and less so than the latter; it curdles easily, and makes a very palatable cheese; it has been long extolled as has also been its whey, for its medicinal virtues, and it has yielded freely to the hand in comparatively large quantities and during a comparatively long time.

Goats do well to be confined in yards as pets for children, and form fine subjects for the exercise of the care and the gentleness which all young people, especially in country situations, ought early to acquire for every kind of domestic animal. Goats do well, also, to be tethered to limited spots by the wayside, on patches of waste ground, or in the corners of fields or paddocks to feed upon coarse herbage or redundant grasses for the sake of yielding milk for invalids. But, in almost any other circumstances, they are ill-adapted or not adapted at all to low, enclosed, and well cultivated districts; for besides being far less profitable in such situations than sheep, they overleap fences, browse upon the twigs of hedges, and constantly do considerable damage by their peculiar tastes and habits. In mountainous districts, however, they are of great value, and ought to be in very extensive request. Goats can feed well where sheep would almost or altogether starve, and in many bare, bleak and rocky regions. The domestic goat, like the wild one, thrives on many a plant which would disgust and

perhaps kill other domestic animals; and, like the wild one, too, it easily climbs to the least accessible and the most unpromising acclivities of rocky mountains in search of food.

The goat is but little used in American agriculture. It is often kept about livery stables because it is thought that its peculiar odor has a tendency to prevent disease.

Goiter, a scrofulous enlargement of the thyroid glands at the throat. Take two drachms iodine and one ounce iodide of potassium, to be taken in ten-drop doses each morning before eating. Once a day rub the neck with iodine. The ugly stain may be avoided by putting the iodine into a mortar and pouring in oil of juniper until the mixture will not stain the finger. It does not impair the strength or peculiar properties of the iodine in the least. Rubbing persisted in for months, a few minutes two or three times a day, will generally scatter tumors of this kind.

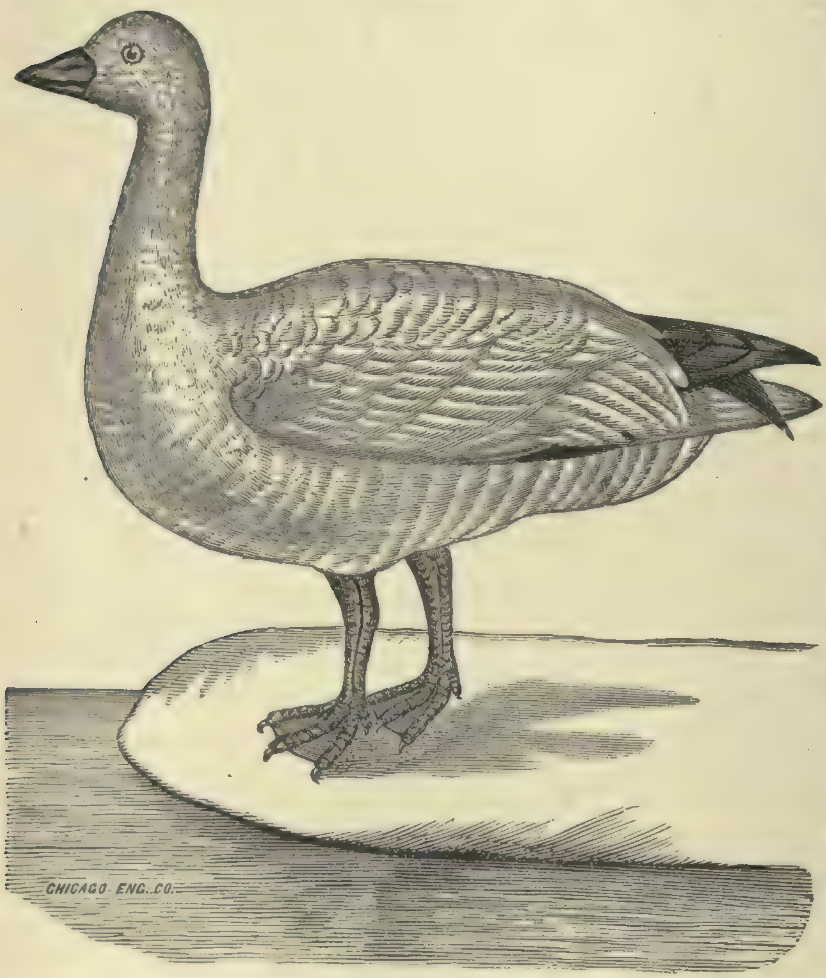


FIG. 1.—*Snow Goose.*

Gold. Gold is valuable, not only on account of its scarcity, which renders it very useful as a medium of exchange, but it possesses some peculiar properties which render it preferable to every other metal for particular purposes. Its great malleability is exemplified in the making of gold leaf, so much employed in gilding. Its ductility and tenacity are shown by the drawing of gold and gilt silver wire, and in gold lace and embroidery. Its softness renders it easy to be worked into various delicate forms for ornaments, for which its beautiful rich color and resplendent luster, which are different from those of any other metal, peculiarly qualify it; and its perfect unalterability, when exposed to the air or fire, has justly stamped its high character in all ages. Its specific gravity is greater than any metal except platinum. Its hardness is greater than that of lead and tin, but inferior to iron, copper, platinum and silver. It cannot be dissolved by any acid except the nitro-muriatic, formerly called aqua regia, and which is a mixture of the nitric and muriatic acids; neither of these acids, separately, can dissolve it; and it is precipitated from its solution in the state of gold powder by an alkali. It forms alloys with most of the metals. These properties render it invaluable for many economical purposes, which are well known; and its never tarnishing, if pure, when exposed to the air, occasions it to be so much used in gilding, on both wood and metal.

GOLD COIN may always be proved if any counterfeit be suspected, by its great gravity of 17.157. Pure gold has a specific gravity of 19.3; the reduced weight of the coin is due to the alloy. Aqua regia is the solvent of gold.

HOW THE VALUE OF GOLD IS ESTIMATED. Goldsmiths usually indicate the purity of gold in the following manner: Perfectly pure gold they suppose divided into 24 parts called carats. Gold of 24 carats therefore means pure gold; gold of 23 carats means an alloy of 23 parts gold and one of some other metal, and so on. The number of carats mentioned indicate the pure gold, and what that number wants to 24, indicates the quantity of alloy.

Gold-Fish. These should be kept in a vessel of such capacity as will allow of at least two gallons of water to each fish, and the water, if of this minimum

quantity, should be renewed every day or two. In renewing, clean the vessel inside with a cloth. The water supplied should be clean and not very hard. These fish need not be fed, as they obtain all the sustenance they need from the water and air. Substances thrown into the water as food only deteriorates that element for their existence. Fresh leaves and growing water plants have a good effect upon the health of the fish.

Goose. The goose belongs to the same family as the duck, but is classed with the genera Anser and Bernicla. The goose, although not mentioned in the Bible, was known by the ancient Egyptians, and other ancient nations. Although apparently a stupid bird, it is aroused by the slightest noise in the night, and the immediate cackling which they begin upon the approach of apprehended danger, is considered as a valuable safeguard. It was held sacred by the Romans on this account, it having alarmed the sentinels of the capitol at the invasion of the Gauls, and thus saved the city.

There are many wild varieties of the goose which make their regular visits to the United States, coming from the Arctic seas and Hudson Bay region. Of these we will treat first, after which the domestic varieties, their care, management, etc.

WILD GEESE. No less than eight well determined species of wild geese inhabit North America; besides these there are four varieties, so that the list of our geese in all include about a dozen fowls.

Barnacle Goose. Some claim that this goose is found on the northeastern coast of the United States, while others think the specimens killed were the White-fronted Goose which, being rare in the East, might have been mistaken for the Barnacle. It is plentiful on the Western coast of England and North of Ireland. It is a very wild kind and difficult to approach by any means. Audubon says it breeds in Ireland, Spitzbergen, Greenland and Lapland. We give an excellent specimen of this bird on this page.

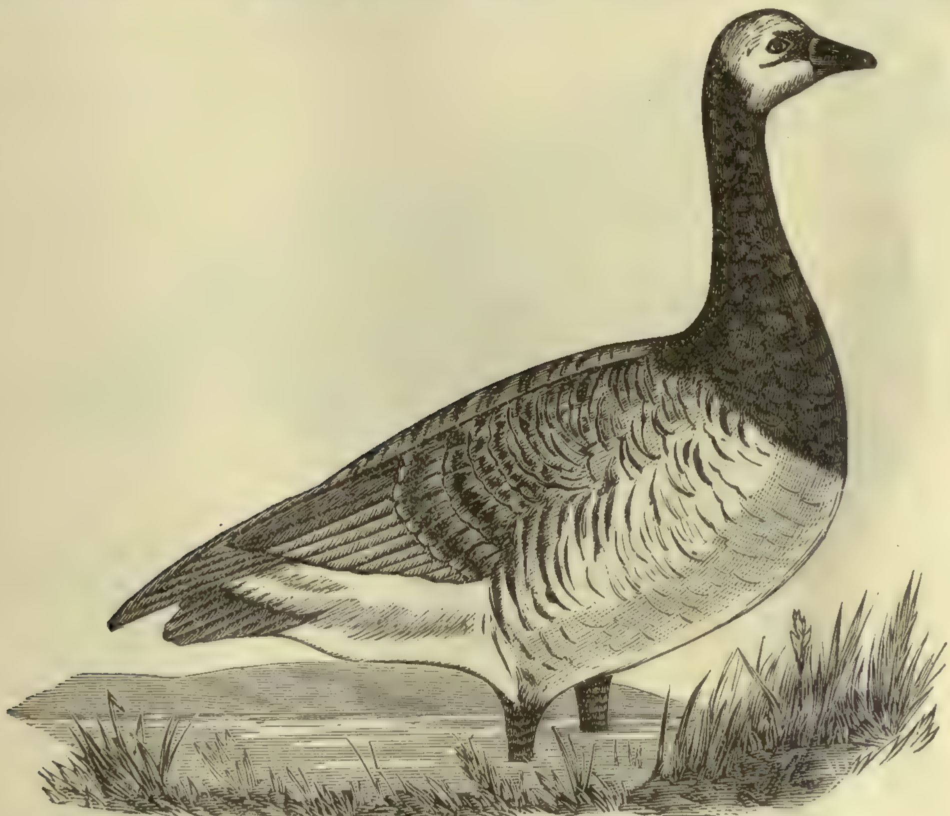


FIG. 2.—*The Barnacle Goose.*

Bean Goose. This species has its home in the north frigid zone, but occasionally wanders as far south as the Lake region. Its beak is rather slender and pointed, its color black with an orange center, the head and upper parts brownish gray, the primaries of a darker hue, both tail coverts are white, the throat and breast are grayish white, and the abdomen pure white. The total length of the bird is about 34 inches. It is most nearly allied to the Barnacle Goose, and is thought by some to be a mere variety of that species. See engraving, page 581.

Brant Goose. The Brant Goose is common on the

eastern coast of the United States, and in very severe winters extends its migrations as far south as the Currituck region, stopping on its journey, and in open winters remaining in the several sounds and bays on the Long Island and New Jersey coasts until spring. According to the severity and mildness of the season, so are their numbers increased and decreased north and south on the Atlantic seaboard to the Carolinas. The common Brant is not known in the West, notwithstanding every bird of the goose family but the Canadian goose is sometimes called Brant by sportsmen of that section of the United States. The misnamed Brant of the West is the White-fronted Goose, on this page. The Brant Goose is strictly a salt-water

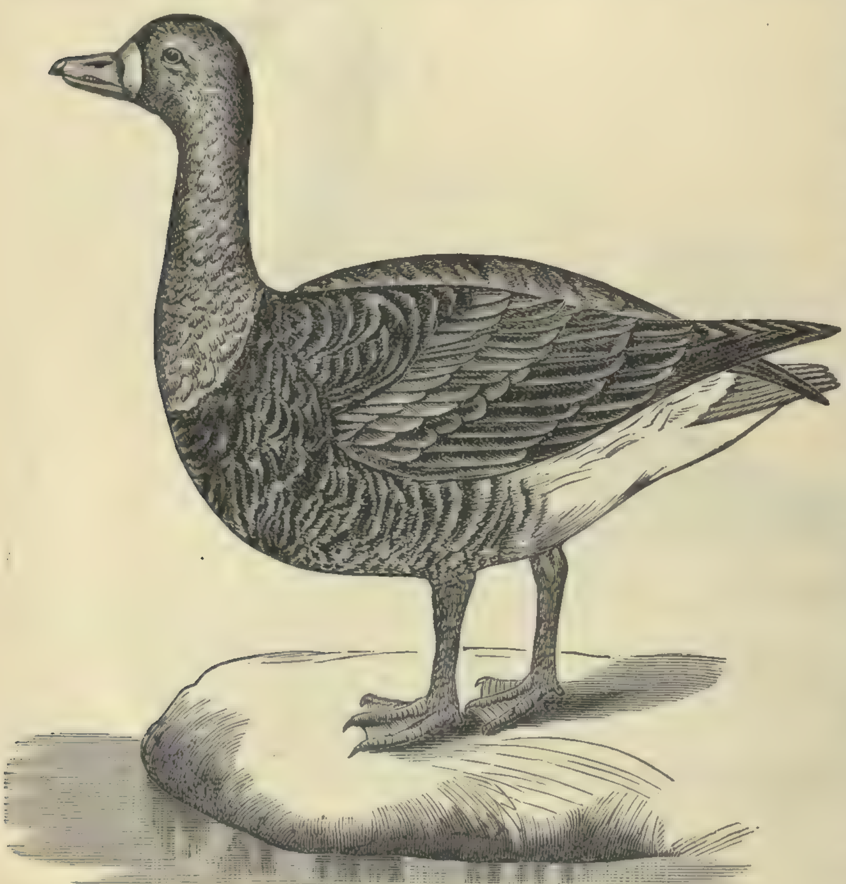


FIG. 3.—*White-fronted Goose.*

bird, never going inland, and seldom, if ever, crossing headlands or projections of land in their course. They breed in the far North, Audubon states, on the coasts of Hudson Bay and the Artic sea, and begin their journey south in the autumn, from the middle to the last of October. The methods of capturing the Brant are precisely similar to those employed with its more important relative, the Canada Goose.

Canada Goose, or *Common Wild Goose*. This is by far the most abundant and universally distributed of the North American geese. In one or another of its varieties it is found in all the States and Territories except, perhaps, the Gulf States. It is the most common wild goose in the United States; like the Gray Lag, as it is known in Europe, it is termed by the common appellation of "Wild Goose" in this country. It is familiar to all sportsmen, and easily recognized from its curious habits of flight and peculiar cry ("honk, honk"). This sound often comes upon the ear at night, when the flock is invisible, and it is frequently heard even in the day-time, seeming to come form the sky, the birds being beyond the reach of vision. They make their annual flights in their regular battalion-like progress to and from their breeding places. Their spring migrations usually take place from the 20th of March to the last of April but are wholly dependent upon the state of the season. They linger in the North, where they breed, until the hard frosts warn them that the lakes and streams will soon be frozen over. Wilson was of the opinion that the range of the Canada Goose "extends to the utmost polar point, amid the silent desolations of unknown countries, shut out from the prying eye of man by everlasting and inseparable barriers of ice." In size the Wild Goose is 35 inches long, and the wing 18 inches. The upper parts are a brownish color, the lower parts lighter, while the head, neck, bill and feet are black. In a state of domestication the female does not breed until two years old. The gander will mate with the common goose, but their young will not breed.

Hutchins' Goose. Dr. Richardson, in his valuable work on ornithology, tells us that the Hutchins' Goose was for a long time taken for the Brant, or an emaciated Canada Goose. Its resemblance to the latter is so great that, were it not for its decreased size and the more distinct barred markings on its breast and belly, the two would be identical. The Hutchins' Goose is abundant in Hudson Bay, and on the Pacific coast as far south as California; and the lakes of all the Western Territories at times throng with them. A good engraving of this species is given on page 580.

Snow or *Arctic Goose*, or *White Brant*, is plentifully distributed throughout the greater portion of the

United States; but of late years its principal range is in the West and Southwest, from Texas northward. Audubon saw it in great numbers in the Gulf of Mexico, and in its gray plumage on the lower Mississippi. Until the Snow Goose reaches two years (some writers say three), its plumage is an ashy-gray or sooty-white. In the West this bird is frequently called the White Brant, and sometimes confounded with the White-fronted Goose. The excellent engraving of this goose (shown on page 576) very clearly shows its build and shape, and scarcely needs further description.

White-fronted Goose, Speckled Belly. In the West this bird is very abundant, coming in advance of the Canada Goose, and leaving ten days or two weeks earlier. Dr. Richardson says they breed in the Mackenzie river region and in the Arctic seas. They are called Brant in the West by many, thus confounding them with the real Brant (*Anser Bernicla*). By some they are termed the Laughing Goose, on account of the grinning appearance of their bill, the space between the upper and lower mandible being wide apart and displaying a corrugated ridge resembling teeth. The range of the White-fronted Goose is entirely westward in the United States, being very rare in the East. The measure of an adult bird in its winter plumage, as taken from a specimen in the Philadelphia Academy of Sciences, is as follows: Length to end of tail, 27 inches; to end of wing, 26 inches; to end of claw, 29; extent of wings, 60; wing from flexure, 14½; tail, 4¾; bill, 1¾; weight, 5½ pounds. When domesticated it belongs to the class of birds which are restrained from resuming their original wild habits more by the influence of local and personal attachment than from any love which they seem to have for the comforts of domestication. They may be trusted with their entire liberty, or nearly so, but require an eye to be kept on them from time to time lest they stray

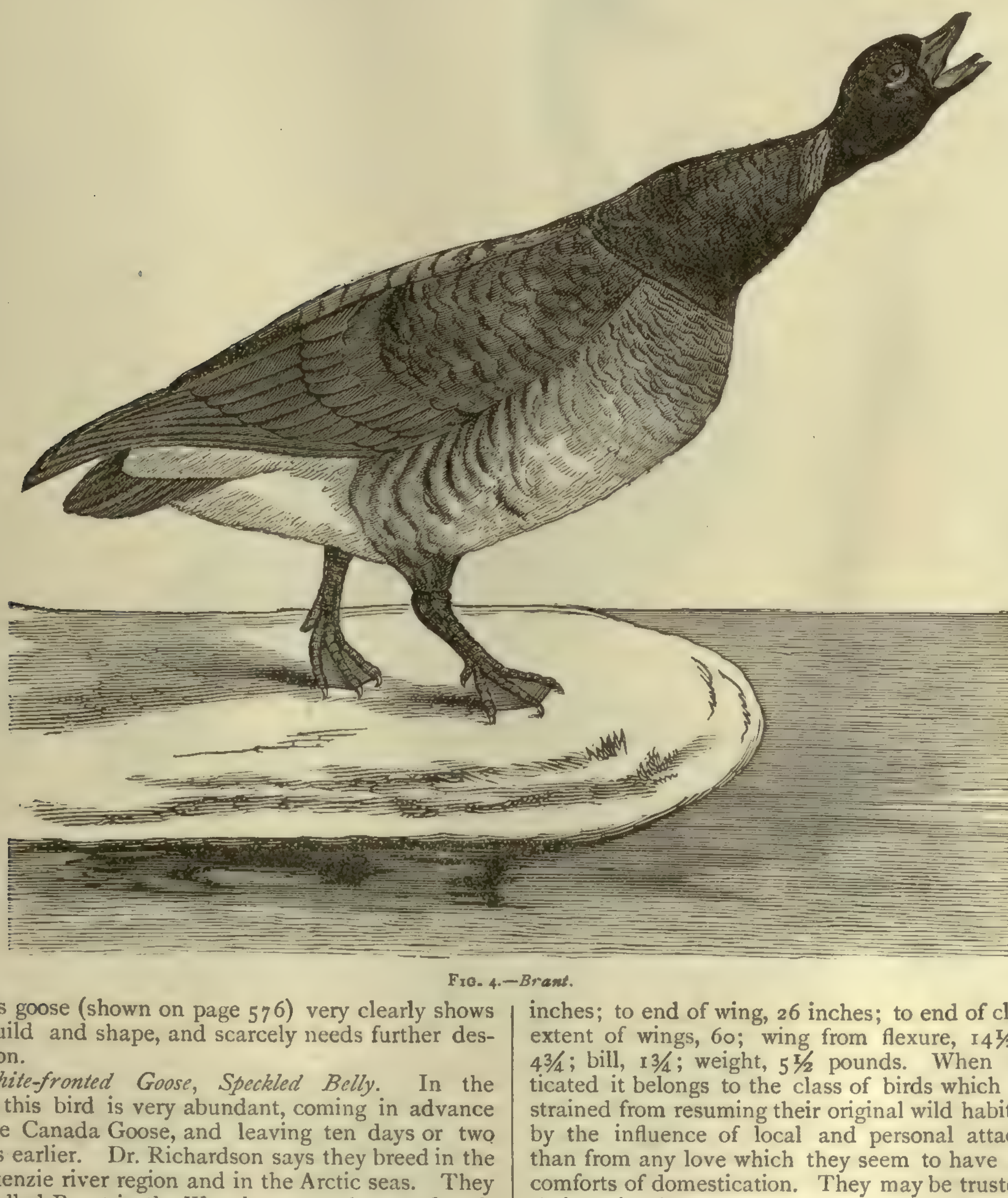


FIG. 4.—*Brant.*

away and assume an independent and wild condition.

The first impression of every one, upon seeing this species in confinement, would be that it could not be trusted with liberty; and the sight of its exercising its wings at its first escape would make its owner despair of recovering it. This is not, however, the case. By no great amount of care and attention, they will manifest such a degree of confidence and attachment as to remove all hesitation as to the future; and they may be regarded as patterns of all that is valuable in Anserine nature,—gentle, affectionate, cheerful, hardy, useful and self-dependent. The gander is an attentive parent, but not a faithful spouse. The eggs are smaller than those of the common goose, pure white, and of a very long oval; the shell is also thinner than in most others; the flesh is excellent. For a fine picture of this goose, see page 578.

Besides these breeds of wild geese there is the Ross Goose, the Blue Goose, or Bald-headed Brant, and Emperor Goose, all of which, however, are seldom met with in the United States save the Blue Goose. See page 582. It is found during the migratory season distributed over the West in company with the Snow Goose and the White-fronted Goose. All wild geese are captured similarly, and the explicit directions given in the article Guns and Gunning will apply equally well to all wild geese.

FIG. 5.—*Hutchins' Goose.*

DOMESTIC VARIETIES. Of the eight sub-varieties of the goose family supposed to have descended from three distinct wild species, the common Gray, or White

Goose, the Bremen, or Embden, and the Toulouse, are supposed by some to have come from the Gray-legged goose still found wild in the North of Europe. Others consider the domestic species a mongrel, like the dunghill fowl, made up of several varieties, to each of which it occasionally shows more or less affinity, and yet others contend that it is not to be referred to any existing species.

The domestic gander is polygamous, but he will seldom couple with females of any other species. Hybrid common geese are almost always produced by the union of a wild gander with a domestic goose, and not by the opposite.

Bremen. Is a large, pure white goose, with brick-red legs and bill, first brought to this country from Bremen, in Holland. In England, they are called Embden, from a town of the same name in Holland, where theirs were first obtained. They are said to be exclusively bred in Germany and Russia, and probably Austria. These geese are very large, weighing from twenty-two to twenty-six pounds, live weight, and occasionally full thirty pounds when in high flesh, as seen in exhibitions; and though so large, they are well proportioned, hardy, healthful, and very showy. They are quiet and peaceable, and take on flesh very rapidly with extra feed. They also supply a superior quality of feathers in very large quantity. The female lays about the same number of eggs as the common goose, but usually commences much earlier in the spring. A cut of this goose is given on page 583.

Chinese Geese. As an ornamental and useful variety of aquatic fowls, the Brown or White China Geese would be much better for the breeder than the common kind. They are of all the Anser tribe the most prolific layers. They commence early in the spring and lay from twenty to twenty-five eggs without stopping, and if broken up in their inclination to sit, will lay again and again. They breed three or four times in a season if allowed, and are careful and vigilant mothers. Their eggs are not more than half the size of those of the common goose, but they more than make up for deficiency of size by laying almost thrice the number of the larger breeds. In color this variety is mostly brown, shading from dark to light. The neck has a dark stripe down to the body, the under parts grayish brown and darker under the wings, and the legs are of a dusky orange color. One peculiarity of the China goose is a knob at the base of the bill. They are more swan-like in shape and carriage than any known variety.

FIG. 6.—*Bean Goose.*

Hong Kong or African. Is colored the same as the Brown Chinas, with bills, knob and legs a dull black, while in size it has no superior. It is also distinguished by a large fold of loose skin under the throat, called the dew-lap, that increases with age.

Toulouse. Was brought to this country from the South of France. It is distinguished from the common gray goose by the uniformity and constancy of its color, which is alike in both sexes, and darker than in the common goose, and by its very large size, being as heavy as the best bred Bremen. They are

rather short-legged, have round, compact bodies, and a large development of the abdominal pouch, which, in the common goose, is a mark of considerable age, but commences its appearance in this variety when but a few months old. Like the Bremen, they lay early in the spring, are very quiet, fatten readily, and have excellent flesh. Our common geese cross freely with the Bremen and Toulouse, the first cross yielding birds nearly or quite as large as either parent; but the results of the cross rapidly degenerate by breeding among themselves. To keep up the size the cross birds should be bred to one of the larger geese. The cross between the Bremen and the Toulouse is even larger than either parent, but deteriorates by breeding-in. The time of incubation by this variety is from twenty-eight to thirty days. See cut, page 583.

CARE AND MANAGEMENT. Generally not more than four or five geese should be allowed to one gander, to be very profitable, and such a family will require a house about ten feet square. Each nest should be about two feet and a half square. Geese should be set early in the spring, as it is difficult to rear the young in hot weather, and incubation requires about 34 days. They sit very steadily, but they should be induced to come off daily and take a bath. They should also be faithfully supplied with food and water, to keep them from eating up their own eggs. The ganders remain near when sitting, and seem to act the part of a sentinel. They seem very anxious to see the young ones that are to be born make their appearance. It is not necessary to keep the gander away. Incubation lasts from 28 to 30 days. After 28 or 29 days' incubation, begin to clip the shell. This may be done at intervals, however, of from 24 to 48 hours. Like turkey chickens, goslings must be taken from under the mother lest, if feeling the young ones under her, she might perhaps leave the nest of the tardy brood still unhatched. After having separated them from her, they must be kept in a basket lined with wool and covered with cloth, and when the whole of the eggs are hatched, may be returned to the mother. The male seems to evince the same solicitude for the young as the mother, and will lead them and take equal care of them. On the second day after they are hatched, they may be let out after the dew is off, if the weather is warm, but care must be taken not to expose them to the scorching rays of the sun, which might kill them. The goslings should have immediate access to the turf, and be fed on boiled oatmeal and rice, with water from a pond, in a very shallow dish. They should not be allowed to swim for about two weeks, during which time the goose should be kept under a very large crate. Until fledged they should be protected from cold, driving rains. For fattening, they should be penned up half a dozen together in a dark shed, and fed on barley meal, being let out several hours for a last bath before they are killed, in order to clean their feathers.

The liver of a fat goose is often larger than all the other viscera, and was a dish in so great reputation among the epicures of Rome that Pliny thought it deserved a serious discussion to whom the honor of inventing so excellent a dish was due. They fed their geese on figs, to improve their relish, and were not ignorant that they fattened sooner in a dark room; but it was left for modern gastronomers to invent the barbarous method of nailing down their feet and putting out their eyes.

Though greatly relished by some persons as food, it is not a universal favorite. The flesh abounds in flavor, and is considered to be highly stimulant. When young it is tender, but, in general, it is only adapted for good stomachs and powerful digestion, and should be sparingly used by the sedentary and weak, and by

FIG. 7. —*Blue Goose.*

persons subject to cutaneous diseases. Its strong flavor is by some thought to require modification by stuffing with sage and onions, though others relish it only when this is not demanded. From the various parts, however, many savory dishes are prepared, for which we refer to the receipts on that subject. The fat is reckoned peculiarly subtle, penetrating and resolvent, and is usually preserved for domestic applications.

The average weight of the large kind of geese is from nine to fifteen pounds, and instances have been known of their weighing thirty pounds when fully fattened; but the smaller breeds are preferable for the table.

It is not altogether on account of use as food that this bird is valuable; their feathers, their down, and their quills have long been considered as articles of more importance, and from which their owners reap more advantages. In this respect, the poor creatures

have not been spared; urged by avarice, their inhuman masters, in some places, appear to have ascertained the exact quantity of plumage of which they can bear to be robbed without being deprived of life.

DISEASES. Geese are seldom unhealthy, and consequently are attacked by but few diseases. Cold and fogs are their worst enemies; therefore, when young, care should be taken not to let them out but in fair weather, when they can go to their food without a leader. They are particularly subject to two diseases: the first a looseness or diarrhœa, for which Main recommends hot wine in which the parings of quinces, acorns, or juniper berries are boiled. The second is like a giddiness, which makes them turn round for some time; they then fall down and die, if they are not relieved in time. The remedy recommended by Main is to bleed the bird with a pin or needle, by piercing a rather prominent vein situated under the skin which separates the claws. Another scourge to goslings are little insects which get into their ears and nostrils, which fatigue and exhaust them; they then walk with their wings hanging down, and shaking their

FIG. 8.—*Toulouse.*

heads. The relief proposed is to give them, on their return from the fields, some corn at the bottom of a vessel full of clear water; in order to eat it they are obliged to plunge their heads in the water, which compels the insects to fly and leave their prey. It is the same with the goose, says Main, as with every other bird that is fattened up; that moment must be laid hold

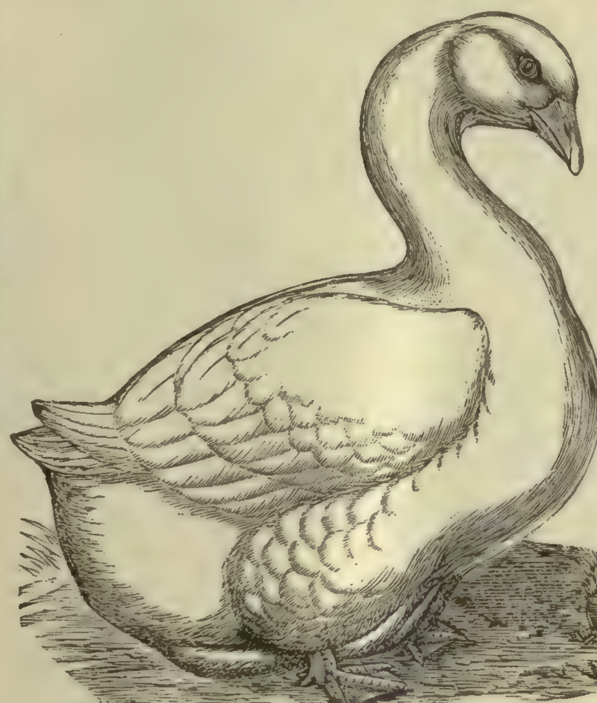


FIG. 9.—*Bremen or Embden.*

of when they come to a complete plumpness, or they soon get lean and die if they are not killed. Meal and skimmed milk will soon do the business; after ranging in the grain stubbles but little else will be required. These are called green geese, and are most esteemed by the epicure; they will then be about six weeks old, tender and fine. Steamed potatoes, with four quarts of ground buckwheat or oats to the bushel mashed up with the potatoes, and given warm, it is said, will render geese, cooped in a dark place, fat enough in three weeks. The French method of fattening consists in plucking the feathers from under the belly; in giving them abundance of food and drink, and in cooping them up more closely than is practiced with common fowls; cleanliness and quiet being, above all, indispensable. The best time is in the month of November, or when the cold weather begins to set in.

ROAST GOOSE AND DUCK. Boiling water should be poured all over and inside of a goose, or duck, before you prepare them for cooking, to take out the strong, oily taste. Let the fowl be picked clean, and wiped dry with a cloth, inside and

out; fill the body and crop with stuffing; if you prefer not to stuff it, put an onion inside; put it down to the fire, and roast it brown. It will take about two hours and a half.

Another: Geese and ducks, if old, are better if parboiled before they are roasted. Put them on in sufficient water to cover them, and simmer about two hours. Make a stuffing with four onions, 1 ounce of green sage, chopped fine, a large cupful of stale bread crumbs, and the same of mashed potatoes, 1 teaspoonful of butter, a little pepper and salt, and 1 unbeaten egg; mix them well together and stuff the body of the goose; then place in the oven and bake about an hour and a half. Serve with apple sauce.

Gooseberry. This fruit is too well known to need any particular description in this place; but the fact that good ripe gooseberries are sweet and luscious is not so well known. This berry is generally picked when green, and for those who like sour fruit it makes a valuable sauce, the greatest objection being the large amount of sugar required in their preparation. They are also good for pies, tarts and puddings, the flavor being liked by everybody, and it being the earliest fruit that can be used.

CULTIVATION. Like the currant, gooseberry plants are propagated only by cuttings. Select the strongest and straightest young shoots of the current season, in the fall, cut out all the buds from that portion which is to go into the ground, to prevent suckering, and plant these cuttings in a deep, rich soil on the north side of a fence or hill, or in some shaded border. They should be inserted in the ground about six inches deep, and from three to six inches should remain above the ground; press the soil firmly about them, and cover with a mulch of coarse manure, to be taken away the following spring; at that time examine them, and if any are found raised by the freezing press the earth again firmly around them. The ensuing fall they should be well rooted and ready to transplant to their permanent situation, which should be a sunny place.

The gooseberry in our climate is very impatient of drouth, and therefore the best soil for it is a deep, strong loam, which should, like the ground for currants, be heavily manured and mulched from year to year. To raise good fruit regular and liberal pruning is absolutely necessary; no sucker should be allowed to grow; the branches should be thinned out every winter, an effort being made at the same time to preserve the fine outline of the bush. In the usual shrub form, with horse-and-plow cultivation, etc., these plants will bear profitable crops for many years; but in the tree form, where but one stem is allowed to grow in a place, they will begin to decline in about five or six years. With this plant, as well as with all other fruit trees, the thoughtful gardener will keep up a succession of young plants by striking some cuttings every season.

As to the distance from one another at which they should be planted, there is a wide difference of opinion, some advising that they should be very thick in the rows about eight feet apart, and others thinking that they should be about four feet apart in the row and the rows about five or six feet apart. The former method is said to prevent mildew to some extent, especially if but very little trimming is done. Of course, all old wood should be kept cut out. Give clean cultivation, and for mulching wood and coal ashes are very good to mix in with the other material.

VARIETIES. Not many English varieties of the gooseberry are recommended for cultivation in the northern portion of the United States, as they are very liable to mildew; but where they are not so liable, the Crown Bob, Roaring Lion, Red Champagne and Whitesmith are recommended as the best. These should be severely pruned, and both branches and fruit patiently thinned out. For many years the Houghton Seedling has been the most popular variety.

American Seedling, American Cluster, Pale Red, etc. Bush more upright than Houghton, very productive, hardy, exempt from mildew; wood slender; fruit small to medium and when fully ripe is darker in color than the Houghton; hangs a long time upon the bush; flesh tender, sweet and very good.

Charles Downing. An upright, vigorous growing variety and very productive; exempt from mildew and disease; wood stout and heavy, and thorny; foliage abundant; fruit somewhat larger than Houghton, whitish green with the rib veins distinct, and hangs on until severe freezing weather; it is probably one of the best varieties for the latitude of Iowa.

Houghton's Seedling. This is still the king of gooseberries for the West, as it has been for many years. It is a vigorous grower; branches rather slender and drooping; very productive and not subject to mildew; fruit medium size or below, inclining to oval, smooth, pale red, tender and sweet. Dried by artificial heat it is excellent for puddings and pies.

Mountain Seedling. A good market sort. The bush grows tall and straggling and bears abundantly very large and small berries, which are sweet, a dark brownish red with a long stem and tough skin, and disposed to hang long on the bush.

Smith's Improved. This plant is more upright and vigorous than its parent, the Houghton seedling; the fruit is larger and somewhat oval, light green, with thin skin, a bloom and an excellent flavor; excellent for cooking and as a dessert. As this variety has a tendency to overbear it should be liberally pruned. For all purposes this variety stands next to the Houghton's Seedling in the West.

Gopher, a species of rat, with cheek pouches, broad, mole-like fore feet, and of a reddish or chestnut brown color. The name has also been given in different localities to several species of ground-squirrel and other burrowing animals. The gopher, west of the Mississippi river, does much damage to field crops; and there is no easy and specific remedy against them known. The best that can be done is to destroy them in all practical ways, with dogs, traps, shooting, etc.

WHORTLEBERRIES.

LAWTON BLACKBERRIES.

MAMMOUTH CLUSTER RASPBERRIES.

CHARLES DOWNING GOOSEBERRIES.

Goulard, a solution of sugar of lead, used for inflammations: so called from the inventor; "Goulard's extract."

Gourd. The gourds, especially the larger kinds, require a season fully as long as that in the Ohio River valley and southern Missouri to attain perfection. The ornamental kinds are apt to grow too large if the ground is too rich.

VARIETIES. *Hercules' Club.* Grows four to six feet in length.

Sugar-Trough. Holds several gallons and will last years as sap vessels.

Dipper, Double-Bottle and Angora are also good varieties.

Dish-Cloth. The lining of this gourd is so tough that it can be used as a dish-cloth. It is also called "Bonnet gourd" or "Luffa."

Besides the above there are many fancy varieties.

Gourd-Worm, a worm that infests the liver of sheep; called also the fluke-worm.

Gout, inflammation of the fibrous and ligamentous parts of the joints, first attacking the great toe and then the other toes, the fingers and the larger joints. The disease is the result of "high living," and is far more common in England than in this country. Treatment: In this complaint, a perspiration should be kept up by the use of hot medicines—especially composition and pennyroyal tea, as this will assist nature in expelling the gouty matter. As the seat of the disease is generally in the foot and leg, it should be wrapped in the softest wool, wet in sweet oil, and lightly bandaged. When the fit is over, a dose of tincture of rhubarb should be given. When the disease attacks the head or lungs, measures should be taken to bring it to the feet. For this purpose, let the two feet be bathed in warm water, followed by strong mustard poultices. To prevent any aggravation of the disease, the subject must adopt a radically hygienic or vegetarian diet, and be totally abstemious from all artificial drinks and epicurean dishes.

Governor, of an engine, two swinging globes for maintaining a uniform velocity of the machinery, by proportioning the steam to the work.

Gown, a loose, flowing upper garment,—especially a woman's dress or an official robe; any loose wrapper worn by gentleman within doors.

Grackle, the purple or crow blackbird. It is a great pest to oats and corn. Shooting at them considerably night and morning will drive them away. It is still an open question whether they do more harm than good, as they also destroy many injurious insects. They pass the winter in the South. Sometimes the red-winged blackbird, when young, is mistaken for young grackle, but it is also equally destructive.

Grade Cattle are the descendants of any pure breed crossed with the native or mixed breeds. See Cattle, page 211.

Grafting. This is the process of so fixing a shoot or cion or twig of one plant upon another plant that it will grow, and bear its own fruit. This is the most common method of propagating varieties with their characteristics, the seeds of which, if sown, would produce other and inferior fruit. There are several methods of grafting, some being better for some plants and others for other plants. The most important points to bear in mind are, to apply the inner bark of the stock and of the graft precisely to each other, and to bind them firmly in that position The great advantage obtained by grafting, is that of being able to appropriate the entire vigor of an old established plant to the single piece of wood which is attached to it by grafting; and whether this be in the ground or in pots, or whatever be the nature of the subject, there is no other means by which the object can be effected, unless it be by budding, which, after all is said and done, is but a branch of the same operation; the difference being, that whereas by grafting we attach a piece of wood, with perhaps several eyes, by budding we cut out each eye with a small piece of bark, and by cutting a slit in the bark of the stock, and raising it on each side, we are enabled to tuck in the small piece with the eye to it, and bind it there. In this case the operation of tucking the one bark under the other is facilitated by making a cross cut. It is obvious that every eye on a new variety can thus be made into a plant, and the whole vigor of the stock, as in the case of grafting the other way, is thrown into the growth of the new variety. This practice is more adapted in some subjects than others. Roses are nearly all propagated by budding; and those who wish to form a collection cannot do better than provide themselves with briers and bud them in mid-summer, or thereabouts, with all the varieties they require. See the article Budding.

WHIP OR TONGUE GRAFTING. This is most generally practiced when the stock and cion are nearly of an equal size. The point is in so forming the graft and stock that the sap and bark of each will meet the other perfectly; or, if either be too large, the bark will match on one side. The tongue is a notch cut in the stock corresponding with one cut in the cion, each having a lip, as it were, to meet the other, and when put together, serve as a support in steadying the graft until they are united in growth. (Fig. 1, second and third examples.) This system is largely practiced by nurserymen in the propagation of the apple, and, being done upon the roots of the stock, is called root grafting. The work can be done in mid-winter, the roots being kept in moist sand all winter, and cions being taken from the tree late in the fall or any time during the winter when they are not frozen, and kept in the same manner. Grafting can of course be done upon stocks in the open ground in spring, or

FIG. 1.—*Splice and Tongue Grafting.*

upon limbs of trees in early spring. The latter is called "top-grafting," and is often resorted to in renewing old trees, or in introducing new varieties.

SPLICE GRAFTING. This is simply binding together the smoothly beveled surfaces of the two pieces without any tongue or notch. (First example in Fig 1.) Crown grafting is about the same, differing only in having a simple notch in each piece so that they will fit perfectly. The latter is rarely practiced except upon small stocks standing in the ground, and then worked near the upper rootlet or fiber.

SADDLE GRAFTING is one in which the stock is cut into the form of a smooth wedge, and made to fit in a corresponding deep notch cut into the lower end of the cion. This method is practiced more with the cherry, peach, plum, apricot, etc.


FIG. 2.—*Saddle Grafting.*

SIDE GRAFTING is that in which a notch or slit about one inch long is cut in the side of the stock, paring the outer portion, then splitting the graft and paring both the inner and outer portion, so that when inserted there will be a union of the bark and wood. The stock should not be headed in until the graft shows signs of union, and then the pruning back should be gradual.

CLEFT GRAFTING is an old mode now seldom practiced. It consists in sawing the stock or limb off square, then splitting it down with grafting knife or chisel, cutting the lower end of the cion in the form of a wedge, and inserting it so that one side at least will be in association with the alburnum, or inner bark. The withdrawing of the chisel or knife holds the graft firm. Fig. 3.

All grafts should be firmly tied up in an envelope of cotton or other kind of cloth dipped in grafting wax, which consists of four parts of rosin and three each of bees-wax and lard, melted together. This is generally preferred, although there are of course many compositions made for the purpose. Fig. 1, last example.

SINGLE-BUD GRAFTING consists in removing a portion of the wood, bark and all, from the stock, and fitting into its place a bud with a piece of wood and bark attached.

CROWN GRAFTING is that which is generally practiced in top-grafting, which is the insertion in the margin of a stub, sawn off for the purpose, several cions. In this case, in stead of splitting the stock, the grafting stiletto is carefully passed one or two inches down between the bark and wood, loosening it and slightly cracking it open, when the graft, which is cut only on one side as a tapering half-round wedge, of any desired length and with or without a shoulder, is firmly set in. Two, three or four such grafts may be set in a large limb, their number hastening the covering of the stump of the limb, and when this is effected they can be cut away.


FIG. 3.—*Cleft Grafting.*

Grafting by approach, or inarching, is grafting the cion of a tree growing near, without cutting it off from the parent tree until the new growth is established. This mode is chiefly followed with fruit plants in greenhouses, as camellias, oranges, etc., which, being put in boxes or pots, can be readily adjusted for the process. A stay bar is often of advantage, to hold the trees steady until the process is finished. The cut surfaces in this work should of course be made exactly to match.

THE CIONS. Procure the grafts or cions in the latter part of February, or during the first part of March. The best cions are taken from the ends of the limbs,—last year's growth. These should be cut from one to two inches below the starting of last year's growth. When they are used the small end is to be discarded. Three buds are sufficient to have on a graft. Ordinarily one twig will make but one or at the most two good grafts. The last year's growth are preferable to the suckers, or "water-sprouts," as they come into bearing sooner—but the latter will grow the thriftiest as a general rule. Grafts taken below these will come into bearing sooner than those of a year's age, but are usually of objectionable shape, and make a low, scraggly top.

The cions of different kinds of fruit should each be placed in different bundles and firmly bound with a strong cord, to which should be attached a tag or label of pine, about two inches in length, and from three-fourths to one inch in width, on which should be plainly written with a lead pencil the name of the kind of fruit it represents. The best way to preserve the cions until they are required for use is a question of no small importance. The method we prefer is to pack the bundles in saw-dust thoroughly wetted, laying thick layers of it around and between the bundles in a water-tight box. The box should be kept in a cool place, or may be buried near the surface of the ground. Freezing does not injure them, provided no artificial heat is used to extract the frost. They will do well if buried near the surface of the ground. When the weather is sufficiently warm the process of grafting may commence.

Where one has young trees raised from the seeds, the better way is to dig them up in the fall, after they have attained the size of three-eighths to half an inch in diameter; cut off the tops to within three to five inches of the root, and place them in moist soil in a cellar, filling up the spaces with the soil to within an inch of the top. Leisure hours can be employed in grafting them. In trees of this size, this is done by cutting the root just below the place which, before it was removed from the place where it grew, was at the surface of the ground, with a sharp knife, making a slant of three-fourths to one and one-fourth inches in length. Select a graft having three buds as near the same size as the stock as possible, and cut the lower end in a slant that will be in a perfect fit to the stock. Place these together, being sure that the space

between the bark and the wood (the avenue for the flow of the sap) fits perfectly on one side at least. Tonguing is useless. If the graft and the stock are the same size and the barks fit on both sides, it is better, as the growth of the cion is liable to be greater. Having done this, wrap around it a strip of muslin on which melted grafting wax has previously been spread with a brush, replace it in moist soil and there let it remain until it can be re-set in the ground. It is better to have the orchard ground ready prepared, and set them where they are to remain, at a distance of thirty feet apart, as removing them again from the nursery, where they may have been placed to attain a large size, retards their growth.

Trees may be grafted in the limb after they have grown to a large size, provided they are sound and healthy. Limbs from half an inch to two inches in diameter may be grafted. This is usually done by what is called "cleft grafting."

Where the stub is more than half an inch in diameter, two grafts should be inserted in each. This makes the pressure on the inserted part of the graft more even, and gives two chances instead of only one to have a living graft. If both scions grow one should be subsequently sawn off close to the stub, for if both are allowed to grow they will form a crotch that may in future be as detrimental as it would be unsightly.

There is another method of limb grafting which may be employed, when the season is far advanced, and the bark "slips" or fails to split at the cleft in the wood, so as to render cleft-grafting difficult and often impracticable. It is to prepare the stock as in cleft grafting, then slit the bark, and if the stub be over an inch in diameter on both sides, downward for the space of an inch or more. Raise the corners of the bark slightly with the point of a knife blade; then at the slit insert a wedge made of iron or hard, seasoned wood, and loosen the edges of the bark. This being done, cover the top of the stub and the slits with wax.

These methods of grafting may be practiced on apple, pear, plum, and some other fruit trees, but for peach trees budding is preferred, which must be done later in the season, usually in the months of August and September.

Grafting Wax. This is variously made. It usually consists of rosin, tallow and beeswax. Sometimes they are mixed in equal parts; but this mixture is hardly adhesive enough; more rosin increases its tenacity. A cheap and useful compound, but sometimes found rather inconveniently adhesive to the hands, is made of four parts of rosin, two of tallow, and one of beeswax A coat of the wax, about one-twentieth of an inch thick, spread over muslin, calico, or tough and flexible paper, makes an excellent plaster for out-door grafting; or, if spread half as thick on paper, is well adapted to root grafting. In either case the strips should be narrow, that they may be easily wrapped around the graft till it is well covered, when the rest may be torn off. In making the plasters it is essential that the ingredients of the wax should be thoroughly stirred together before it is spread. A paper, soft, thin and tough, is used for wrapping. For out-door grafting in cool weather, a furnace of charcoal is sometimes necessary to soften the wax; but all out-door grafting should be done when the temperature is sufficiently mild to keep the wax soft enough to work.

Grain. This term includes all those kinds of grass which bear a straw, and which are cultivated on account of their seeds for the production of meal or flour. The word corn, or its equivalent in other languages, is frequently applied exclusively to that kind of grain which constitutes the chief nourishment of the country. Thus, in a great part of Germany, it is rye; in France, it is wheat; in the Low Countries, spelt, and in North America, maize. That the different kinds of grain grow wild in some countries is well known, as, for example, barley and oats in Germany; but they have not the perfection of the cultivated grains. These all seem to be natives of warmer climates in Asia, Africa, South America, and to be annual plants, becoming hybernating only from cultivation, since a summer does not suffice, in northern climates, for their development. In common with most grasses, they form their stalks or stems upon the lower joints of the root. Their fascicular roots spread themselves out chiefly upon the surface of the ground, which they almost cover with their thick web, while a smaller part penetrates deeper, when they find looseness of soil and nourishment to attract them. All kinds of grain contain nutritious particles of a similar character, although they vary, both in their quantity and their mixture, in various grains. These elements are: 1. Gluten, which affords the strongest nourishment for the animal body. 2. Fecula, or starch, which is very nutritious, although not so much as gluten, which, however, it seems to render more digestible. 3. A sweet mucilage, which is more nutritious than starch, but is small in quantity, and renders the grain liable to the vinous and acetous fermentations. 4. The hulls, which consist of a fibrous matter, and contain a digestible aromatic substance. 5. Moisture, which is predominant even in the dryest grain, and increases the weight of the mass, although it lessens the specific gravity; it affords no nourishment, hastens the decomposition of all kinds of grain, if they are not kept very dry, and serves, after planting, to stimulate the first motions of the germ.

Grain Growing. The result of long continued experience proves unmistakably that where the farming is good, on well drained and deeply cultivated soil, thin sowing, no matter what kind of grain, is far more profitable than thick. It is wrong to go on sowing the same quantity of seed our forefathers did when broadcasting, without taking into account the altered circumstances, such as the drill, drainage, and higher farming, and then complain because we do not have larger crops. The higher you farm the less seed is required. We lay down no particular rule, but recommend each farmer to satisfy his mind by comparative trials which quantity of seed is most profitable to him under his peculiar circumstances of soil, climate, and

style of farming. It is generally known that ergot in rye, and it is to be found in no other grain, when brought into the human organism operates as a narcotic poison. The farmer ought to remove the infected plants growing in the neighborhood of his rye field.

It requires an experienced eye to discover smut in wheat, for the infested ears are not distinguished in their outer appearance from the healthy ones. The diseased grains, however, when rubbed between the fingers, burst out at the slightest pressure, and we see that, instead of the white meal, they are filled up with a dark smutty mass, which is distinguished by a nauseous smell resembling herring brine. A solution of blue vitrol, which is not hurtful to the seeds, is sure to kill the dangerous spores and at the same time is a cheap preventive.

Rust and brands infest and destroy the stem as well as the leaves. In examining your corn-fields in the beginning of summer, you will most likely find a number of plants covered all over with bright, rusty spots and lines. Mildew in grain is the mycelium of a parasitic fungus, which, sometimes very thin and cobweb-like, sometimes in a thick, felty layer, disturbs the development of the infected plant, particularly by obstructing the stomata, and by drawing its nourishment from out of the infected organs by means of little wartlike processes, through which the mycelium is attached to the plant on which it feeds. It is often found in abundance covering the leaves of the several cereals. Dark, heavy loam, if the climate is agreeable, is better adapted to the production of grain than any other. See articles on Corn, Wheat, Rye, etc.

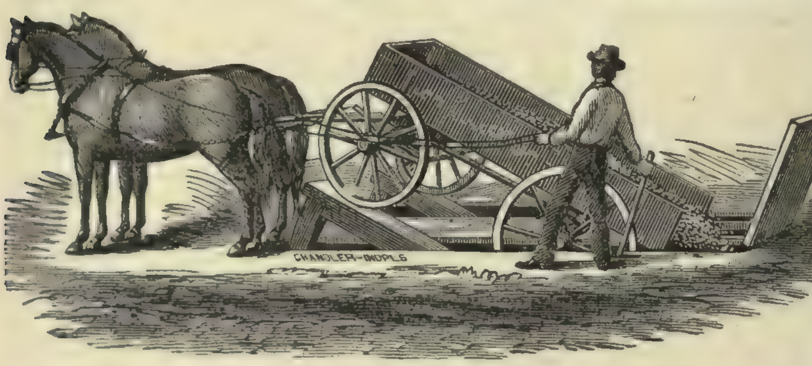


Fig. 1—*Grain Dumper*.

Granary, an apartment, a division of a building, an entire building, or a very extensive store, for containing and preserving grain.

Every granary, whatever its capacity, ought to be dry, well-ventilated, inaccessible to vermin, and conveniently situated for both receiving and surrendering its contents; it ought to have appliances for regulating ventilation according to the condition of the grain and the state of the weather; it ought to afford scope for the special treatment of any grain which may happen to be attacked by disease; it ought to be so situated and constructed as to be free from injurious temperature, and from any access of foul air or damp vapor; and if it be more than a mere room or recess, for keeping a small stock of grain for a single month or two in sacks, it ought to be divided into sections by means of either fixed or movable partitions, in order that, without waste of space, different kinds of grain and different parcels of the same kind may be effectually kept separate.

A room finished off in the barn, or over the wagon shed, though often made to answer the purpose, is not a satisfactory substitute for a building devoted to this special purpose. The granary may be a very simple structure, but it should be an independent building. The size and the detail of construction will vary greatly with the requirements of different farms, but there are a few general principles which should be universally regarded. The building should be set upon stone posts, or a smooth brick wall, which should rise at least three feet above the level of the ground. This is one of the most effectual methods for keeping rats away from the grain. If walls are used, spaces should be left to allow a circulation of air under the building. Two sides of the granary should be covered with slats 2½ or 3 inches wide, and placed ½ an inch apart. The other sides should be boarded perfectly tight. The eaves should project considerably and the roof be kept constantly in repair. The floor should be made of planks closely fitted and smoothly laid. There should be at least two windows to admit light, and a ventilator should also be provided. Against the sides covered with slats, bins for holding ears of corn may be built. These should not be more than three feet wide, but in height may extend nearly to the roof. Against the sides covered with boards bins for wheat, oats and shelled corn may be constructed. These should be perfectly tight, with well-fitting covers, and provided with locks and keys. Bins for this purpose should not be more than three or four feet wide and four feet high. They should be divided off by partitions into several compartments, each holding from 10 to 40 bushels of grain, and should be marked on the inside to show the number of bushels they contain, as illustrated by Fig. 2, page 60.

GRAIN DUMPER. A modern and most convenient

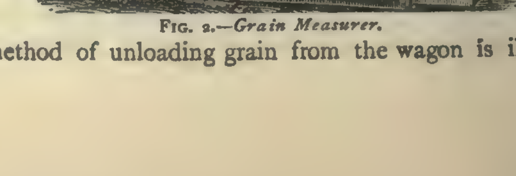


Fig. 2.—*Grain Measurer*.

method of unloading grain from the wagon is illus-

trated by Fig. 1, on the preceding page. Especially is this a valuable contrivance for mills and grain elevators. It enables men to unload rapidly, thus avoiding delays and waste of time. It is made by the Nordyke & Marmon Company, of Indianapolis, Ind.

GRAIN MEASURER. Figs. 2 and 3 are illustrations of substantial and perfectly working grain measurers, manufactured by Nichols, Shepard & Co., Battle Creek, Mich.

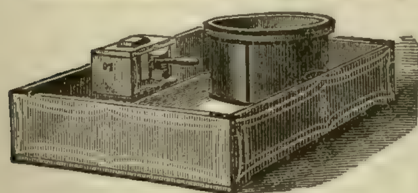


FIG. 3.—*Grain Register.*

Grange, a farm; generally a farm with a house, at a distance from neighbors; an organization of farmers for mutual instruction and self-protection.

Granite Ware, sheet-iron cooking utensils which have a clouded, bluish enamel inside and out, and are more free from poisonous matter than porcelain. No boiling of articles of food should be done now-a-days in uncoated iron vessels. Care is requisite, however, to guard against burning anything in enameled ware.

Granivorous Animals, animals which wholly or mostly feed on grain or other seeds.

Granulation, the act of forming into grains, as powder, sugar and honey. In the healing of wounds or sores, suppurative granulation is the growth of grain-like protuberances of healthy tissue, serving to fill the cavity and unite the sides. Sometimes these grow too fast; then they are unhealthy, being soft and growing beyond the edges of the wound. To prevent this, sprinkle a little powdered blue-stone or a little sulphate of zinc, and the wound will soon heal level with the surrounding surface. "Granulated sugar" is merely a selling brand of a variety of sugar. Honey at ordinary temperatures will in the course of a few weeks or months whiten and granulate, when it is said to be "candied."

Grape. The grape is honored by greater antiquity, perhaps, than any other fruit, not only as an article of diet, but also as a source of a beverage, which is more popular than that made from the other fruits. The modern "grape cure" is, perhaps, nothing but a revival of what was very universally practiced in ancient times. In most acute attacks of fevers, if the patient eats nothing but the juice and pulp of the best grapes, he will recover far more readily than by the employment of any other "victuals and drink." But this is not the place to repeat all the praises of this fruit, which has been so celebrated in prose and song. We proceed at once to the practical item of

PROPAGATION. The most usual method is by cuttings like those of currants and gooseberries. The cions should be long enough to contain three buds and an inch or two more at each end. These are planted in the ground with one bud below for making roots, and two above for the vine. While but one vine should be allowed to grow, the two buds are taken so that in case one of them is destroyed by accident, there is another to grow. Another method of propagation is "layering," the process of which is described under that head. After one season's growth of these young plants, either in the fall or in the spring, they are to be transplanted to the vineyard, which should be a warm, sunny hillside, not steep, better if it be sandy, gravelly or shaly, and of the quality of good corn ground.

The best locality is the southwestern brow of a hill, as the temperature there is warmer and more even, and late frosts in May or June will not be followed so soon by a hot sun, which injures the vines. The drier the soil the sweeter the fruit. Some say that the grape does better where the winters are mild and the summers cool; this is probably true for hot countries, but in the extreme Northern portion of the United States they want all the heat they can get in the summer time.

Grafting the grape-vine improves the fruit, and is best done in the winter or very early in the spring, as the plants at that time do not bleed. It is believed, however, that the bleeding does no perceptible injury, except that it prevents, in grafting, a good union of the cion with the stock. Bleeding may be prevented by working into the pores of the wound, by thumb and finger, a paste of one part of calcined oyster-shells beaten to fine powder in a mortar, and three parts of cheese. A second application is sometimes necessary. Experience varies as to whether we should graft above or below the surface, or whether ring or cleft grafting is the better. Wild vines furnish the best stocks. But it is doubted whether grafting is needed in the West.

The ground should be plowed or trenched to the depth of 18 inches or two feet, being enriched by well rotted manure and thoroughly pulverized. In the States west of Lake Michigan it is best to stake off the rows north and south, about eight feet apart, for trellises, and six for stakes, so that the vines will receive all the sunshine possible. In the States east it is perhaps best to have the rows running east and west, so that the western breeze will dry off the vines quickly after the rains, which are more frequent than in the West. Where the ground is not pulverized to the depth above mentioned, holes two feet in diameter must be dug to that depth, with a mound of loose earth in the bottom of each, on which the plants are to be set, with the roots spread out as represented on page 511. The distance of plants in the rows should be 8 to 12 feet, according to the kinds and manner of training. Prune the roots smoothly, cutting off bruised ends and the long extensions. In general, set the plants so that after the earth is pressed closely upon the roots they will be at the same depth below the level of the ground they naturally grew. In Wisconsin and Minnesota they prefer to set about four inches below the surface; mulch thoroughly, and

keep moist the first year; the best mulching is fresh-mown grass not in seed, lightly covered with leached wood ashes. Allow but one cane to grow, keeping it tied to a stake, and limit its height to three or four feet; allow, also, the laterals not to extend beyond two or three buds; pinch off the buds at first starting, and the tendrils too, and not wait until you have to use the knife. The second year it will be ready for the trellis or stake, and begin to bear a little, but it should not be allowed to bear fruit this year. While some viticulturists are in favor of letting the vine grow unpruned and unchecked, bower fashion, most vineyardists train to trellises or posts, and prune the vine, cutting the branches back to within three or four inches of the main stem, and leaving two or three buds for next year's fruiting; but the next year only one of these is allowed to grow, the most vigorous or the lowest being the favored one. When stake training is contemplated, the posts should be set before the planting, that the roots may not be disturbed.

The trellis consists of three wires or courses of lath fastened to the row of posts, and horizontal training is preferable to perpendicular; also, the nearer the ground the grapes can be grown and matured the better, other things being equal. A modification of the horizontal is the "fan-shaped."

In November or early winter, prune back the arms which have borne fruit the previous season, near the base or main stem, except such varieties as the Rogers' Hybrids, Isabella, Diana and some others, which should be allowed arms of old wood, and the young canes cut back, or kept back, to short spurs of one or two buds. Cultivate between the rows with a five-tooth cultivator, and use the hoe, allowing no weeds or grass to get a foothold. All grape-vines should be protected during the winter; the Concord is the hardiest, and does fairly well without being buried during the winter, but even it will do enough better for protection to make it pay. After the wounds have had a few days to season, lay the vines down upon the ground, covering with straw, seedless hay, or cornstalks and light earth, it matters but little which is next the vines. Practice and creed vary as to the propriety of trimming off some of the leaves during the summer.

The practice of what is called the "annual renewal" system is followed and highly recommended by many vineyardists. It consists in producing new canes each year for the next season's fruit. Probably its utility is owing to circumstances. Grape culturists will vary in their practice so long as one class endeavor to raise the greatest amount cheaply, irrespective of quality, and another the best quality, regardless of cost.

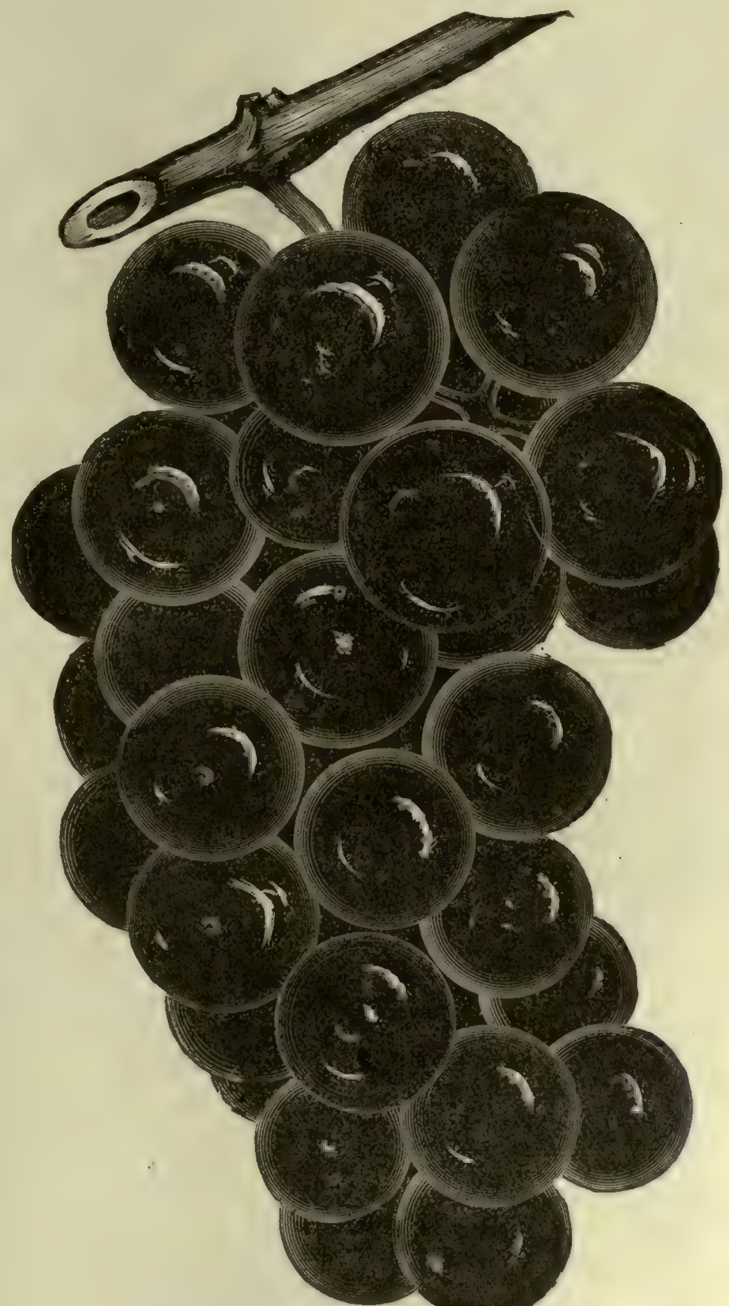
Overbearing should never be allowed, as it weakens the vines and renders them subject to disease and insects.

The best manure is a compost of cow-dung, old sods or loam in equal parts, and to each wagon load two bushels of air-slacked lime, one peck of salt and one bushel of ground bone, thrown broadcast upon the ground in the spring, and plowed in. Land-plaster is good, as it absorbs moisture from the atmosphere and rains, retaining it a long time, and giving it slowly back to the soil during dry weather. Cob ashes, tobacco stems, and small dead animals are also very good; but fresh stable manure should never be applied, as it causes mildew and rot. Burying manure one year on one side of the vine and the next on the other, and so on, is often very remunerative.

Gathering the Fruit. Grapes are generally gathered before they are sufficiently ripe; they do not fully ripen until a week or two after they color, and the Concord is better if it is let remain on the vine four or five weeks after it turns black. The Hartford Prolific, however, is about as good as soon as it fully colors as it will ever become.

Keeping the Fruit. Many varieties of the grape can be kept far into the winter, some even until spring; and as the earliest usually ripen in August or the first of September, with a well selected assortment of varieties we may have it in season nearly or quite as long as the apple. For keeping they should be gathered when the vines and fruit are dry (the middle of a bright day is the best), spread a few days for the evaporation of any chance moisture and the drying of the ends of the stems. All unripe, decayed and imperfect berries should be removed. Then pack in shallow boxes two or three layers deep, with or without a thickness of paper between the layers, cover the boxes and keep dry and cool as possible above the freezing point. Perfectly clean dry oats are excellent for packing: there is not the objection to them that is found in sawdust, chaff, chopped hay or other fine and dusty materials. Rye straw is excellent. The fruit will require an occasional examination, but with a little care we may enjoy it for months.

Where the Isabella, Catawba, Ionia or Diana can be grown, there is no difficulty in keeping them till the first of the new year or later. The grapes are allowed to ripen fully; they are picked and placed in shallow trays, in which they remain in an airy room to "cure." The operation of curing consists merely in a sort of wilting, by which the skin becomes toughened and will not break when the fruit is packed. The clusters, when properly "cured," are packed in boxes, usually of three or five pounds each. The bottom of the box is opened, the larger clusters laid in carefully, and smaller bunches packed in upon them in such a manner that it will require a moderate pressure to bring the cover (or, properly, the bottom) of the box to its place, where it is nailed down. The pressure used is such that when the top of the box is opened, the grapes next to it are found to be somewhat flattened. The fruit must be pressed in such a manner that it cannot shake in travel, and this can only be done with grapes the skin of which has been toughened by being properly cured. If clusters were placed in the box as they come from the vines, and subjected to the needed pressure, the skin would



MOORE'S EARLY.

crack around the stems, liberating the juice, and the whole would soon pass into decay. With the Concord and related varieties, the skin is too tender to allow of long keeping, and it does not seem to toughen in the curing process.

Another Method. Take new soap boxes and nail cleats on the ends or sides, about one inch from the top, and between these, bars at various distances, as required by the varying length of the bearing shoot-cuttings. The bars are made by nailing a small strip on top of each. As late as possible in the season cut off the bearing-shoots containing the bunches, and shorten them so they will crowd between the end of the box and the top part of the bar, resting on the bottom part. Hang the bunches in their natural posotion and lay on the cover. By this method the box can be handled, carried to the light, and each bunch be examined as the winter advances. Decaying berries or bunches can be removed, and the best be kept, without any mouldy taste, as is so common when grapes are packed solid and kept late.

INSECTS AND DISEASES. The insect most noxious to the grape-vine in the West is a species of louse known only by its scientific name, Phylloxera (Fig. 1),

FIG. 1.—*Work of Phylloxera.*

which sucks the roots, causing masses of warts and knots, ultimately killing the vine. Its work is slow and sure, and the vine being weakened by it is very often destroyed more readily by mildew, rot, etc. The Concord, Hartford and Ives' Seedling are not so much attacked by it. Remedies: Whale-oil soap in solution; flooding the land for thirty or forty days after the season's growth has subsided; sulphuric carbonate of potash sprinkled on the ground in the form of powder, to be carried down into the ground by rain.

The Thrip is a little hopping insect which infests the under side of the leaves and proves very destructive, especially upon the vines protected by high wooden fences, walls or houses. The leaves are sapped by the insect, become blanched and have a scorched appearance, die, and afterward the whole vine dies. Remedies: Night lamps and tar paper still mornings and evenings when the leaves are well grown; or, a few applications of a weak solution of carbolic acid. The Gall Louse is similar to the Thrip in its habit, and may be treated in a similar manner.

Several species of beetle infest the grape, namely, the Flea Beetle (Fig. 2), the steel-colored and the

FIG. 2.—*Grape-vine Flea Beetle.* (Haltica chalybea.)
a, leaf infested; *b*, magnified view of larva; *c*, cocoon; *d*, beetle.

brown spotted. The flea beetle is a small, oblong, bluish or greenish insect and a very active jumper. It is the larva of the beetle that does the mischief on the vine. It is of a shiny brown color, with a row of darker spots on each segment; the head is black. The only redeeming feature about it is that it seldom appears in the same locality in great numbers during consecutive years. These beetles leave their hibernating quarters in April, and attack and destroy the young leaf-buds as soon as they appear; later they feed upon the leaves which have escaped their earlier ravages, and deposit their eggs upon them. The eggs are of an orange color, and soon hatch into a chestnut-colored larva. These larvæ also feed upon the leaves, and when they appear in great numbers sometimes strip the vines of their foliage. After a month of active life the larvæ descend to the ground and bury themselves near the surface, where they make cells of the earth and change to pupæ of a dirty yellow color. The adult beetles, issuing in the course of a few weeks, again feed upon the leaves during the autumn, doing, however, but little damage, and later seek their winter quarters beneath the bark and splinters on the vines and the stakes which support them, as well as under any rubbish that may be in the vineyard. Remedy: Take two pieces of common cotton sheeting, each being two yards long and half as wide; fasten sticks across the ends of each piece to keep the cloth open and then drench with kerosene. Give the sheets thus prepared to two persons, each having hold of the rods at opposite ends of the sheets. Then let the persons pass one sheet on either side of the vine, being careful to unite the cloth around the


LINDLEY.
WHITE FRONTIGNAN, OR MUSCAT.
LADY.
CONCORD.

base of the vine; then let a third person give the stake to which the vine is attached a sharp blow with a heavy stick. Such a blow will in nearly every case jar the beetles into the sheets, where the kerosene kills them almost instantly.

This process, after little expense, can be performed almost as rapidly as the persons employed can walk from one vine to another. The expense necessary is very trifling, and boys can do the work quite as well as men. Warm, bright afternoons are the proper times for this work to be done, and it should be performed faithfully every sunny day until the vines are out of danger. This mode of combating the beetle is much more effectual than any other which has been hitherto suggested; for it can be used early in the season before the vines are seriously injured and before the insects have begun to multiply. In connection with the above, the remedies which have been recommended often should, if necessary, be used. These are as follows: First, all rubbish should be removed from the vineyard, and the stakes and trellises which support the vines be well cleaned of bark and splinters, so as to afford the beetles little chance for hibernating in the vineyard. Second, if the larvæ appear in great numbers, lime should be sifted over the vines.

There are two other species of this genus noxious to the vine, which may be similarly treated.

The larvæ of several other kinds of beetle are also injurious to the vine; as, Colaspis, a yellowish grub; Fidia, or "rose-bug," chestnut brown; drops to the ground readily and easily caught like plum curculio; another rose-bug which especially infests the Clinton grape; several species of vine-chafers, which should be destroyed by dusting or syringing as soon as possible after their first appearance. Grape curculio, which like the plum curculio drops off and can be caught and killed in the same way; Bosteichus, Fig. 3, which also is injurious to the apple, the peach and the hickory; broad-necked Prionus, a creamy white grub with a pale bluish line along the back which works in the roots of grape and fruit trees; and the tile-horn Prionus, whose mischief is done before it is discovered; no remedy except to destroy the vines.

Fig. 3.—*Bosteichus basillare.* *a*, larva; *b*, pupa; *c*, beetle.

The snowy tree cricket, although when young lives on plant lice and insect eggs, girdles the stems of grapes, causing them to wither and fall to the ground. Remedy: Cut off the affected twigs before hatching time and burn them.

Mildew consists of several species of fungus, and is easily detected. The best remedy known is the sprinkling of powdered sulphur and quicklime upon the vines, which, however, is more effectual upon European varieties than upon American. The grape rot is a serious evil in the West, some varieties being far more liable to it than others. The Concord can be saved from it by a sprinkling of air-slacked lime, either common or oyster, and sulphur, in equal parts, several times during the season, when the vines are wet. It is said that it will pay to enclose each bunch of grapes in a little paper sack when danger threatens.

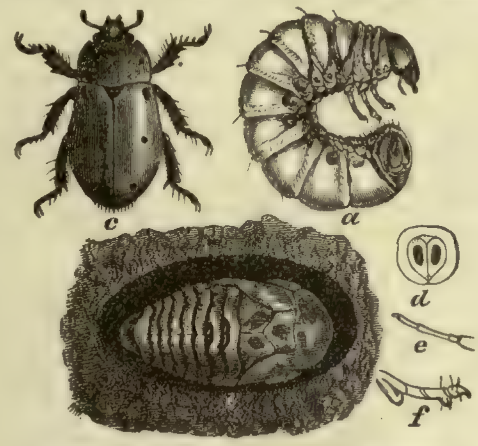


Fig. 4.—*Spotted Vine-Chafer.* (Pelidnota punctata.) *a*, larva; *b*, pupa; *c*, beetle; *d*, tip of abdomen; *e*, antenna, magnified; *f*, leg.

Some birds are troublesome to the vineyard. They can be kept off by stretching cotton twine over the vineyard, attached to laths nailed up.

The grape rot is probably due to certain states of the weather, which favor the development of Bacteria, the disease being similar to twig blight in the apple and the pear. It may be prevented by training against buildings or on high poles 12 to 20 feet high. The use of paper bags is said also to be a preventive of this, as well as of other diseases, and also a protection against birds and insects. Muslin bags are better than paper, as they are more easily tied on, and they will be good for several years' use. Paper bags, however, have the advantage of turning rain better, which is an object with some. In these bags white grapes remain of a greener color, but the other sorts color well.

Varieties. The most profitable varieties for wine are the Oporto and Virginia Seedling, which make a red wine; next the Martha, which makes a white wine; and, thirdly, the Delaware and Catawba,—in some places also the Herbemont. Wine from Rogers' Hybrids imitates foreign wines.

Adirondac. Bunch large, compact, shouldered; berry large, perfectly black, beginning of September, very good dessert, fair market; foliage subject to mildew.

Agawam, Rogers' No, 15. Bunch long, compact, shouldered; berry large, dark red, fair, dessert and market, middle of September; keeps well after gathering. Is a shy bearer.

Allen's Hybrid. Bunch medium, shouldered, compact; berry medium, whitish yellow, best dessert, poor

market, middle of September; liable to mildew; finest of white grapes.

Alvey. Bunch medium, shouldered, berry small, black, fair dessert and market, beginning of September; has a thick, tough skin; sour, fibrous pulp and large seeds.

Autuchon, Arnold's Hybrid No. 5. Bunch long, compact, often shouldered; berries medium, greenish white, with a golden tint when fully ripe; skin thin; flesh void of pulp, sprightly and rich.

Belvidere. Hardier than the Concord, in character and quality about equal to the Perkins; ripens the beginning of September.

Brighton. Bunch medium, shouldered; berry large, strongly adhering to the stem; skin moderately thick, reddish purple; flavor rich, sprightly, vinous, moderately sweet, remarkably agreeable, not entirely free from pulp; ripens at the time of the Concord, is more vigorous and the fruit is better.

Catawba. Bunch medium, shouldered, open, red, very good dessert, fair market, October; hardy as the Concord, one to two weeks earlier, becomes foxy when too ripe; makes good wine; recovers from the attacks of the phylloxera about every third or fourth year.

Champion. Very early.

Clinton. Bunch medium, compact, shouldered; berry small, black, sour, very poor for dessert or market, October; good for red wine; very subject to insect depredations; rots badly.

Concord. Bunch long, compact, shouldered; black, very good dessert, best market, middle September; next to the best for wine; it makes a red wine; subject to rot but not to fungus; still the most profitable grape for the West. Should hang on the vine four or five weeks after coloring.

Creveling. Bunch medium, compact, shouldered; fruit black, good dessert, very poor market, middle of September; sets fruit poorly and is a thin bearer.

Croton. Bunch medium, compact, shouldered; berry small, greenish yellow, translucent, remarkably delicate and beautiful; flesh uniformly melting, sweet and of a Chasselas flavor; has but one or two seeds, which are small; hangs on the vines until late; keeps well in the winter; makes good raisins; very productive and hardy, a free grower, of firm, short-jointed wood; subject to mildew; fruit ripens the beginning of September; one of the best table grapes.

Delaware. Bunch small, compact, shouldered; berry small, light red; flesh very sweet, mild and pleasant; best dessert and market, middle of September, but is not vigorous, being of slow growth, subject to diseases and insects; does better grafted on trimmed roots and cultivated in a clay soil.

Diana. Bunch large, compact, long; berry large, light red, rather foxy, with a thick, tough skin, fair dessert and market, end of September; one of the best keepers; a thin bearer on strong soil.

Elvira. Vigorous, hardy and productive, light green fruit, but crowded and apt to rot.

Eumelan. Bunch large, compact, shouldered; berry purple black, best dessert, very poor market, middle of September; has large seeds; fruit commences coloring in August.

Eva. Like the Martha, but white and a little better in quality.

Hartford Prolific. Bunch large, compact, shouldered; berry large, black, poor dessert, good market, beginning of September, hardy and productive.

Gœthe, Rogers' No. 1. Valuable in latitude 39°; ripens late; beautiful and of fine flavor; berries very large, yellowish green, often blotched with dull red; bunch large, shouldered. Ready for use almost as soon as colored.

Herbemont. Thin skin, luscious juice; berry small, dark blue, covered with a thick, light bloom; bunch large, compact, shouldered; rather a southern grape,

Iona. Bunch large, open shouldered; fruit red, best dessert, fair market, middle of September; not vigorous, but resists diseases and insects; blossoms late.

Isabella. Bunch large, shouldered, open; berry large, oval, black, fair dessert and market, end of September; fair for wine; some seasons it fails to ripen; should be pruned to single or two-eyed spurs.

Israella. Bunch medium, compact, shouldered; berry large, oval, purple black, good dessert, poor market, middle of September; sweet, free from pulp; requires warm soil.

Ives, Ives' Seedling. Bunch medium, compact, shouldered; fruit black, good dessert, poor market, end of September; good for wine; vine vigorous, hardy and productive; does better on heavy soil; among the three best for profit in latitude 40°.

Janesville. Black, good dessert and market, beginning of September; two to three weeks earlier and hardier than the Concord; great favorite in the Northwest; second quality in flavor.

Joseph Henry. Earliest, and good as Delaware.

Lady. Bunch medium, compact, long; berry large, yellowish green, best dessert, middle of September; the best of the white grapes; foliage persistent in some sections, in other places it falls off in July and renewed in the fall and the wood seems to ripen; in the latter case the fruit withers; vine hardy as the Concord.

Lady Washington is a new and promising variety.

Lindley, Rogers' No. 9. Bunch medium size, long, compact; berry a beautiful red, fair market, dessert and wine, middle of September; hardy, vigorous and productive.

Martha. Bunch medium, open-shouldered; berry large, beautiful greenish yellow, very sweet, rather foxy, poor dessert, fair market and wine, middle of September; hardy, vigorous and productive.

Maxatawney. Bunch medium, loose generally; berry oval, greenish white with an amber tint; flesh not pulpy, very sweet and delicious, good market and wine, last of September.

Merrimac, Rogers' No. 19. Bunch large, short, broad, compact; berry large, black, good dessert and market, especially in latitude 38°; middle of September; much like the Wilder in quality; vine vigorous and prolific.

Missouri Muscadine. "Hardiest of all, and bears like a Siberian crab-apple."

Norton's Virginia. Bunch medium, shouldered, compact; berry small, dark purple, poor dessert and fair market, especially for wine, but for the latter purpose it needs water and sugar; ripens in October; needs late protection or favorable season.

Oporto. Most profitable grape in the Northwest for wine; the wine is red; bunch small, slightly shouldered; berry medium, black; flesh purple, pulpy, austere.

Perkins. Bunch medium, shouldered, compact; berry oval, light red, becoming copper-colored, covered with a light bloom; good market and wine, and in some places next to the Concord for profit; plant very hardy and productive; fruit ripens early, inclined to be foxy when over-ripe.

Prentiss. Bunch medium, skin thick, flesh good, rich, sweet flavor; one of the latest.

Salem, Rogers' No. 22. Bunch short, small, broad, compact; berry large, dark red, good dessert, market and wine; end of September; vine vigorous, productive.

Taylor's Bullitt. Bunch small, short, shouldered, compact; berry small, greenish white and amber, good toward the South, end of September; a beautiful grape.

To Kalon. Bunch large, shouldered; berry large, purple-black, very good dessert; poor market; end of September; inclined to rot.

Walter. Bunch medium, shouldered, compact; berry medium, light red, best dessert, fair market, wine and raisins; middle of September; vine does not do well in the East.

Weehawken. A fine early white grape.

Wilder, Rogers' No. 4. Bunch large, compact, shouldered, sometimes double-shouldered; berry large, black, with a slight bloom; very good dessert, market and wine; middle of September; succeeds well in the West; should be pruned to single or two-eyed spurs.

Worden. Bunch large, compact, shouldered; berry large, black, very good dessert and market; a week earlier than Concord and better in quality; valuable in the latitude of Central Illinois.

Foreign grapes are recommended strictly for cultivation under glass; and as, when thus situated, they may be considered for all practical purposes as independent of climate, and as they are, moreover, thus grown mainly if not wholly for dessert purposes, we will here copy merely the list recommended by the American Pomological Society:

Barbarossa, Prince Albert, Brigola. Black, sweet, very late; hot vinery.

Black Champion. Sweet, early; cold vinery.

Black Damascus. Sweet, late; cold vinery.

Black Frontignan. Muscat flavor, late; cold vinery.

Black Hamburg Sweet. Ripens the average time; cold vinery.

Black Prince. Sweet, ripens at the average time; cold vinery.

Black July. Sweet, early; cold vinery.

Bowood Muscat. White, Muscat flavor, ripens at the average time; hot vinery.

Buckland Sweetwater. White, sweet, ripens at the average time; cold vinery.

Calabriana Raisin. White, sweet, late; hot vinery.

Cannon-Ball Muscat. White, late; hot vinery.

Chasselas Musque, Joslin's St. Alban's. White, early; hot vinery.

Duc de Magenta. Black, sweet, early; hot vinery.

Early Silver Frontignan. White, Muscat, early; hot vinery.

Golden Hamburg, Stockwood Golden Hamburg. White, sweet, late; hot vinery.

Golden Champion. Amber, sweet, medium season; hot vinery.

Grizzly Frontignan, Red Frontignan, or Constantia. Red and yellow, Muscat, medium season; hot vinery.

Gros Colman. Purple, sweet, late; cold vinery.

Lady Down's Seedling. Black, sweet, very late; hot vinery.

Muscat of Alexandria. Black, late; hot vinery.

Muscat Hamburg. Black, average season; hot vinery.

Mrs. Prince's Black Muscat. Late; hot vinery.

Queen of Nice. White.

Red or Rose Chasselas. Red, sweet, medium season; hot vinery.

Red Lombardy. Red, sweet, medium season; hot vinery.

Rio Virgin. Royal Muscadine, white, sweet, early; cold vinery.

White Nice. White, sweet, late; hot vinery.

West's, St. Peter's. Black, sweet, very late; hot vinery.

White or Dutch Sweetwater. Sweet, early; cold vinery.

White Frontignan, or Constantia, Muscat Blanc, etc. White, Muscat, average season; hot vinery.

Wilmot's or Dutch Hamburg. Black, sweet, medium season; hot vinery.

Zinfindal. Black, sweet, average season; hot vinery.

Grass, a vast and most important natural order of plants. It comprises probably one-sixth of the whole vegetable kingdom, and contributes to the green parts of the world by far the greater part of their verdure. It includes hundreds and even thousands of species which constitute the daily food of animals, and yet it exhibits one of the simplest structures which occur among the perfect forms of vegetation, and is one of the most thoroughly natural orders known in systematic botany. It combines such amazing specific variety, with general simplicity, as to be comparatively very easy of study and arrangement. The grasses display to the economist a stupendous instance of the adaptations of plants to the uses of man and the lower

animals; they afford the young botanist the best illustration of the truth and beauty of the natural orders of plants; and they demonstrate, in ten thousand other ways, by their organism, their mechanical transmutations, their connection with soil and light and air, and the mighty and multitudinous parts which they display between lifeless elements and living bodies, the providence, wisdom, and benignity of the Creator. They comprise all the plants which yield grain, most of those which constitute pasture, some of the best which yield sugar, and not a few which abound in useful secretions, grateful juices and fragrant odors. Their thousands of species are distinguished from one another, not only by obvious botanical characters, but by their nutritive values, their economical adaptations, their periods of flowering, their habits of duration, their methods and seasons of growth, and their love or dislike of particular soils and situations. Their flowers, though unheeded or thought obscure by superficial observers, are remarkable for the perfection of their parts, the elegance of their structure, and the blending of only one set of differential marks with an enormous variety of generic and specific characters; and either by the texture of their organs, the number of their stamens, or the relation of their sexes, or especially by the form, texture, appearance, number, position, and arrangement of glumes, paleæ and scales, they afford means of a far readier and surer discrimination than if they were among the most gorgeous and complicated glories of the flower garden.

The vegetable kingdom is divided into three great natural orders, called Acrogenous, Exogenous, and Endogenous, terms referring to their different modes of growing. To the last of these belong the grasses. The word Endogenous means ingrowing; that is, the increase in the growth takes place upon the interior of the stem, which is often hollow, though mostly filled with a soft, pithy substance, which becomes harder as it nears the outer surface of the stem. The peculiar formation of the leaves of endogenous plants is also striking; the veins all run parallel with each other, mostly throughout their entire length, instead of branching off and forming the beautiful and prominent network so noticeable in others. To this order also belong a variety of plants differing widely from the grasses, such as some species of of the Lilies, the Orchids, and many more, some of which will be mentioned hereafter.

The stems of most plants are much branched, but the formation of the grasses is peculiar, the stalk being mostly tubular and jointed, and quite simple, except where, in some instances, it is parted to give place to a cluster of flowers. The leaves are very long and narrow, and the flowers are variously arranged, sometimes scattered loosely upon the stem, as in the oats, sometimes in a short, compact head, suspended from the ends of long and slender branchlets, as in the Fescue grasses; and sometimes they are densely crowded at the end of the stem, in a lengthened spike, as in Wheat, Rye and Timothy. Each flower is composed of concave valves, placed one over the other; they are most conspicuous when the beautiful white, yellow, purple or scarlet anthers, which are hung gracefully upon their slender filaments, project from the lips of the corolla; the plant is then in bloom; and who does not admire a specimen of fresh-blown Foxtail or Timothy, especially when on some foggy morning the minute particles of moisture have settled upon the delicate stamens, giving them the appearance of being thickly studded with jewels?

We have said that many of these plants have jointed stems; this is observed in those whose leaves grow one above the other; each joint here answers the double purpose of giving strength to the stem and support to the leaf. But, in other varieties, the only leaves produced are what are called radical, or leaves growing from the root; with these the stems are not jointed, but receive additional strength from their being sometimes triangular or square, and mostly very fleshy and stout.

It is a remarkable provision of Nature, that those plants which appear to have been designed for food, either bear seed in great abundance, or are supplied with some separate provision for reproducing themselves; this is particularly noticeable in the grasses. Wheat, Rye, Corn, Oats, Rice, and Barley, which constitute staple articles of food, all produce their seed in great quantities; while in many species whose seed supply the wants of the birds, the roots are perennial and creeping, and are continually sending up suckers, thus increasing themselves many-fold by a distinct method.

Those seeds which require to be sown every year are reserved for the use of man, whose superior intellect teaches him the proper mode of rendering them useful; while the inferior animals depend entirely upon that provision which Nature has made for their supply.

The cereal grasses, or grain plants, are very rapid in their growth, and in a surprisingly short time send up a tall, hollow stem, divided by joints where the leaves are inserted, one at each joint, on the alternate sides of the stem; each leaf embracing the stem like a sheath.

Wheat stands at the head of the cereal grasses for its great productiveness and utility. There is no doubt of its great antiquity, grains having frequently been found enclosed with the mummies of Egypt. Some of these having been sown, have produced plants similar to those now grown in the Levant.

We do not wish, however, to discuss the cereal grains in this article, but will confine ourselves to those plants which come under the head of the term grass as used in every-day life by many people. They apply it to all those plants which are used for pastures and meadows. This is a classification, however, founded upon use alone, disregarding all the other features of the plants. A great variety of grasses and other plants are known by the same name in different sections, or one plant may have several names. Such names afford little guide as to what is meant. There is such a variance in this respect that without the Latin name

is given, one cannot be sure that he is correct in his naming.

Our Western prairies are particularly excellent for the raising of the grains and hay, on account of the humus consisting so largely of the remains of the prairie grass which has for many centuries grown upon them. Were the climate always favorable, the prairies of the West would far excel all the rest of the world every year in the production of these most useful articles of food and forage. In Illinois, Wisconsin, Iowa and Missouri, forage grasses are more profitable than the small grains. Among the many kinds of grass which have been profitably cultivated for hay, we will name, in the order of their popularity, only these: Timothy, red-top, Hungarian, millet, orchard grass, the fescues and blue grass. The last mentioned, although little cultivated, constitutes our most valuable grass for forage, both in respect to its nutritive qualities and its universality of growth. The species abounding in the Northern States is supposed by some to be different from the "blue grass of Kentucky," and by others to be a variety of the same. Timothy flourishes in all soils except such as are wet, too light, dry or sandy, and is found in perfection on the rich clay loams between 40° and 44° north latitude. Orchard grass furnishes three good crops in one season. The kind of grass suited for permanent pasture depends upon the kind of soil. Indeed, it is hardly worth while to try to seed down permanently any but moist soils. For these the following kinds of grasses are best suited: Red top, 5 pounds per acre; creeping bent, five pounds, meadow spear-grass, 4 pounds; fowl meadow-grass, 4 pounds; red fescue, 5 pounds; meadow oat-grass, 4 pounds; crested dog's tail, 3 pounds; timothy, 3 pounds.

Cultivation of the Grasses. As a general rule, grass seeds do best when sown early in the spring, in a mellow soil. If this is done while the frost is leaving the ground, no harrowing will be necessary, as the spring rains wash the seed into the porous ground and secure to it an early germination. They are also successfully sown in August or September, when the fall rains will generally give them sufficient growth to stand the winter, if the land be free from standing water. Many judicious farmers renovate their old, worn-out meadows by giving them a coating of unfermented manure and then turning the sod completely over. On the surface thus plowed, a dressing of well rotted manure or compost with ashes is spread and thoroughly harrowed in lengthwise with the furrows. The seed is then sown and slightly harrowed in, and the decomposing manure, with the stubble and roots of the old sod, give an immediate and luxuriant growth. Grain may occupy the land with the grass seed, but if the latter be sown alone and sufficiently thick, the young plants will exclude the weeds and occupy the soil as profitably as can be done with the grain. For a good coating of grass, the English method is to mix together and sow on a single acre, without any grain, a bushel or more of various seeds best adapted to the purpose. Sowing broadcast by hand, on a very calm day, is a good method, if skillfully done; otherwise one of the modern drills should be used.

Lands that should be kept in perpetual grass are such as are frequently under water, heavy, tenacious clays, and the steep hillside tracts which are liable to wash. Low bottom lands are of course the most profitable for haying, as they are kept rich by overflows. Strong clay lands can not be properly worked with the plow without great labor, unless when under-drained and well filled with manure; yet these soils are, next to the bottom lands, the most profitable for hay crops. In breaking up such land it should be well plowed, manured, harrowed and heavily seeded to grass; and if any deficiency of seed or growth is manifested they should receive an addition of seed, with a compost dressing. A Wisconsin dairyman, however, maintains that surface cultivation, without plowing, is the best. The necessities and advantages of seeding steep hillsides, subject to wash by the rains, are too apparent to need any illustration. It is well to pasture such land to sheep, as they drop most of their manure on the higher points, which is partially washed down and sustains the fertility of every part. Very stony land should not be broken up by the plow for the meadow any more than for any other purpose.

Permanent meadows and pastures should be now and then renovated, as there are not returned to them quite all the elements that are taken from them. After skimming the cream off them for a number of years, returning to them only the grosser constituents will not restore to them their original richness. Ground bones, gypsum, and in short whatever tends to develop an exuberant vegetation, must be constantly added to the ground. Ashes and salt are particularly good for pasture lands, as their office is to cause the earth to give up to the grass and other forage what plant food it contains. Lime, bone and gypsum add to the quantity of plant food in the soil. Permanent meadow lands, if constantly cropped without manures, may be exhausted with much greater rapidity than pastures, though this depreciation is much more gradual than with tillage lands. The proper time of applying fertilizers is by scattering them over the surface when the grass is just commencing a vigorous growth in the spring, or simultaneously with the first rains after mowing.

While meadows may be pastured with impunity in the fall when the ground is dry and hard, they should never be pastured in the spring.

As with all other crops, there should be rotation with grass. Instead of turning an old meadow directly into a new one, better devote the ground to other crops for a few years.

As to the time for cutting grass, much depends on the kind of grass and other circumstances. It yields more substance when cut after the seed is fully formed, say when it is between the milk and dough state; but it is preferred by stock when it has been cut in the flower, or just before. The curing of grass for hay is pretty universally understood by the farmers of the West at the present day. They know that the

best curing is effected on drying but rather cloudy days, and that two days is abundantly sufficient time for curing. All rain or heavy dew is a damage, if it falls upon grass partly cured. After partially drying it is best to let it remain a few days in cocks, on the same principle, as it were, that we prepare the most palatable dishes for the table by a slow simmering toward the last in a closed vessel. Some recommend that hay should go into the barn or stack, not perfectly dry and crisp, but slightly soft and moist in its own juices, and should therefore be stacked or stowed away in the barn at precisely the right time · others say, the drier the better.

As to the varieties of machinery for haying, we refer to the article Hay. In this department of farming, machinery has a signal advantage over the old practice of hand labor. The introduction of the mower has caused our meadows to be cleared of stones, roots, etc., and to be rolled down smoothly with a roller, all of which is a decided advantage to the actual yield of the crops.

As to threshing for seed, many kinds, as orchard grass, are best treated by taking a handful at a time and switching it over a barrel top. They cannot be threshed clean or winnowed properly with a threshing-machine.

Timothy constitutes the staple hay crop throughout the Northern and Western States; it thrives on most soils, in nearly all situations, averaging two to three feet in height; its best development is on the rich clays and clay loams between 40° and 44° north latitude; its roots are perennial, it is easy of cultivation, is hardy, and averages one and a half to three tons per acre, but affords but little aftermath; both green and cured, it is relished by cattle, sheep and horses; its nutritive power is computed at half its weight, dry; stands pasturage well throughout the season. It is also a valuable crop for seed, an acre yielding 15 to 25 bushels of clean seed, worth in the market $2 to $4 a bushel. The seed, at the rate of 6 to 12 quarts to the acre, may be sown either in the fall or spring, a fine tilth requiring the least and a stiff clay the most. It is well to sow it on wheat or rye in August or September. When sown alone or with other grasses early in the season on a rich soil, it will produce a good crop the same year. It is often sown with red clover on the plan that it should be cut when in bloom. Its seed ripens after that of clover. In New England and New York this is known as Herd's grass, and in some sections it is called "cat's-tail," the most appropriate name of all. Its only scientific name is Phleum pratense.

Red-Top is considered next in value to timothy for hay, being hardy, luxuriant, preferring a wet or marshy ground, if a little sandy the better, averaging one and one-half to two feet in height, with a yield of 875 pounds of nutrient material to the ton. Its roots are perennial, it flowers late, makes good pasture, fair hay, yielding two to four tons to the acre; flourishes throughout the United States. Of the seed, sow 15 to 30 quarts to the acre, with wheat, in September. Should be cut when in bloom and then may be pastured. Relished by cattle. Known as Herd's grass in Pennsylvania, Burdin's grass in Rhode Island, Red Bent in some places, Summer Dew in others, Fowl Meadow, Fine Bent, etc., etc., but to scientists only as Agrostis vulgaris. Another species of this (A. stricta) is known by some of the above names.

Blue Grass far excels all others for pasturage, but is of little value as hay. It is the most common grass known. That which abounds in the North has been supposed by some persons to be of a different species or variety from that of Kentucky, but probably without sufficient foundation. It reaches its highest perfection in strong limestone soils, particularly in the rich uplands west of the Alleghany mountains. It might be considered an evergreen grass, as it retains its greenness, as well as its virtues, through the winter, except when there is much freezing with no snow on the ground. From it the people of the Ohio river valley, the upper Mississippi valley and the Lake region obtain most of their milk, butter and cheese. It is the most forward grass in the spring, and ripens its seed in June; whence one of its local names, "June grass." The seed immediately germinates under the refreshing showers of that season, and the young grass sends out its long, slender leaves one to three feet. One acre of good blue grass is considered equal in value to an acre of corn, and it costs much less. One acre will keep a cow. The yield, per acre, is estimated at three to five tons, dry. Nutritive matter, 1,317 pounds per ton. It is also the best lawn grass. In sowing, supply 10 to 15 pounds of the seed to the acre. It is not well adapted to alternate husbandry, as it requires more than one summer to get well established; but it is persistent, and is often regarded as a troublesome weed. Known also as Green grass, Meadow grass, Spear grass, Kentucky Blue grass, Smooth-stalked grass, etc., but to the scientific world simply as Poa pratensis.

Another species, Poa compressa, has flat stalks, which are dark green, hard, shrinking the least of all grasses in drying, rich in nutriment, dwarfish in habit, abounding in the Northern States, tenacious of its foot-hold, forming a good covering to the ground, and known also as Blue grass, Wire grass and Flat-stalked Meadow grass. Poa trivialis, or Roughish Meadow grass, has the appearance of the "great queen of grasses," is somewhat valuable for both hay and pasture, affects low, wet ground, grows about 20 inches high, and is best cut when in seed, about July 10; but it is more highly esteemed in England and Scotland than in this country.

False Red-Top (Poa serotina) takes the place of blue grass in Wisconsin and Minnesota. Called also Swamp Wire grass. Was formerly called Fowl Meadow grass. The stem is evergreen, tall, thriving on low, wet land, is good for pasture, and in the region named, also for hay, as such being soft and nutritious.

Dwarf or *Early Meadow* grass (Poa annua) is found everywhere in old pastures and about dwellings, making much trouble by constantly springing up in

paths and drives. It is pale green, sweet, short and early, fit for pasture only.

Millet (Setaria Italica), or *Bengal Grass*. This runs wild in this country, where it is sown, but as a forage plant it is said to be not equal to oats. It requires a dry, rich, well pulverized soil. Sow broadcast or in drills, from May to July. It ripens in 60 to 75 days. If sown broadcast for hay, 40 quarts of seed to the acre will be required; if in drills, for the grain, eight quarts will be sufficient. It may be cured like hay, yielding from two to four tons to the acre; or it may be used profitably as green fodder. All cattle relish it, and fowls are fond of the grain. For green fodder it should be cut before the first seeds begin to ripen; and for grain, just before they begin to fall. It grows two to four feet high, and yields 25 to 100 bushels of seed per acre. It stands drouth well, and is particularly adapted to dairy farms. In the Western States, however, the above has mainly given place to the next mentioned.

Hungarian Grass, or *German Millet*. This is liked by all farm stock, but the seeds, if allowed to get ripe, are supposed to bring on disorders of the kidneys, especially in horses. For this reason it should be fed rather sparingly to horses unless it has been cut when in bloom. Two feeds of Hungarian per day, with one of straw, to cattle, will carry them nicely through the winter. It is an annual, enduring drouth remarkably well, has many leaves, which are juicy and make an abundance of nice fodder. It attains its greatest luxuriance on soils of medium consistency and richness but does very well on light and dry plains.

Egyptian, *East Indian*, or *Pearl Millet* (Pencillaria spicata). This new millet is quite distinct from all other species, and is without doubt destined to take a place in the front rank of valuable forage plants. Sown in light, sandy soil, the plants at first appear feeble, resembling broom-corn; but when a few inches above ground they begin to tiller, and new shoots appear very rapidly from the original root, until they number a half dozen to a dozen or more. The stems at first are nearly prostrate, but when about two feet long they begin to assume an upright position, reaching a height of eight to ten feet, not differing in color or substance from common Indian corn. In fact, it is one of the most "leafy" plants in the great family to which it belongs. When the stems have reached nearly their full height, the seed or flower spikes appear near their summit. As soon as the first or principal flower spike appears, the stems throw out lateral branches from every joint, these in turn producing leaves and flower spikes. When cultivated for fodder, the seed should be dropped in drills, and given plenty of room on account of the peculiar habit of tillering. The fodder is in the best condition for cutting and curing when the stalks are five or six feet high; but if used for soiling, it might be cut earlier or later, at the convenience of the cultivator; the stumps sprouting and throwing up a new growth, continue to grow until killed by frosts. Cows, horses, and other farm stock are exceedingly fond of this kind of millet, eating it with as much avidity and apparent relish as they do the green leaves of corn. Ninety-five tons of green fodder have been grown from one acre. West of the Missouri river it may be sowed on upland, in drills two and one-half feet apart, two quarts per acre; hoe twice before it is a foot high; after that no weeds will get a foothold, so rapid and luxuriant is its growth, seeds stooling 10 to 25 stalks. Is not easy to be blown down by the wind, and stands drouth wonderfully well. Probably of greater value to young stock as a fodder plant than corn. All kinds of stock are over-fond of it. May be cut four times. Land good for corn is all it wants. The seed will not mature in the Northern States.

Orchard Grass is the best grass we grow in the shade. It will grow three to five feet high, yield three to five tons to the acre, is at home in the Northern States, and requires a porous, deep and fertile soil; sow the seed in March at the rate of 20 to 30 pounds to the acre, and it will take possession of the soil as a perennial; may be mowed from June to September; but it is best to cut the first crop just before the seed ripens, and pasture it the rest of the season. To secure a tender, succulent herbage, it should be fed closely. The seed is remarkably light, weighing only 12 to 15 pounds per bushel. Its tendency to grow in stools or tussocks is an objection to it as a meadow grass.

American or *Swamp Cock's-foot* is another species of the foregoing, yielding a large amount of grass or hay, but of inferior quality.

The *Fescues*. The *Tall* seems to be more nutritive than any other grass. It grows three feet high, does best in a black, rich loam, flowers the first week in July, ripens its seeds the last week, but is best cut when in flower. The *Meadow* species likes a boggy soil, bears well, and produces an early grass, much relished by cattle, either green or cured as hay. It is an excellent pasture grass, forming a considerable portion of the turf of old pastures and fields. Ripening its seeds early, they sow themselves, germinate and take possession of the ground after other crops are cut. The leaves are long and tender. It is not sown much in this country, and when it is sown at all it should be mixed with other grasses, as orchard, rye, or June. *Spiked* fescue is adapted to a rich loam, and produces the best of hay and pasture. *Purple*, *Sheep's*, *Hard* and *Floating* fescues are all natives of this country and good pasture grasses. Sheep's fescue is plentiful in mountainous regions and adjacent plains. It is deemed a nutritious grass, notwithstanding its hard, wiry appearance. It assumes various forms, according to conditions of location; grows about two feet high, chiefly in bunches or stools, with erect, straight, stiff culms and long narrow leaves of pale green color.

Sweet-Scented Vernal Grass. This is one of the earliest in spring and latest in autum, luxuriating in a dry, sandy loam, and affording two to three crops a season. Its chief value lies in its energy in taking possession of old, worn-out fields; and it is this species

of grass that gives that delightful perfume to new-mown hay in the East.

The *Tall Oat Grass* is early, luxuriant, grows about five feet high, makes fair hay but better pasture, and flourishes in a loam or clay soil. Good for soiling and for rowen. It is often found on the borders of fields, hedges, woods and pastures. Has been considerably cultivated.

Meadow Foxtail is also an excellent pasture grass, resembling timothy in appearance, but earlier, and has a softer seed-top. It thrives on all soils but the driest. It is relished by stock of all kinds, and gives an abundant aftermath. In all lands, therefore, designed for pasture, it should form a considerable portion of the mixture. It will endure almost any degree of forcing, by liquid manures or irrigation. To gain a firm footing in the soil, it requires three or four years. The seed is covered with soft, wooly husks and is consequently light, weighing but five pounds to the bushel and containing 76,000 seeds to the ounce.

The original prairie grasses are still abundant west of Missouri and the Missouri river, but they will all eventually give way to cultivated crops.

Many other species of grass are of some value and are sometimes sown with standard kinds; as, White Bent, Fiorin, Brome, Chess, Perennial Rye, Ribbon, Bermuda, Barnyard, Crab, Tussock, Buffalo, Mesquit, Arundo, Gama, Grama, Hair, Thin, Blue-joint, etc., etc., but they deserve no particular notice.

Grass Lands, lands producing herbage for the feeding of farm stock.

Grass, TO CRYSTALLIZE. Take 1 pound of alum, pulverize and dissolve in 1 quart of water, but do not let it boil; pour the solution into a deep earthen jar, and let it stand until about blood-warm. Fasten your grasses with strings to a stick laid across the top of the jar; set away in a cool place where they will not be disturbed for 12 hours, then take them out and let them drain. For blue crystals use indigo or washing-blue; for yellow, boil a few saffron leaves in a little water, and mix it with the alum water; for pink or red, use Prussian red, the more you use the brighter the color. The solution may be heated over and used until the alum is gone. Be sure and have your grasses perfectly dry before putting them into the water. Press some green and autumn leaves to put in your bouquets. Some bitter-sweet berries (if you can get them) will be quite an addition.

Grasshoppers. At the present day this term is limited by exact writers to those green insects which are akin to and include the Katydid, while all the grayish insects ordinarily called "grasshoppers" are truly locusts. See Insects.

Gravel, the formation of stone or calculous substances in some of the urinary organs. These agents are originally contained in the food and drinks taken. When the functions are in a healthy condition these substances are carried off in the regular secretions, but when, owing to debility of some of the organs, generally the kidneys, there is an excess of ureic acid in the system, which, uniting with the calculous particles, form larger masses or stones, these are sometimes so large that they will not easily pass off through the urinary ducts. This stone may lodge in the kidneys or in the ureters, or it may pass into the bladder, and if not neutralized or removed will cause inflammation in the parts.

If the stone is lodged in the kidneys, a severe and steady pain is experienced in the small of the back. The most intense pain, however, is felt when the substance is passing through the ureters from the kidneys to the bladder. This pain is so severe sometimes as to cause fainting and convulsions. When the stone is lodged in the bladder, very distressing pains will be felt in that organ, accompanied with more or less inflammation and an itching along the urethra.

In treating this distressing disease, should the pain be severe, which is generally the case, give first an opiate,—from 40 to 60 drops of laudanum, or ½ grain of morphine, and repeat in a short time. Then administer suitable diuretics, warm fomentations, etc. When the urgent symptoms have been relieved, give a hydragogue cathartic, as podophyllin and cream of tartar. Remedies should then be administered to dissolve the stone and counteract the tendency in the system to its formation. The juice of red onions is claimed to be a solvent of the stone. A gill is to be drunk morning and evening, for three days. An herb known as gravel-root, common in some sections of the West, is said to be a specific in this disease. It should be freely used in the form of a decoction.

Gravy. A CHEAP BROWN GRAVY. Take 1 pound of gravy beef and a sheep's melt; cut it into slices, dredge them with flour, and fry them lightly in butter; then pour in not quite 1 pint of water. Add a seasoning of pepper and salt, a small onion, and a piece of celery cut into slices. Set the stew-pan over the fire, and let it stew slowly for 2 hours. Skim it well; strain it; add 1 spoonful of catsup, and set it by for use.

GRAVY FOR HASHES, ETC. Break some bones, and put them into a stewpan, with any spare cuttings of meat you may have; add a little pepper, salt, and 12 allspice, ½ head of celery, and 1 bunch of sweet herbs, and simmer it for about 2 hours, with sufficient water to cover it. Cut 1 small onion into slices, fry it in a piece of butter, and boil it up with the gravy for 15 or 20 minutes. Strain it into another stewpan, with two tablespoonfuls of walnut catsup, and a piece of butter rolled in flour, boil it up, and it will be ready for your meat.

FISH GRAVY. Skin, clean, cut up and soak 3 small eels; put them in a stewpan and cover them with cold water; add 2 or 3 anchovies (or a little essence of anchovy); add some sweet herbs, whole pepper and mace, lemon-peel, and a shred of horse-radish. Stew gently till the fish is drawn down, and

put in, when about half done, a crust of bread toasted to a high color. Strain off, thicken with a piece of butter and flour, and it is ready for use with almost any kind of fish.

GRAVY FOR A GOOSE OR DUCK. Put 1 set of giblets and ½ pound of lean beef into a stewpan, with 3 sage leaves, 1 onion, some whole pepper, salt, and 3 pints of water, and boil it for 3 hours; then add 1 glass of port wine, with a spoonful of flour mixed smooth to thicken it, and boil again for 2 or 3 minutes.

WHITE GRAVY. This gravy is the stock of several white sauces, and is made thus: Put into a quart stewpan 3 pounds of lean veal, cut into dice, and ½ pound of lean ham, cut smaller; add a glass of cold water, and put over the fire until the "white glace," or jelly, forms on the bottom of the pan; then add 3 pints of cold water, 1 bunch of savory herbs, 1 sliced onion, and 1 blade of mace. Let it slowly come to the boil, then add a little salt, skim carefully, and simmer slowly for about 3 hours; strain, and when quite cold remove all the fat.

Grayling, an excellent fish of the salmon tribe. See page 472.

Graze, to eat grass and small herbage, as cattle graze on the meadows.

Grazier, a farmer who employs himself principally in buying, feeding and selling cattle and sheep. He differs from a stock-farmer in paying little or no attention to the breeding or rearing of stock, in having a closer connection and far more frequent interchange with the markets for stock, in devoting his chief professional skill to the speediest and most profitable fattening of the particular breeds and individuals which he judges to have the best adaptation to his pastures and to the markets. He requires a good knowledge of the many different breeds of stock, an intimate acquaintance with the peculiar adaptations or non-adaptations of each breed to such circumstances of climate and pasture as those which characterize his farm, a ready discernment of the excellencies or defects of any individual of each breed, a profound knowledge of the many principles and practices involved in the most economical treatment of grass lands and thoroughly mercantile habits in selecting the best markets, in making the seasonable purchases and sales, and in subordinating his whole professional conduct to the fluctuations and even the caprices of demand.

Grease, a local inflammation of the heels of horses, causing an unsightly condition of the parts. It is the result of suppurative inflammatory action of the skin and heels of the hind legs, usually, but sometimes of the fore ones. It is more common with coarse-bred Western horses and heavy breeds than in well or fine-bred horses.

Grease or **Fat.** TO PRESERVE GREASE. Boil all the scraps, rinds and bones in a weak lye, and the purer grease in clear water. Let the mixture cool, take off the cake of grease and strain it. It is well to do this occasionally, as you save it; for when kept for a long time, impure grease becomes offensive. You must be careful to dry off all the water before laying it away in the grease tub, if you wish it to keep sweet. The best plan to collect drippings is to put it while warm into water nearly cold. Any impurities it may contain will sink to the bottom.

To preserve soap-grease, fill a cask with good strong lye, and drop all refuse grease therein. Stir up the mixture once a week.

TO TAKE GREASE OUT OF CARPETS. As soon as it is dropped put on plenty of wheat or buckwheat flour, whiting or magnesia, to absorb the oil and keep it from spreading. If the oil is near a seam, rip it so that the oil will not spread, and put whiting on the floor under the carpet. Next day sweep up all the flour above and under the carpet with a stiff brush, and put on plenty of fresh flour. The above is in case oil is dropped. To extract simple grease spots, rub them with white flannel dipped in raw spirits of turpentine. If they show after a while rub again, on both sides. If there are grease spots on the floor remove them with potters' clay before the carpet is laid down.

TO REMOVE GREASE FROM CLOTH AND WOOLEN ARTICLES. Place a cotton or woolen cloth, or a piece of blotting paper under the article to be cleansed, then rub upon the spots some pure benzine, and the grease will disappear. Be sure to place a cloth under the garment to be operated upon, otherwise a circular stain will remain, which cannot be removed. The benzine drives the grease through the article to be cleaned, and is absorbed by the cloth placed under it. After the spot is removed, continue to rub with a dry cloth until the benzine is evaporated, thus avoiding a stain.

Another way to remove grease spots from goods and paper, especially the latter, is to grate on the spot a thick coating of French chalk; common chalk will answer, but it is not as good as the French. Cover the spot with brown paper, set on a moderately warm iron, and let it remain till cold. Care must be taken not to have the iron so hot as to scorch or change the color of the cloth. If the grease does not appear to be out, on removing the iron, grate on more chalk, heat the iron again, and put it on. Repeat the process until the grease is entirely out.

Refined benzine has become the almost universal means for removing grease spots and dirt. Directions for using it are given just above.

TO REMOVE GREASE FROM SILK. Separate the yolk of an egg from the white as perfectly as possible; stretch the fabric on a board, and, with a soft clothes-brush, dip into the yolk and rub the spot with it until the grease seems loosened. The yolk will not injure the most delicate colors, but the rubbing may if too severe. Rinse with warm rain-water, rubbing the edges with a damp cloth, and clapping the whole between dry towels. If the stain is not quite gone, repeat the process.

Another method is to rub the spots of the silk

lightly and rapidly with a clean, soft cotton rag, dipped in chloroform, and the grease will immediately disappear without injuring the color of the silk. Be careful to rub the article lightly and rapidly, and finish with a clean, dry cloth. Very highly rarefied benzine, such as is prepared by first-class druggists, will also immediately remove grease spots from the most delicately colored silks.

To Take Grease Spots out of Boards. Make a paste of fuller's earth and hot water, cover the spots with it, let it dry on, and the next day scour it off with soft or yellow soap.

To Remove Grease Spots from Books. Moisten the spot with a camel-hair pencil dipped in spirits of turpentine; when dry, moisten with spirits of wine.

Green Fallow, green crops plowed into the soil.

Greenhouse, a building with a glazed roof in which plants are kept in pots and arranged on stages in a manner pleasant to the eye. A structure of this kind should not be placed where it will be much exposed to the prevailing cold winds. A south or east exposure is best. The foundation may be made of stone, brick or wood. A wall of stone or brick should go below the frost, and be laid in mortar made of stone lime and water lime of equal parts, with the proper amount of clean, sharp sand. A good stone wall will be lasting, but it will carry off much heat from the building. It might be furred with a thin layer of wood, or lathed and plastered, using some water lime. A solid brick wall for a greenhouse, in the climate of Central New York or Michigan, will last but a few years. Further south they are said to answer for the south and east walls. The heat and moisture within, and the cold without, cause the brick and mortar to crumble and give way. A hollow, ten-inch wall of two tiers of brick bound together with strips of iron is warm and durable if made of good hard brick. Walls of wood are cheapest, dryest and warmest, and if well made they are often more durable than walls of stone or brick. For such a wall, posts are used of cedar, chestnut, locust or even oak, blue ash, or red cherry, set deep and firm. Such a wall will last 20 years or more.

The cistern should be large enough to hold all the water which falls on the house during the year, so that none be wasted. As we are using water most of the time, the cistern should have about one cubic foot of contents to three or four square feet of ground covered by glass and potting room. We prefer them to be built under ground, of bricks, arched over, just outside the house or under the center of it. They are often built under the center stage, and covered with planks, upon which rests the pots or a stage to support the pots. In this case the walls are about two and one-half feet above the path. If such a cistern is left partly uncovered, the water soon becomes nearly as warm as the air of the house. Lead pipes run from the gutter or eaves-trough, underground to the cistern. If the cistern is outside or below ground, there should be a large open tank, made of boiler iron, cement or planks in the house, to contain water until it has become warmed by the heat of the house. Water for plants should be at least as warm as the air of the house in which the plants grow. Above this tank should be a good force pump, with hose enough to reach any part of the house, to enable two men to shower the plants whenever desired.

Designs for glass structures are almost endless. They are known as double-span roofs, having a roof of equal extent on each side; as lean-tos, with the roof all sloping one way from a high wall or building; or as a two-thirds or three-fourths lean-to, in which one of the walls is higher than the other, and the rafters are longer on one side of the house.

A lean-to is cheapest, but for most purposes a double-span roof is the best. The latter, if running north and south, gives an equal distribution of light, so the plants grow symmetrically without being turned around every little while. A lean-to or two-thirds lean-to is rendered warmer with the same heating apparatus, on account of the protection of the high walls from the cold winds. The lower the houses are made, the better, provided they are high enough to afford room for the plants. In very high houses the air at the top is so much warmer than that near the ground that it is almost impossible to heat them suitably for plants, unless the plants are also elevated on a high stage near the glass. Plants "draw" or grow slender when grown far from the glass. Every man of experience will now say, Build low. For ordinary purposes, nine to twelve feet is enough for the extreme height. For good work, without regard to appearance, six or seven feet is much better. If a number of houses are to be erected, they can be joined in any way to suit the locality or the taste of the designer. If much extended in a line, they make a greater display, at the expense of economy in fuel. For mutual protection and convenience, it is better to place the houses close together.

It is a good way, now quite popular, to build three houses, with double-span roofs, running north and south. These are joined side by side with a house for potting and packing (with furnace below) running along the north end. This room on the north affords protection from the cold, does not obstruct the light, and permits the gardener to pass from one house to the other without exposure or opening of outside doors. In England and Ireland many of the best houses have a framework of iron or copper. They present a fine appearance, are stout, durable, and do not obstruct the light, or harbor insects. Some have been tried in various places in this country, but so far as we have been able to learn, all have failed to give satisfaction, on account of the great extremes of our climate. These changes cause the glass to break, and the frame work conducts away the heat too rapidly in cold weather. We are not aware that any of the latest improved English patents have been tried in this country. Our best builders universally condemn a metallic frame.

Choose glass about 10 inches one way, double thick,

and quite flat, so as to make tight joints. In curvilinear houses, have the glass 8 by 10 inches where the curve is greatest, and 10 by 14 or 16 inches where the curve is least, all the sash being 10 inches apart. None of the glass in this case need be bent, but imbedded in soft putty made of kiln-dried whiting and white lead mixed in oil. Each glass is fastened with four zinc shoe nails half an inch long. One of these is placed at the lower edge on each side, to keep the lower glass in place and the upper glass from sliding down; the other two are an inch and a half farther up the sash. The sash are one-sixteenth of an inch farther apart than the width of the glass. No putty is now used on the outside by the best builders, but some thick paint covers the upper edge of the glass, running on three-sixteenths of an inch. In England some of the best houses are now made without any putty or lap of the glass. They are free from drip, and permit any pane to be removed without disturbing those near it. Portable greenhouses are there quite common. Ground glass is liked by some to obscure the light in summer, to prevent the plants from burning. They break more easily than plain glass, and they do not give so much light in winter, when we usually want all we can get. To obscure glass in long, hot days, whitewash of lime is often used; but it acts unfavorably upon the sash, paint and putty. Indigo in hot water or linseed oil is cheap, easy put on, and answers a good purpose. Whiting in oil is nice. A favorite with many for nice houses is sugar of lead ground in oil and diluted with turpentine. Take but little at a time on the brush and put on thin; before dry, dust or dab over with a light, dry brush, to break up the lines in the covering. Any of the above can be easily removed in autumn, especially with the aid of a little pearlash water. Some fix up curtains of muslin, tacked to the sash inside, or placed on rollers. Some have curtains outside, made to roll up under a cover on the ridge of the house. You can have a huge blind made like a window blind, of 7-inch boards, the whole large enough to cover one side of a commercial plant house. You can close them at night to save heat, and open to any extent during the day to get just as much light as you want.

Double glazing is not very common, though it saves much heat. The snow will not so readily melt off in winter; dust and dirt and insects get in and look bad. It works well in perpendicular walls. Double glass for a third of the way from the bottom is most needed, where the air is coldest. The inside glass need not lap or be puttied. The glass may slide in from the top, and be removed for cleaning or replacing when broken. All nice houses above eight or nine feet in height should be supplied with King's patent apparatus to open the upper ventilators. It opens them all at once, to any extent desired, or closes them and holds them securely wherever placed. English sliding sashes for ventilation are clumsy affairs.

A curvilinear roof has some advantages. It is more ornamental. The light is better because the angle at which it strikes the glass is more varied. Such a roof gives head room next the sides of the house, without great height at the center or next the wall of a lean-to. The roof is stronger, and needs no center posts in a room twenty-five feet wide. It may be kept from spreading by half-inch rods running across from rafter to rafter, with right and left screws in the middle to arrange the tension. Paint the rods of the same color as the sash, so as not to be conspicuous. When well built, curved roofs are much more expensive, and, except for their finer appearance, straight slopes are preferable, all things considered. The cost of a house with curvilinear roof, heated with water, and stages for plants, is $2.50 to $3.00 for each square foot of ground covered. This does not include the cost of masonry. Houses with straight, double span roof, made plain and substantial, heated with water, and stages in, will cost from $1.50 to $1.90 per square foot, besides masonry. If made low for propagating, and posts of wood are used, they can be made and heated with water complete for about a dollar per square foot. If heated with flues, such a house will cost 45 to 60 cents a square foot. The curve for a curvilinear roof should not be just one arc, but it should curve most rapidly about one-third of the way from the bottom or wall. This allows a good slope for the upper part of the roof, to prevent drip. The rafters are about three by six inches, cut from the timber with the grain, framed together and bolted, making one continuous piece from sill to ridge. They may make the lap in two ways, horizontally or vertically. In either case the joints will be covered by a five-eighths inch band on the inside and outside edges, well nailed.

The purlines are two by three inches, about six feet long, tenoned into the rafters and bolted into the opposite one end to end, and placed not over four feet apart. There is a beveled coping on top of the sill, to turn the water off and to serve for the ventilators to shut against.

Fig. 1 represents a neat glass structure, combining

FIG. 1.—*Greenhouse.*

the straight and curved rafter. The side ventilators are hung at the top and open outwards. They are held in place by iron straps and pins; a screw eye holds the strap, one by one-eighth of an inch, to the ventilator; holes in the strap catch on an iron pin in the sill. All side ventilators are best when made to

open under the side shelf and over the pipes or flues, so as to warm the air before it strikes the plants. Similar doors may be hung from the side beds in the house. The flues are often boarded up, to secure

FIG. 2.—*Ventilators.*

good bottom heat for the plants on the side shelves.

Sash bars for a curved roof should be one by one and a half inches, cut on a radius to conform to the rafters, and well nailed in the grooves of the purlines. These bars run only from one purline to another. The plates are two by four inches. The gutter is of wood, about four and a half by three inches in width, the ends put square together with a piece four inches long and five-eighths wide, curved galvanized sheet-iron driven into both ends of the pieces which meet. The gutters are held in place by a bracket, which is useful as well as ornamental. In the winter place a foot-board over the gutter and let it rest on the sash above. Tack it fast. It will be found to keep ice from accumulating in the gutters.

The shelving for all greenhouses may be made of open slats or tight-matched inch boards. The side shelves are about three feet wide, with a light strip on the edge to retain sand to set pots on. The legs of the shelves should rest on stones or bricks. The paths are about three feet wide, and best made of grout, a trifle rounding to let off the water. Some are made of slats of wood. In a long lean-to for ornamental purposes, a winding path gives great variety, and keeps small parties out of sight of each other. In the center of a wide house there may be a stage with shelves rising towards the center, with an average slope about parallel with the rafters. Some build an eight-inch brick wall within the paths and fill the space with earth for plants. The walls must be tied with iron rods running across the bed.

It is impossible to describe a tenth part of all the tasteful fixings seen in houses managed by skillful persons. These consist of brackets, rock work, trellises, rustic seats, grottoes, fountains, aquaria, fancy pots, etc.

The heavier parts inside, above the stages, are beautiful when painted pearl white, and the sash a light sky blue. The legs of the stage may rest on a flat stone or a few bricks. The wood-work should be well painted, and all joints are better if put together in green paint.

Greenhouses are very apt to have too much wood in them when built by common mechanics. They should be made as light as is consistent with strength. Heavy ornaments are all out of place.

Propagating is mostly done in low, narrow houses, placing the cuttings in sand which is on the stage. As before remarked, the space under the stage or shelf is usually boxed up, to keep the sand much warmer than the air above it, to secure what is called a good bottom heat. This is very essential to good success, and too often overlooked or forgotten. There is nothing new in this fact, as it was well known 40 years ago, and perhaps a hundred. Shelves or benches for this purpose are usually made of wood, sometimes of slate. Some prefer vats containing warm water. They are more expensive, and will not last over six or eight years. Good vats can be made of water-lime cement, held in place by boards till sufficiently hardened. A vat of wood may be made as follows: Lay a tight shelf or bench three feet wide along the side of the house, selecting the best pine stuff 1¼ inches thick, tongued and grooved, and carefully put together in green paint. Place a piece 2½ or three inches wide, one edge up, along the front edge and back edge of the shelf, and across the ends; also one along the middle. The middle strip does not extend quite to the farther end. On these three parallel strips place another tight shelf, with edges 3 inches high, upon which place 1½ inches of clean sand, to contain the cuttings. This must never get above 70° for most cuttings. Tap the flow pipe and conduct it into the side of the vat near one end. The water, 1½ inches deep, after passing down one side of the vat and back the other, will pass out through another pipe into the return to the boiler. To check the heat, place a little block partially over the upright flow pipe where it enters the vat. If much over 80 feet long, the water gets too cool before leaving the vat. Fifty to 60 feet, or any shorter length will do.

A LEAN-TO is a kind of greenhouse often used, but the light is all from one side, and not so good for the plants unless they are frequently turned around. A neatly constructed greenhouse, attached to a dwelling,

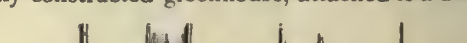


FIG. 3.—*Greenhouse Attached to a Dwelling.*

and partaking somewhat of the nature of a lean-to, with but little of its disadvantages, is shown in Fig. 3.

A very cheap one, easily managed, may be made as

follows: Just beneath a sloping outer cellar door may be placed a few sash and glass. On warm days, or at all times, except nights and very cold weather, the wooden doors may be open. Some plants will do very well in such a place. One can be made on a much larger scale, on the same plan, which can be entered through the cellar or from the house above. A saddle boiler is used, arched all over with brick, which grows smaller as it becomes a flue and enters a large chimney, which also answers for other fires in the house. It needs very little care. The boiler also has some pipes attached for warming with water. It takes about 2½ cords of 3-foot wood for a year.

A portable, dwarf span-roof greenhouse, for setting over asparagus, rhubarb, grapevines, tomatoes, etc., to keep off frost and retain heat in spring or autumn, can easily be made. Doors on hinges may be made, to cover the glass quickly in cold weather. The cost is about one dollar per foot, three feet wide.

Heating Apparatus. Steam is now seldom used for heating greenhouses, as it requires more attention, and there is more danger than when warm water is employed. Heat does not circulate until the steam is generated, while water begins to circulate as soon as the temperature rises one degree. Warm water is safest; there is no danger of gas or explosion, the heat is not excessive anywhere, but evenly distributed. There is something injurious and unpleasant about a high heat of flues or iron pipes. The labor of tending fire for warming by water is very little, an item of no small account in a large house. The cost of boiler and pipes is the greatest objection to their use. Water is best for large houses; many prefer brick flues for small ones. The boiler should be large enough to contain a great body of hot coal, and not need hurrying. The flow pipe must come out at the highest point of the boiler. Most builders put up pipes so the flow pipe slowly rises from the boiler to the extreme end, where there is an expansion tank; from here the pipe returns below and parallel with the flow pipe, and enters the lower part of the boiler. One man arranges the flow pipe to slowly descend, and the return pipe also, through the whole length. It works well. His reasons for this arrangement are—that after leaving the boiler the water grows colder, and heavier, and naturally falls, to make room for the lighter warm water. The fewer turns in the pipe, the better. After many years of experience, an authority gives the following rule for the amount of 4-inch pipe to heat a glass house well made: For a temperature of 40° to 45°, with outside at 10° to 15° below zero, we need one foot of pipe to every four feet of glass exposure; for 65° to 70° we need one foot of pipe to every three feet of glass. The boiler should be four to eight feet below the level of the house, though this is not essential with all heaters. The pipes at each joint rest on brick piers carefully made. Houses on low ground may have the pipes descend and then rise to pass under a sill, but this is thought objectionable. For farther details, consult almost any catalogue advertising heating apparatus.

Flues have long been used. They are very simple in construction. The bottom is made of bricks and tiles, a foot one way, held up on bricks or stones to allow the heat to escape; the sides are made of two or three bricks above each other on edge; and the top is covered with tiles. The flue should gradually rise for its whole length. The mortar should be thin and the bricks damp, so that no joints will be left for pointing. Well puddled clay makes a very good mortar. Tiles a foot square often have a notch along one edge to overlap a notch in the previous tile. The little furrow on top should be filled with mortar. A brick furnace may be made and set two or three feet below the flues. The door should be just outside the glass house and open into the shed near a coal bin. If for coal, make for a moderate-sized house, a furnace 1½ feet wide, 2½ feet high at the center of the arch, and 2 feet deep, and lined with fire bricks. If for wood, it must be longer and some larger, depending on the size of the house. The arch needs an iron front, with two doors, one for fuel and one for ashes. Iron grates to hold up the fuel are desirable. It is generally thought impracticable to make flues work well if much over 120 feet in length. On the flue should be placed several large, long pans of water, to afford moisture. Instead of bricks for the entire flue, after about 20 feet, flues are nicer and better made of large cement drain pipe; they crack and give out heat too freely for placing near the furnace. A saddle boiler is sometimes used, uniting the heating by flues with that by water. It is a very economical and satisfactory way of heating small houses.

To fumigate a greenhouse, a cheap and convenient method is to set a large flower-pot, containing some dry tobacco, upon two small, inverted flower-pots, which are as far apart as may be to hold up the larger one; invert another large flower-pot, same size as the other, over it, and placing a burning candle underneath, so that the tobacco will be kept smouldering, without blazing.

Kindred topics are Floriculture, Gardening, Window Gardening, Hot-bed, Cold Frame, etc.

Green Crops, crops which alternate with the cereal grasses in regular rotations, or which admit of the cleansing and ameliorating cultivation called the green fallow.

The term green crops is sometimes employed in a large sense, to designate all cultivated esculent plants which are used in a green or ripe state; and in this sense, green crops comprise the greater portion of the ordinary productions of the kitchen garden.

Green Fly, any of the green colored species of aphides which infest peach-trees, plum-trees, cherry-trees, or the shrubby plants of the greenhouse or the conservatory.

Green Food, cut or gathered esculent plants, used in their fresh or succulent state. It differs from fodder in excluding all dried substances, and from pasturage or herbage in being consumed in the house. See the article Soiling.

Green Manure, vegetable substances incorporated with the soil in their succulent state, to act as fertilizers for subsequent crops. They may be either entire plants or parts of plants; either weeds or parts of cultivated crops, or the whole of cultivated crops; either the produce of waste grounds carried to arable fields, or the refuse of any kind of useful produce, or specially raised upon the spot with the express design of being used as a manure; either used some little time after becoming dead, but before losing their succulency, or buried in the soil by the same act or process which destroys their life.

Vegetables returned, partly or wholly, into the soil in the same condition in which they have grown out of it might seem, to an unreflecting person, or to one unacquainted with agricultural chemistry, utterly incapable of acting as fertilizers; and certainly, if they derive all their substance out of the soil, and were to return it in the same state of chemical combination and with the same play of chemical affinities in which they derived it, they would give back exactly what they received, and affect the soil in no other manner than by the accessories and accidents of their culture. But by far the largest portion of their bulk is derived, not from the soil at all, but from air and water, and the whole of this is contributed by green manure as clear gain to the soil, or as prepared and ready aliment for the succeeding crop; and the remainder of their bulk, though extracted from the soil, is brought into new affinities, and more practicable ones than before, so that even this, as returned to the soil by green manure, is in a condition for more rapid and advantageous assimilation than if it had not recently played a part in vegetable growth.

Green manure, though a very important, facile and powerful means of enriching the soil, and though known in some forms to the ancient Romans, and practiced in others by very many farmers of the present day, has received but very little attention from scientific agriculturists, and is even unrecognized in name by very many cultivators.

Specific green manure may be regarded as at present practically unknown among the farmers of Great Britain; residual green manure from cultivated plants is known principally in the form of breaking up lea grounds and plowing clover lands, and partly in the practices of kitchen gardeners, namely, in the plowing in of the leaves and tops of turnips; and incidental or waste green manure is known only in such a fitful and scattered manner as places it beyond the limits of all system.

Greens. Nearly all sorts of vegetables and weeds have been used for greens in man's eagerness in early spring for something fresh grown. The following are the best in the order of their dietetical quality:

Asparagus, turnip and cabbage sprouts, beet tops and spinach, mustard and horse-radish tops, salsify tops, purslane, yellow dock and rhubarb, cowslips (Caltha palustris), young poke, lamb's-quarters, dandelion, potato tops, etc. When boiled enough they will sink to the bottom. When cooking them mixed, do not put the very tender kinds along with the tougher or older. If you have not a piece of salted meat with them, put in some salt.

Greyhound, a slender, graceful variety of dog. See Dog.

Grinders, the large teeth used for mastication. See articles Cattle and Horse.

Grindstone. The grindstone is an important adjunct to the farmer's outfit, and the selection of good ones requires knowledge and care. When it is possible, grindstones should be large, and turned by some power stronger than human muscle; for there is no task more irksome, especially to boys, than turning a grindstone, when a 200-pound man is laying his weight on the instrument that is being ground. On ordinary farms, wind, dog and horse power can be employed to turn grindstones. Where hand-power is used the stones should be of moderate size. The best stone for all purposes is moderately hard and of even texture, to prevent the stone becoming uneven. It should be carefully hung, and well centered to prevent wabbling and thrusting. The axle should turn on rollers, or in metal boxes. For heavy work, such as grinding scythes, axes, and large tools, a stone two feet in diameter is small enough, and should be turned by a power equal to that of a strong man; but when small tools are to be ground, such as knives, small chisels, etc., a smaller, finer stone can be used, and driven by a treadle. Grindstones should never remain in a trough of water. When the stone is still, the part in the water becomes soft by soaking, and wears unevenly. It is better to place a vessel of water on a frame at one end, and make a smale hole in the vessel, so that a small stream will spout out upon the stone while turning, plugging it up when not in use. Whenever the stone has become irregular, it may be made perfectly round again by fixing an old chisel, or other blade of steel, to a frame, so that the straight edge of the blade will rest at right angles upon the stone. One end of this frame should work on a hinge fastened to an upright, so the frame will rise and fall with the irregularities of the stone. The other end of the frame should rest upon an upright when the blade is on the lowest depression of the stone's surface. This will prevent any cutting of the depressed portions of the stone, and will permit the cutting of the stone down to a perfect circle, with the diameter the same as the lowest portion. Do not allow the stone to get out of order, but keep it perfectly round as above directed. Clean off all greasy tools before sharpening, as grease or oil destroys the grit.

One of the commonest acts of negligence which causes a farmer expense and a great deal of vexation, is that of setting the crank of the grindstone in so loose and slovenly a style that it strikes the frame and and is broken off.

Artificial Grindstones can be made by taking pure, white sand, 5 parts; shellac, 1 part; melt, and form into the proper shape while warm. The fineness

of the sand must depend on the work the stone is intended for. Pounded emery may be substituted for sand. The same composition is formed on pieces of wood, for the purpose of sharpening knives, cutting stones, shells, etc.

To Measure Grindstones, multiply three-fourths of

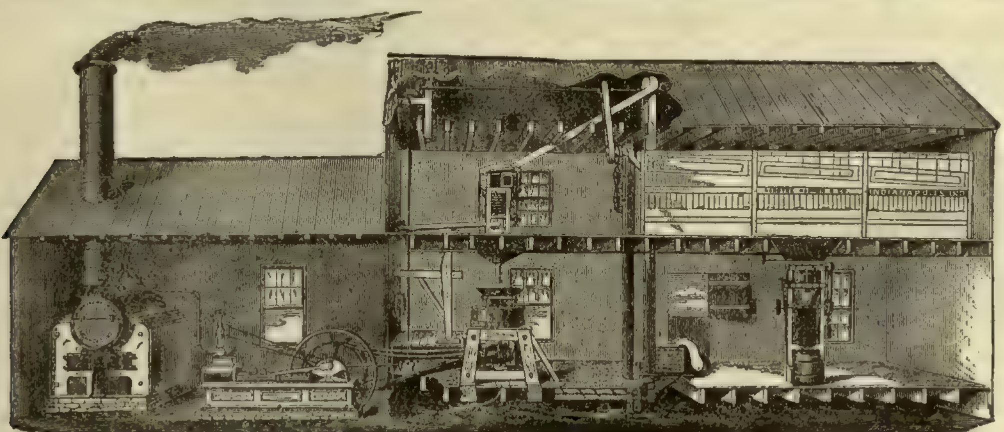


Fig. 1.—*Portable Mills.*

the square of the diameter by the thickness. Example: How many cubic inches in a grindstone 22 inches in diameter and 4 inches thick? 22 times 22 are 484; ¾ of this is 363; 4 times the last are 1,452, cubic inches, the answer.

Gripes, is sometimes applied to colic, which see under Horse, and page 278.

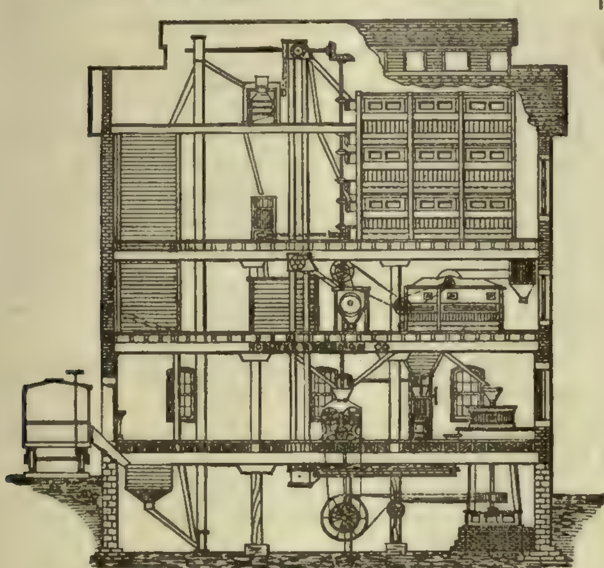


Fig. 2.—*Roller Mill.*

Grist-Mills. The ordinary grist-mill at the present day are driven either by steam or water power. Wind and water power were the motive powers used by the ancients, but whatever changes have been made in the moving power and the various apparatus of the mill, the grinding is done in the same way. Two circular stones, placed very near to each other, are still employed. The mills illustrated in this article are known as portable mills, and are small and may be run to advantage in any good neighborhood. They are made and sold by the Nordyke & Marmon Company, of Indianapolis, Ind. Either run of burrs can be stopped or started, as needed. The outfit

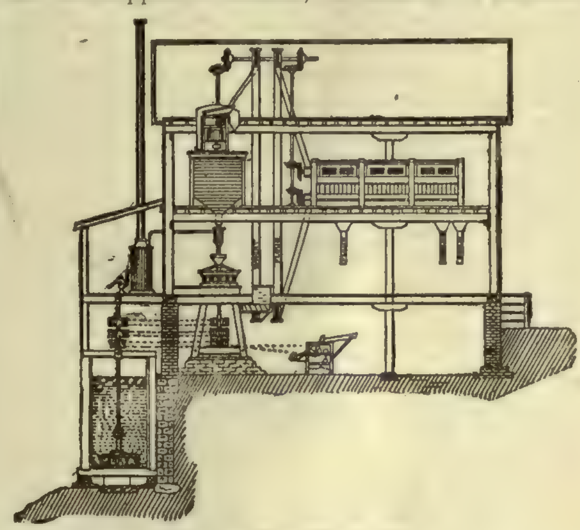


Fig 3.—*Water-Power Mill.*

comprises one wheat mill, one corn mill, one flour bolt, conveyors, etc., one double-suction smut machine and screen shoe, three sets of elevators with belts, cups, etc., scales, picks, bag truck, etc.

Fig. 2 gives a sectional view of a roller grist mill. A study of it reveals one feature after another, all tending to exhibit in a grand result the neat and convenient system which modern milling science has attained.

Fig. 3 presents a like view of the mill as run by water power. In contemplating the erection of a mill, one is inclined to believe he can procure one thing

of one party and another of another, and work them all in to advantage; but the further he proceeds with his task the more entangled and vexatious it becomes. It is, therefore, more satisfactory, as well as cheaper, to engage some responsible party who supplies all the appurtenances of grist-mills, and especially one who furnishes competent millwrights to put up the mill, and make good all guaranties.

Hand and Power Mill. It is a great luxury to have fresh-ground meal, either corn or wheat, for bread, mush, puddings, etc. Between the meal from a hand mill, cooked and served the same day it is ground, and that which is generally sold at the supply stores in town, there is as great a difference, both in flavor and healthfulness, as there is between fresh vegetables from the garden, cooked and eaten immediately, and the old, dirty, wilted, immature stuff we find in the city market. Hand mills, ranging in price from $3.50 to $25 can be obtained through hardware dealers. L. J. Miller, of Cincinnati, O., is one party who makes them. Fig. 4 represents a combined mill, weight 100 pounds, and price $25; capacity one to three bushels per hour.

Fig. 4.—*Combined Hand and Power Mill.*

The same party also manufactures a fine power mill for grinding drugs and spices as well as grain, Fig. 5. This mill will run equally well either way—right or left—and can be attached to any kind of power, steam, wind, water or horse. The plates are made of the hardest white iron, ground true with an emery wheel. One pair will last for five to eight years for farm use, and when worn out are easily replaced. See also Feed-Mill.

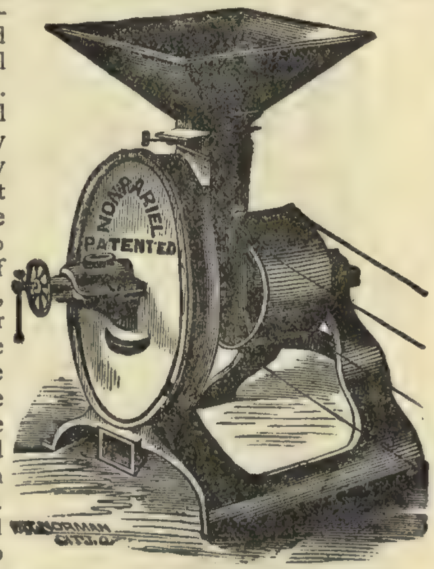


Fig. 5.—*Grain, Spice and Drug Mill.*

Grit or **Grits,** the coarse part of meal; oats or wheat hulled or coarsely ground; groats. (The word has other meanings.) All the grains have been variously hulled, cracked, ground and cooked, and sold under a variety of fancy names.

Groats (grawts), oats or wheat deprived of the hull or outer coating.

Groin, the depressed part of the body between the belly and the thighs. Whenever there is chafing in the part, either with adults or with children, dust it with corn starch· if that is not at hand, take common flour.

Groom, a servant who attends to the stable, and feeds, grooms and litters horses. He ought to possess a thorough knowledge of the wants and habits of the horses, to exercise much patience and skill in the management of the particular animals in his charge, and to practice regularity and care in the performance of his several duties, both upon the animals themselves and upon their stable.

Grooming, the combing, brushing, and hand-dressing of a horse. Every horse which is kept much in the stable, or is highly fed, or is little worked, requires grooming as a substitute for out-door exercise, and every horse which is demanded by taste or fashion to have a spruce and glossy appearance, requires grooming as the only healthy means of maintaining a healthy "coat." But the curry-comb needs to be but lightly applied to any horse, and not applied at all to a horse with thin or tender skin; and a soft brush or even a hair cloth, aided by a little additional pressure of the hand, will, in many instances, effect all the purposes of an efficient grooming. A farm horse, or any horse whatever, which is hard-worked during the day and turned into the field at night, would be injured, rather than benefitted, by any further grooming than the mere brushing of the dirt from his legs.

Gros-grain (gro-grain′) or **Grogram** (grog′ram), a kind of coarse stuff made of silk and mohair; also, a kind of strong, coarse silk.

Ground-Bait, bait consisting of balls of boiled barley, etc., dropped to the bottom of the water to collect together the fish.

Ground-Cherry, a common, hairy weed, bearing edible berries within inflated pods.

Ground Hemlock, a species of creeping yew growing in the Lake region.

Ground Ivy, a catnip-like, creeping plant, common in some door-yards; gill-over-the ground.

Grove, a small and ornamental wood. An open grove consists entirely of trees, and a closed grove, in addition to trees, has either an environing or an underwood shrubbery. Groves admit of a vast variety of forms and arrangements, and may be made either principal or subordinate features of a scene; but whenever they are intended mainly for shelter, or often when intended principally for picturesque effect, they

ought to have their trees, not in rows, but at scattered distances.

Grouse are beyond all question the finest game birds of which we have any knowledge. The true grouse are confined to the northern hemisphere, and attain their greatest development in North America, no less than nine well marked species being natives of this country. The grouse may be distinguished from any of their relatives by the more or less dense feathering of the tarsus and the groove for the nostril, by the presence above the eye of a strip of naked yellow or red skin, and by the pectinated margins of the toes. In addition to these peculiarities several species possess curious tufts of feathers on the side of the neck, and some have under these feathers air sacks which are capable in the breeding season of great distention.

CANADA GROUSE, SPRUCE PARTRIDGE. The Canada Grouse is a northern species nowhere very abundant. Its favorite haunts are the dense swamps of Canada, Northern Maine and the Adirondack region, where grow the pine, spruce and tamarack, on the buds and leaves of which it feeds.

DUSKY GROUSE, BLUE GROUSE, GREY GROUSE, MOUNTAIN GROUSE, PINE GROUSE, FOOL-HEN. This species is certainly one of the finest birds of its family. Its flesh is almost entirely white,—as much so as the Ruffed Grouse or quail, and has a peculiar tenderness and flavor. The breast is remarkably full, and the whole body compact and plump. The feathering is close and thick, wings and tail short and square, the latter a beautiful fan when spread, like that of the Ruffed Grouse. Its food and habits are nearly the same as those of the latter bird, consisting of insects and the berries and seeds of the pine cone, the leaves of the pines, and the buds of trees, etc. It has also the same habits of budding in the trees during deep snows as the Ruffed Grouse, which are so often shot while thus engaged on winter moonlight nights in the orchards of New England. With the Blue Grouse, however, this habit of remaining and feeding in the trees is more decided and constant; and in winter they will fly from tree to tree, and often be plenty in the pines when not a track can be found in the snow.

The nests of the Dusky Grouse are upon the ground, usually well hidden in a thicket, and the broods about one-third larger than those of the Sage Hen, generally from twelve to fifteen in number. The eggs are of a creamy white color, speckled all over with dots of chocolate brown.

The Blue Grouse is more or less abundant throughout the Rocky Mountains, extending northward to Alaska, and south nearly to Mexico. It is perhaps nowhere more numerous than in Montana, in which Territory one may sometimes see twenty broods in a day's travel.

SAGE GROUSE, COCK OF THE PLAINS. This species is the largest of the North American grouse, and yields in size only to the giant Cock of the Woods, of Europe. In the early season, that is, in August and the first half of September, it furnishes fine sport, for it lies well, and when it rises flies so straight and steadily that it is very easily secured.

The male bird is over two and one-half feet long, and weighs seven pounds or more; indeed, specimens are sometimes said to attain a weight of over ten pounds. The upper parts are variegated with black, brown and yellowish grey; the sides of the lower part of the neck are whitish, and are furnished with curious stiff feathers, each of which terminates in a long hair or bristle. The lower part of the breast and the abdomen are black. The females and young males of the first autumn are smaller and lack the stiff neck-feathers of the old males. Such in brief are some of the characteristics of this fine grouse.

The Sage Grouse is an inhabitant of the high, dry plains of the interior, which are covered with a more or less thick growth of the sage brush (Artemisia tridentata). On the leaves and buds of this shrub the grouse chiefly feed, sometimes varying their diet with grasshoppers and berries, or the buds of the willow and greasewood.

During the summer and autumn, the Sage Grouse congregate in packs of from ten to twenty, usually all members of the same brood. At the approach of winter, however, the packs become very large, several hundred being sometimes found together. At this season they are very wild.

The broods pass the night on the uplands, coming down to the water morning and evening, and retiring to the higher grounds again without much delay. The sage grouse are said to spend the night upon the ground, roosting together much after the manner of the common quail.

SHARP-TAILED GROUSE, SPRIG TAIL, PIN-TAIL, WHITE BELLY. The range of the Sharp-tailed Grouse is quite extended, for it is found from Alaska on the north to Kansas on the south, and from Michigan to the Sierra Nevadas and the Cascade Range.

The prevailing colors of the Sharp-tailed Grouse are a clear dusky black above, and pure white beneath; upper parts variegated, with transverse, rather zigzag spots of yellowish brown; wing coverts with large rounded, and outer webs of primaries with smaller and more quadrate spots of pure white; breast thickly covered with broad V-shaped, and the sides with less numerous, sagittate marks of uniform clear slaty or dusky; legs densely feathered; throat thickly spotted with dusky; the two middle feathers of the tail one inch longer than the others.

In size, this species about equals the well known Prairie Chicken or Pinnated Grouse, and altogether is one of our finest game birds.

An interesting fact in the history of this species, is that it seems to retire before the advance of the settlements, while its place is taken by the Pinnated Grouse. Thus in Minnesota, where formerly the White-bellies abounded, and the Prairie Chicken was unknown, the former are now becoming each year more scarce and the latter more abundant. The Pinnated Grouse seems to follow the husbandman, and to be far less wild and untamable than the Sharp-tailed.

PINNATED GROUSE, OR PRAIRIE CHICKEN.

It is said that in entering a wheat field the Sharp-tailed Grouse always flies, and thus cannot be trailed by a dog, but must be winded, while the Prairie Chicken always goes to feed on foot, and may thus be roaded up by a dog.

Pinnated Grouse, Prairie Chicken. No member of the grouse family is better known than the Prairie Chicken of the Western States, and none is more numerous or more eagerly sought for by sportsmen. This species is from eighteen to twenty inches in length. Its color is blackish brown, varied above and below with tawny; the under tail coverts and vent are white, and the throat buff. The sides of the neck are ornamented with little wing-like tufts of feathers (whence the name pinnated), and beneath these are two naked spaces, which in the breeding season, during the "tooting" of the male bird, are distended until they reach the size of an orange. The "tooting" is the call of the male bird, and is only heard during the early spring. At this season the grouse are great fighters, dashing at each other with more display than effect, and with little or no damage done on either side. This bird is found in open plains on which are few trees, but sometimes takes to the scrub oak for shelter. The nest is composed of grasses and leaves, built on the round under the shelter of a bush. The eggs are brownish white, often somewhat spotted, and from ten to fifteen in number.

A tuft of long, pointed feathers on each side of the neck covers a naked, orange-colored air sack, which is capable of great inflation. These air-sacks enable the males to produce the peculiar booming sounds which are always heard during the pairing season. When the air receptacles are inflated, the bird lowers his head to the ground, and, opening its bill, utters a succession of sounds, going from loud to low till the air of the sacks is exhausted; then immediately erecting itself, and inflating the sacks, it proceeds as before. These sounds may be heard a mile or more.

We present a full-page illustration of this variety of the grouse on the preceding page.

The "Prairie Hen," or Pinnated Grouse, is lawful game in most of the States between the middle of August and the first of January, but the season closes in reality about the first of November, because the birds by that time have become so wild that but few care to hunt them.

Their flight is regular and swift, frequently, in October, flying several miles, then dropping down in the long grass. They fly less rapidly than the Ruffed Grouse, but like them, make a cluck just before starting. They resort to their feeding ground about daylight, and retire to the cornfields or fresh plowed fields to dust themselves, and come for their evening meal about four o'clock. They roost within a few feet of one another all the year, seldom roosting on trees, but generally take an open field, and sometimes on the fences. In the early fall their flesh is light, but after a few frosts the flesh becomes dark, and loses its delicate flavor. Unlike the Ruffed Grouse, they can be domesticated, and will pair and breed during imprisonment, and do not migrate like the other varieties. The grouse in the spring commences about April to "toot," and can be heard nearly a mile.

Ruffed Grouse, Partridge (of the East and North), Pheasant (of the South and Southwest). The Ruffed Grouse is of all our game birds the most difficult to kill, least domestic in its habits, and most particular as to the haunts which it frequents. The range of this grouse extends over the whole breadth of our continent, wherever there is wooded country, northward as far as the fifty-sixth parallel, and southward to Texas. Audubon says that there are portions of South Carolina in which it never existed, and it is doubtful whether it is found in the extreme southeast at all.

Nothing can excel the grace with which it moves upon the ground. It walks with a proud step, elevated head, the ruffs more or less raised, and its exquisitely beautiful tail partly spread. It poises a second or two on one foot, then on the other, and at almost every movement utters a soft cluck. If disturbed it lowers its head, spreads its tail wider, and runs rapidly into the thickest bushes. If there be no hiding-place near, it at once takes wing with the loud whirring which all have heard who have had the pleasure of visiting its favorite resorts. According to Audubon, these sounds are never heard when the bird rises of its own accord, but only when flushed by a real or supposed enemy. The flight is straight, rather low, and under ordinary circumstances not more than one or two hundred yards at a time. If, when flushed, it alights upon a tree, as is often the case in regions where it has not been much hunted, it will generally be found, if at all, on the side farthest from the pursuer, and close to the trunk, and standing so still and erect that one can readily mistake it for a stump of a broken limb.

Doubtless in point of flavor and delicacy the Ruffed Grouse may be awarded the palm above all other birds of the gallinaceous tribe.

The wide extent of country which the Ruffed Grouse (or Pheasant as they call it in some localities, or Partridge as they call it in others) inhabits, causes it to be well known in almost every section of the United States, and there are few sportsmen who have not toiled and been tantalized in its pursuit. Early in April the cock grouse begins his wooing, and perched upon some fallen log, commences his amatory drumming, calling to his side the unfortunate mate whose family duties he will soon refuse to share.

We present a fine picture of this species of bird on page 613.

Ptarmigan, Willow Grouse, Partridge (of New-Foundland). The various species of Ptarmigan are all alpine birds, and are found only in the north, and on the highest mountain ranges. They are to be distinguished from all other members of the Grouse family by the dense feathering of the tarsus and toes, by turning white in winter, and by the possession of only fourteen rectrices, or tail feathers.

Rock Ptarmigan, Mountain Ptarmigan. This species is still more boreal in its habitat than the preceding, and but little is known concerning it. It is never found within the limits of the United States.

White-tailed Ptarmigan, White Quail. The White-tailed Ptarmigan may be distinguished from all others of the genus by having the tail white at all seasons. It is the smallest of our Ptarmigan, and it is the only one of regular occurrence within the territory of the United States. In the winter this species is pure white throughout, but the summer plumage is curiously mottled with dark brown and tawny and white.

Grub, a larva which infests fields, orchards, and gardens and partially destroys the crops. The word is sometimes used so very loosely as to designate wire-worms, slugs, and almost all kinds of maggots which occur in the field; it is sometimes used less loosely to designate the larvæ of the most mischievous grass-eating insects, whether dipterous, coleopterous, or hymenopterous; and it is now more commonly, and with very obvious propriety, used in so restricted a sense as to designate only the larvæ of certain species of the coleoptera.

Gruel, a drink made of meal, or flour, and water.

Oat-meal Gruel. Put a pint of boiling water into a sauce-pan; stir in gradually two table-spoonfuls of oat-meal. When smooth, set to the back of the stove to boil for half an hour or longer. Season with salt, and strain before serving. Sugar may be added if liked, and a flavoring of nutmeg, lemon or cinnamon. Port wine is often used for invalids. Another very nice gruel is made by taking a little more oat-meal and adding a cup of sweet milk just before straining, after which the gruel must be simmered for ten minutes and seasoned to taste.

Corn-meal Gruel. To make a cupful of this, wet a tablespoonful of the meal with a little cold water, pour upon it half a pint of boiling water, and let it boil half an hour. Nutmeg, sugar and cream may be added if liked.

Arrow-root and Tapioca gruels are made in a similar manner.

Graham Gruel. Stir a spoonful of the flour into a pint of boiling water; boil about five minutes; strain it through a milk strainer, and season to taste. There are little strainers to be had which are made purposely for culinary work.

Ground-rice Gruel. Rub a tablespoonful of ground rice in a small quantity of cold water and stir it into a half-pint of boiling water; add a little salt, and let it boil up a half a minute. When milk is allowed, it is well to make the gruel of equal parts of milk and water.

Flour Gruel. Tie up in a piece of thick cotton cloth a coffee cup of white flour; boil it steadily for three hours, then remove the cloth and lay the lump where it will become perfectly dry. To use it, grate it and thicken two gills of boiling milk with a dessert spoonful of it wet in cold water.

Cracker Gruel is made of pounded crackers, with the usual seasoning.

Grunter, is applied to horses that give forth a grunting noise. One condition, giving rise to wheezing, roaring, whistling, piping, and rattling will, with slight modification, produce a grunter.

Guano (gwah'no), the excrement and remains of sea birds, which have accumulated for ages upon rainless, rocky islands of the South Pacific coast. When genuine, it is one of the most valuable of the special fertilizers.

In the prevailing native language of Peru, the word *huana* signifies dung or manure, *huanacaci* signifies the application of manure to land, and *huanaes* signifies birds which supply dung of a kind and in quantities fitted to be used as manure; and the first of these words, though pronounced *whana* by the Peruvians, has been corrupted by the guttural enunciation of Europeans into the word guano.

Peruvian guano is the chief supply in the market, but all the guano in the world is very limited in quantity compared with the demand; hence many unprincipled parties have resorted to adulterations and imitations. Every farmer, however, can manufacture his own guano, by saving all the manure and refuse of his poultry yard. Mr. Greeley considered that farmer unskillful who could not with $100 expense manufacture more manure and fertilizing material on his farm than with $150 worth of material brought from abroad. On analysis, Peruvian guano yields 14⅔ per cent. of water, 53⅓ per cent. organic substance, and 33⅔ per cent. ash. Of the latter the principal ingredients are lime, nitrogen, potash, and phosphoric acid. Guano and all poultry manure is very concentrated ("strong"), and there is always danger of over-dosing the land with it. What crops need these fertilizers, and in what portions, are indicated in the respective articles.

The deposits of guano longest and best known, and for some time supposed to be the only ones in the world, occur on the islands and sea-board of Peru, between the 13th and 21st degrees of south latitude. They exist in limited and irregular patches and masses, and have sometimes a thickness of 50 or 60 feet, and are excavated, in the course of commerce, like mines of iron ochre. They comprise many varieties, as to both the comparative age of the accumulations, and the degree and manner in which they have been modified by natural chemical action and by alluvial intermixture; but, in general, they are popularly classified into merely three kinds, the white, the dark-grey, and the red. The white continues to be deposited, and may readily be observed in a quite recent state in the localities which are at present frequented by vast flocks of flamingoes, cormorants, cranes, and other sea-fowl; it has been collected on the isles of Islay and Jesus, at the rate of 20 or 25 tons in a single season; and it may be observed in the island of Torricella, and probably in other places to be gradually passing into the red variety.

The great thickness and vast aggregate extent of the

RUFFED GROUSE.

deposit of guano may seem to warrant a doubt as to their origin in the mere excrementation of birds. The Peruvians, under the government of the Incas, knew well the fact of their origin, and highly appreciated their economical value for the national agriculture; and they made the killing of the young birds on the guano islands a capital offense, and appointed an overseer to the charge of each island, and apportioned the several islands, for manuring purposes, to definite, adjacent, and respective districts of the main land throughout an extent of 200 leagues of coast. But when the Spaniards entered the country, they for a time regarded the whole of the Peruvian account of the guano as a fable, and seemed to regard the accumulations of manure as far too vast to have possibly arisen from the excrementation of birds; and modern visitors to Peru, who should look only to the most superficial appearances, will find that the immense flocks of birds which formerly frequented these shores have been disturbed or driven away by the increase of traffic, and may possibly regard the smallness of the existing flocks as a conclusive proof that the guano must have had other origin. Many things, however, afford decisive evidence that the main part of all good guano consists entirely of the excrements of birds, particularly the observation and testimony of the ancient Peruvians, the observed formation of white guano in some places at the present day, the occurrence of the feathers and bones of birds in recent specimens of guano, and the close similarity of the chemical constitution of guano to that of the newly-fallen excrement of most birds, and especially to that of the raptorial sea-fowls.

Guard, in a mowing or reaping machine, one of the fingers of the cutting apparatus for protecting the knives. An "open guard" has an opening above the knives, to prevent clogging.

Guinea Fowl, a domesticated bird of the gallinaceous group. It exists in a wild state only in Africa, and has thence been diffused, as a domesticated bird, through Europe and America. In its wild state it associates in flocks of 200 or 300, and delights in marshy situations; and both in its wild and its domestic states it roosts on trees or other lofty objects. It is smaller than the turkey, but larger than a large dung-hill cock; it can not be tamed out of a shy, restless and half-wild habit; and it possesses much courage and does not hesitate to attack a turkey. It has a peculiar gait, a singular chuckle, and a harsh, screaming cry; and the male and female of it are so exceedingly like each other as not to be easily distinguished. It has such habits of feeding and domestication as to sufficiently fit it to be kept in the same poultry ground as common fowls; but it makes its nest in very secluded and secret spots, far from home, and gives no notice of laying or sitting; so that its eggs can not be easily found, and require for the purpose of domestic propagation to be hatched and fostered beneath a common hen. It serves as a good night-watch to a farm residence or poultry-yard, for whenever it is disturbed during the night by the sound of footsteps, it makes such loud cries as to summon the attention of the inmates. It is very prolific; both its eggs and its flesh are generally relished. It has been supposed to combine the properties of the pheasant and the turkey. Its flesh, both in color and in flavor, is more like that of the pheasant than that of the common cock and hen. It possesses much delicacy, and is in fine season in March and April.

To commence breeding them, it is best to set their eggs under a common hen, as the old birds wander so far from the premises. If regularly fed, however, at the place of their birth, they will remain about home. They roost on the lower branches of trees, and cannot be persuaded to stay in a house. Eggs must be taken from a Guinea fowl's nest without her knowledge, else she will forsake it altogether. Some nest-eggs, therefore, must be left every time. For breeding, the earliest eggs should be given to a common hen, as the Guinea hen herself is generally too late in the season contracting the "sitting-fever" of her own accord. The chicks require food almost immediately, at least within six hours after hatching, and should be cared for in the same manner as young turkeys, though they may be allowed more liberty. They require more constant feeding than any other chickens, a few hours' abstinence being fatal to them. They need also more animal food, especially in winter. Corn meal should never be fed to the young Guineas during their "baby-hood," but the food should be the same as that given to young turkeys, such as stale bread soaked in fresh milk, cottage cheese (made from thick milk after the whey has been strained off), bits of hard-boiled egg, chopped onion tops, etc., not forgetting that, when feathering up, they require the food little and often, as much as they will eat at a feed, and no more.

Guinea Pig, a small and beautiful Brazilian quadruped of the order Rodentia. It occurs wild in the woods of Brazil and Paraguay, and is treated and used in Great Britain in the same manner as the tame rabbit; and is often kept upon premises in the belief that its odor drives away rats. It is about seven inches long, and has a white ground color, variegated with irregular-outlined spots of black and orange. It is enormously prolific, and but for being unable to withstand the effects of cold and moisture, it would, in its wild state, speedily outrun all possible supplies of food in even the most luxuriant region. The female has been known to produce young ones when only two months old; her period of gestation is only three weeks; she brings forth a new brood at least every two months, and a single pair are capable, in the course of a twelvemonth, of multiplying into a thousand individuals. The young do not attain maturity of growth till they become about six or seven months old; but they are as active and alert about 12 or 14 hours after birth as when full-grown, so that they require exceedingly little parental care. The Guinea pig is eminently cleanly in its habits, and may often

be seen cleaning and smoothing its fur with the most sedulous care. It is particularly fond of parsley and pomaceous fruits, but readily feeds on any one of a great number of herbaceous plants; it appears to ruminate after eating, and it drinks very little, and is exceedingly sensitive to damp and cold. Its flesh is regarded by the Italians as delicate food, and its skin is nearly as valuable as that of the rabbit.

Gull. These birds are well known everywhere, being found almost universally spread over the globe. They are distinguished from other sea-fowl by their straight bill, bending downward toward the point, and marked below the under mandible by a triangular prominence, by their light body, supported by large wings, by slender legs, palmated feet, and a small hind toe. They are timid and cowardly except in defense of their young. Generally seen in large flocks, the old and young separate; the larger species frequent the sea, the smaller, lakes or rivers. They walk with tolerable ease and swim well, but are incapable of diving. They keep much on the wing and their flight is rapid, strong and long sustained, even in heavy gales. In sitting, they contract their neck, and rest on one foot. They are extremely voracious, fighting with each other for prey. They are patient of hunger, but will feed on every kind of animal food either dead or alive, putrid or fresh. Their principal food, however, is fish, for which they will follow the shoals; they catch them with great agility, darting down like an arrow. They breed only once a year, laying from two to four eggs. The species are exceedingly numerous and resemble each other greatly. The gulls are continually fighting each other, the stronger plundering the weaker. No sooner does one rise from the water with a fish in its bill than it is immediately pursued by others stronger than itself, and the first that reaches it tears away the spoil. Should, however, the latter not instantly swallow the booty it has required, it is in turn pursued by others; and, even if it has performed this process, it is ofttimes obliged to disgorge it, when it is seized by one of the pursuers before it can reach the water. The facility which the gulls have of vomiting their food has been taken notice of, even in their captive state. Some of these birds have been tamed, but even then they have always discovered the same quarrelsome and voracious habits. When two are kept together the weaker generally becomes the victim of the ill-temper of the other. This genus is not well understood by naturalists, and much confusion exists as to the species.

Gully, a channel or hollow worn in the earth by a current of water; a gulch.

Gum, a concrete juice, the product of many vegetables. There are many varieties, all reducible to two kinds—soluble, or true gums, which dissolve in water, forming mucilage; and insoluble gums, which soften and swell in water, but are not soluble. Fruit trees often exude gums; this is considered a disease and may arise from the puncture of insects, but according to some, is also an indication of poor soil, requiring putrescent manures.

Gum, Chewing, To Make. Soften 2 ounces balsam of tolu in a water bath, and then mix with it 1 ounce white sugar and 3 ounces bolted oatmeal; roll in finely powdered sugar or flour, and form drops or sticks, to suit the fancy. Another article is made by dissolving paraffin at a gentle heat in a very little olive oil and glycerine; stir it after it becomes cool, and then compress it. The quantity of these ingredients depends somewhat on their quality, and somewhat on what product is desired.

Gums, To Preserve. Keep the tartar off the teeth, rub the gums a minute or two every day with the finger dipped in cold water or brine, and abstain from drug lotions. But the best known drug to harden the gums is a mixture of ½ pint of Jamaica spirits, ½ teaspoonful each of powdered alum and saltpeter and 1 ounce pulverized myrrh. For sponginess, foulness and scurvy of the gums, add 1½ to 2 drachms of Peruvian bark to every ounce of the dry ingredients of any simple tooth paste. A good wash for sore gums consists of 5 drachms powdered borax dissolved in ½ pint of distilled water. For ulcerated gums, take of hypochlorite of lime 10 to 25 grains, gum Arabic mucilage 1½ to 4 drachms, syrup of orange peel 1½ to 2 drachms, and mix thoroughly.

Gunny, a strong, coarse kind of sacking, made from the fibers of certain East Indian plants.

Gunpowder, To Make. Pulverize separately 76 parts nitrate potassa, 11 sulphur and 13 freshly burned charcoal; mix these with a little water, roll into cakes on a board, dry on clean paper in a warm place and crumble it up.

Gunpowder Burns, To Treat. Smear the scorched surface with glycerine, by means of a feather; then apply cotton wadding and cover with oil silk.

Guns and Gunning. In this article we shall treat of guns and ammunitions and their uses, which includes the manner of hunting the various kinds of game. The article is very largely extracted from the Sportsman's Gazetteer, by Charles Hallock, who is considered authority on the subject of guns and their uses.

"In laying down specific instructions for the selection of guns and rifles, with their appropriate charges and various kinds of ammunition adapted to different localities, seasons, and varieties of game," says Mr. Hallock, "we do so with the positive conviction that our views and opinions will be controverted at the outset by hundreds who may differ with us and with each other; just as they would be if we took a position diametrically opposite from that which we now take. With this special plea, we will proceed, simply premising that what we print here has received the sanction of gentlemen of venerable experience in the use of old-time and modern implements in all parts of America, on both sides of the Rocky Mountains, and

THE RETRIEVER AND MALLARD.

who are recognized by the sporting fraternity as reliable and sufficient authority.

The Rifle. "All rifles divide themselves in two

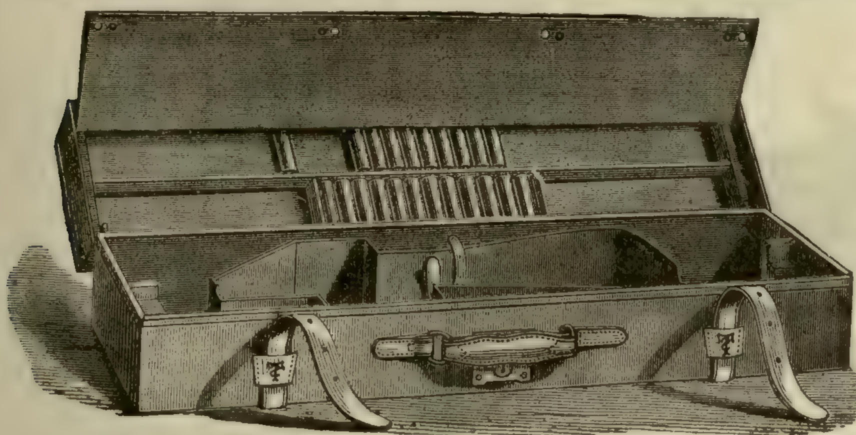


Fig. 1.—*Gun Case.*

great classes, long-range and short-range. Long-range rifles are used as military weapons for arming infantry, and as sporting weapons for hunting cariboo, deer, antelope, and other such timid game as will not allow of near approach. Short-range rifles are used as military weapons for arming cavalry, and for general sporting purposes. The division between the two may be taken at two hundred yards. Rifles for match shooting may be used at both ranges; but, from the natural desire of all of us to accomplish the most difficult feats, they are generally held to mean long-range weapons.

"The first rule we shall lay down is this: It is necessary to decide whether you want a rifle for long or for short range. You can select either or both, but not both in the same rifle. One will not do the work

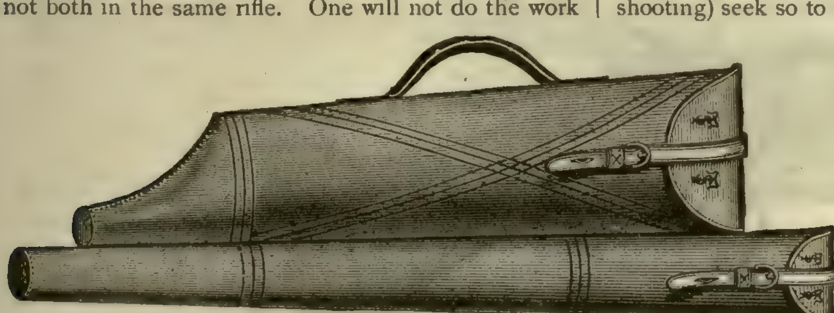


Fig. 3.—*Gun Case.*

of the other. A knowledge of this will save much annoyance and some money. The first requisite of a short-range rifle is that you shall be able to hit any mark small enough to be seen over what are technically called "hunting sights," with an off-hand shot from the shoulder. Greater accuracy than this is not needed. Such a rifle ought to shoot close enough to place a majority of any number of shots within the following-sized targets: 2-inch ring up to 50 yards distance; 4-inch to 100 yards, 6-inch to 150 yards, and 8-inch to 200 yards. A good off-hand shot can do this and fire very quickly, and his gun ought to be able to shoot as close as he can hold it.

"To summarize, the formula for sighting seems to stand thus: Coarse very near the piece, with a less coarse to fine at 20 yards (center, p. b.), thence finer to extra fine at 66 yards thereabouts (and greatest error), thence less fine to fine at 100 yards (center p. b.), thence coarser and coarser (beyond the range). Of course different rifles, and

Fig. 2.—*Gun Case.*

the same rifle with different charges, etc., produce different curves, or errors. Hence, in general, learn well by practice and study the deviations of your rifle along the whole distance, and then (for close shooting) seek so to aim as to correct them.

"Good shooting, however, cannot be done without good ammunition.

"The pasteboard wad over the powder has its advantages and disadvantages. If the bullets fit the shells loosely, it prevents the powder spilling out in carrying, if the bullet comes out, and it also serves in a measure as a gas check, and prevents, in a degree, fire cut. But if the bullet is concaved much in the base, the wad is liable to be forced into the hollow base of the bullet and go with it.

"Another very important item is the composition of

the bullet, which must be of a hardness in proportion to the amount and strength of the powder used. A bullet that would be hard enough to use with 70 grains of powder and shoot well, would be good for nothing

FIG. 4.—*Double-Barreled Shot-Gun.*

to use with a charge of 100 or 110 grains.

"Then the size of the bullet is another point to be attended to. If it is too large it is apt to bind in the grooves of the gun in inserting the cartridge, and tear the patch; and if too small and is loose in the shell, it is liable to slide a little toward the muzzle if the gun is held muzzle downward, and also to be driven forward a little by the blow of the firing-bolt upon the cap before the charge is ignited. All these little things make a difference in the shooting, and help to produce unaccountable misses. The same care and nicety should be observed in loading each and every cartridge

FIG. 5.—*Single Breech-Loader.*

as would be required in loading the most elaborate muzzle loader.

"Another important requisite to successful shooting, as may be gathered from what has been already said is that the ball should have sufficient impinging surface to give a severe shock to and stun the game fired at. This requires a large caliber for small game.

"The sportsman will have no difficulty in finding a number of different rifles in market which will answer the requisite of accuracy within the conditions above laid down. To get a rifle that does not require the use of an elevating back sight above 150, or even 100 yards, we shall not find easy. The reason of this is that military rifles, which are long-range, are so fashionable that makers of so-called sporting rifles follow the proportions of powder and projectile, and the rate of twist best suited for long range, but quite unsuitable for short range. For long range we want as small a bore as possible, as long a projectile as possible, and a very quick twist, to give enough velocity of rotation to keep the elongated projectile end foremost, and as much powder as the small bore will burn. The result is a moderate initial velocity; but owing to the small surface exposed to the resistance of the air, the momentum of the heavy projectile, a very long range.

FIG. 6.—*Double-Barreled Shot-Gun.*

"Now, for a short-range rifle we require the very opposite of all this. We want as large a caliber as possible, so as to make a big hole in our game; as large a charge of powder as possible, to give a high velocity, without which we cannot have a low trajectory. This also requires a short projectile, to diminish the friction on the grooves, and a short projectile requires a slow twist. The length of

barrel must be shorter, which also reduces friction. To reduce these proportions to practice, we find that the Creedmoor long-range rifle and its ammunition have the following proportions: Weight of rifle, 10 pounds; weight of projectile, 550 grains (ratio 1-6); weight of powder, 90 grains; twist, 1 in 20 inches; caliber, 44-100; length of ball, 1.6 inches; length of barrel, 30 inches. A short-range rifle, suited for deer, bears, buffalo, etc., should have the following: Weight of rifle, 9 pounds; weight of projectile, 320 grains (ratio ¼); weight of powder, 80; twist, 1 in 48 inches; caliber, 55-100; length of projectile, ¾ inch; length of barrel, 24 inches. For smaller game, such as turkeys, a caliber of 35-100 will answer, and the length or weight of ball, charge of powder, etc., will be reduced in proportion.

"The difference in the practical operation of the two rifles will be this: With the long-range weapon, if you have your range within a very few yards, and elevate your back sight accordingly, you can make accurate shooting at all ranges. But if you misjudge your distance at all, or even if you know it and have not time to elevate your back sight to its proper height, you will certainly either shoot under or over your game. With a short-range rifle proportioned as we have described, the drop of the ball, owing to its great velocity, is so little, there is absolutely no judging of distance required. Whether you are at 25, 50, 75, or 100 yards, all you have to do is to draw a little coarser bead the farther off your game is. Practice will soon show you how much. Your ball should not deviate more than a couple of inches above or below, and this does not exceed the limit of accuracy heretofore laid down.

"The faults of modern American breech-loading rifles intended for sporting use are: 1. Not large or heavy enough projectile to make a disabling wound on an animal as large as an old buck deer. 2. Not enough velocity of ball, owing to too little powder being used, and too great friction, resulting from an unnecessarily quick twist. The muzzle-loading hunting rifles that were made 20 or 30 years since avoided the second of these faults. Their caliber was smaller than we should now use; but the reason was that in those days a hunter had to prepare his own ammunition, and he liked to make it go as far as possible. There is one other point that deserves mention. Shall we choose a single-loading rifle, or a repeater, that carries a magazine of cartridges? Now, it is very clear that there

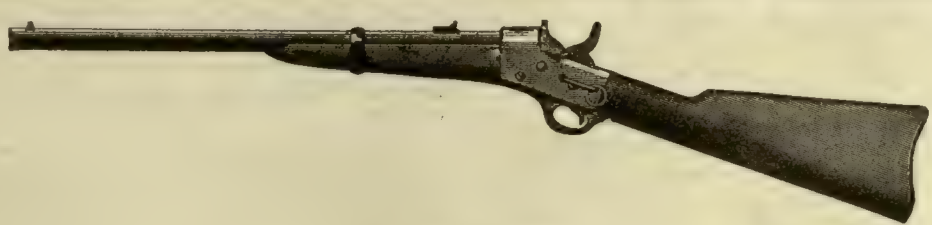


FIG. 7.—*Cavalry Carbine.*

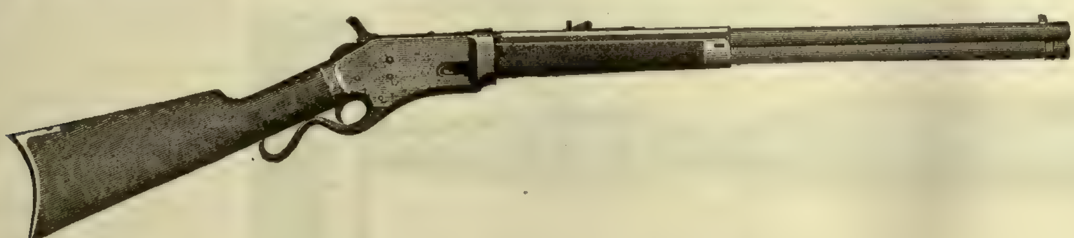


FIG. 8.—*Half-Octagon-Barreled Sporting Rifle.*

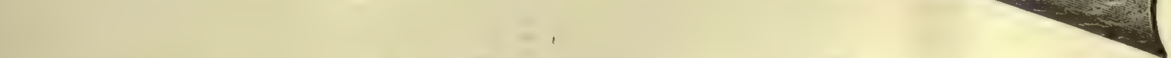


FIG. 9.—*Creedmoor Target Rifle.*

are many advantages in a repeater, and the only question is whether there are any disadvantages, due to its peculiarities, sufficient to counterbalance the admitted advantages.

"The best known of this class of guns is the 'Winchester,' which is made of three models, viz., that of 1866, 1873, and 1876, using respectively charges as follows: 1866, Rim Fire 44 cal., 200 grains of lead, 28 grains of powder; 1873, Central Fire 44 cal., 200 grains of lead, 40 grains of powder; 1876, Central Fire, 45 cal., 350 grains of lead, 75 grains of powder; thus giving a range of power to suit the peculiarity of the game in any section of the country, the 1876 being adapted to the heaviest game our country affords. The mechanical arrangements of all the models are the same, and is proven by experience to be strong and durable, the model of 1876 having been tested with 203 grains of powder and 2,100 grains of lead without injury. There is no more complication to this gun than in most of the single breech-loaders, and consequently no more risk of its getting out of order."

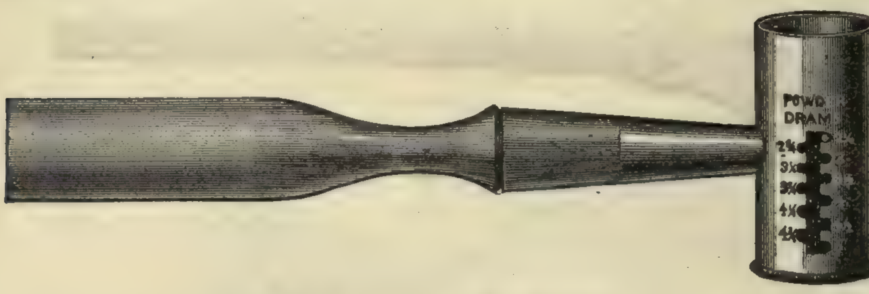


Fig. 10.—*Powder and Shot Charger.*

Guns to Carry Balls. In the timber, where the game is shot at short distances, a strong double gun is a formidable arm when loaded one with ball and one buck-shot cartridge. The ball may be relied upon for ten rods, and at a still longer range with slight elevation, and for snap shots at running game, will do fatal work about as often as a rifle. The round ball is considered as more immediately destructive than any other. The blow is very powerful and the "shock" to the animal consequently great, while the flesh and skin will hardly close over the wound to retard bleeding. It is claimed that large game will succumb more rapidly to the ragged crush of such a large ball, and save many a mile of trailing or the loss of game. There are many long, arduous tramps taken after large game, when every ounce is to be well considered in arranging packs; and when but one gun can be carried, the use of ball in double guns may enable a hunter to decide upon taking a gun that will bring ducks, spruce grouse, etc., to the larder. Round-ball cartridges may be prepared in the same way as shot cartridges, with a wad over the powder, but none on the ball, simply creasing the shell deeply over it, to keep it firm.

Shot-Guns. While the muzzle-loading rifle may be said to still hold its own with the breech-loader, as proved by the long-range tests at Creedmoor and elsewhere, as well as in the field, the muzzle-loading shot-gun has had to defer to the breech-loader. The advantages are so much with the latter, especially in wing shooting, that we shall confine our few remarks to it exclusively. There are so many makers of excellent guns, both English and American (which are chiefly in use in this country), that in attempting a selection of the best, comparisons as to their merits become invidious and fruitless of satisfactory conclusions.

In the purchase of guns sportsmen should be governed by their pecuniary resources; and as all cannot afford to purchase the highest-priced English guns, which cost at least $250 in our markets, including their fixtures, they naturally inquire if an American gun equally good cannot be bought at a price much less. Undoubtedly we have as competent gunsmiths here as any abroad; and inasmuch as most of the materials used by them are of foreign production, imported in a crude state, it is reasonable to suppose that they can be and are perfected and embodied in the completed gun at a much less expense than the imported gun would cost. Such a gun, when obtained, is a treasure. But it happens that a great many inferior low-priced guns are placed upon the market under the pretentious titles of "stub-twist," "laminated steel," "Damascus," and the like, retailing at from $30 to $70; so that one is liable to be deceived unless he is a good judge. The only safety in purchasing, therefore, is to obtain reliable counsel, and to deal with honest and responsible parties.

Inasmuch as good muzzle-loaders can be bought at very low prices, there is a prevalent disposition to have them altered to breech-loaders, for the sake of convenience and safety; but we would not advise this change except in special cases, as the expense of altering will nearly equal the additional cost of a new breech-loader. Choice of guns depends upon the habits and quests of the shooter. For a man who shoots but little, and seldom on the wing, a muzzle-loader is as good as need be required. For a man who wants a general service gun, for field, cover and trap shooting, a breech-loading gun of eight and a half pounds weight, 30-inch barrels and 10 gauge, is the proper tool. It will answer for snipe, grouse, hares, turkeys and ducks, and for deer when loaded with buck-shot. However, a No. 12 gauge is serviceable enough, the odds against it being merely that it will not stand so heavy a charge as a 10 gauge, and of course will not bag the game shot at as often or as easily as the other. For wild-fowl shooting use a gun from nine and a half to ten pounds weight, 32-inch

SNIPE SHOOTING.

barrels, and 10 gauge. For "point shooting," on the Chespeake Bay and similar places, a 14-pound, five to eight bore single gun is the most effective.

Guns for natural-history specimens should be 16 bore and 26-inch barrel; load with mustard shot and a half drachm of powder. No gun will do itself justice or give proper execution unless it is properly loaded. Correct loading used to be acquired by careful observation and practice; but now we have a table of proportionate charges for different gauges, which has been prepared by Major H. W. Merrill, United States Army, to whom all inexperienced sportsmen owe a large debt of obligation. The table, which is herewith given, is based upon the rule that "*The proportionate charges of shot-guns of different bores are to each other in the ratio of the area of their bores.*"

TABLE OF PROPORTIONATE CHARGES OF SHOT-GUNS OF DIFFERENT GAUGES FROM NO. 4 TO 16 INCLUSIVE.

	Gauge Numbers.	Diameters of bores.	Areas of bores.	Ratios of areas.	Loads powder in drachms.	Loads of shot in ounces.	No. of pellets exactly.	
	4	1.08	9137	2.45	7 1-3	2 7-16	534	
	5	.99	7693	2.06	6 1-5	2 1-16	449	
	6	.93	6782	1.82	5½	1⅞	397	
	7	.89	6277	1.67	5	1 13-16	364	
	8	.85	5052	1.51	4½	1½	329	
	9	.82	5275	1.41	4¼	1 7-16	307	
	10	.79	4398	1.31	4	1 5-16	286	
	11	.76	4521	1.21	3 2-3	1 3-16	264	
	12	.73	4176	1.12	3 1-3	1⅓	244	
	13	.71	3956	1.06	3 1-5	1 1-16	231	
Unit of	14	.69	3736	1.	3	1	218	Tatham's
measure,	15	.67	3516	.94	2 4-5	.15-16	205	standard shot
24½ dr'ms.	16	.65	3228	.86	2 3-5	.14-16	188	No. 6.

NOTE.—The unit of measure is three drachms of powder and one ounce of shot for a No. 14 gun.

The charges given are not too light for small game within 45 or 50 yards; for young boys they are too heavy, and may be reduced one-fourth. The Major advises that beyond 50 yards, for large game, ducks, turkeys, geese, deer, etc., the charges be increased according to the powers of the gun and the ends to be accomplished. Some persons will say, and quite truly, that all guns of the same bore do not call for the same amount of ammunition. They are exceptions to the general rule; load them to suit their peculiarities. Very light guns, with large bores, may not shoot pleasantly, from too much recoil; load them less, but at the expense of penetration and wounded game. Cheap guns with rough barrels, and rusty or dirty guns, may kick too much with these loads. These, with all other nondescript and unduly proportioned guns, are excepted from the general rule. This presupposes fair guns only. Very diverse results with good guns may be brought about by having the powder disproportionate to the shot and conversely; using very coarse or very fine powder, also very coarse and very fine shot; by employing more or less wads varying in diameter and thickness, and setting them home on the charge with different pressure or ramming; by holding the gun, when discharged, firmly to the shoulder, or otherwise, etc. Now, if all these items control the shooting, does it not follow that to load a gun accurately for all purposes requires many experiments, good judgment, and even great skill?

Choke-Boring. There have been many crucial tests of choke-bored guns against smooth-bores, both in this country and England, but the advocates of one and the other do not seem wholly satisfied with the exhibit as deciding their respective merits. The advantages of choke-boring under certain conditions of field shooting are certainly conceded. The effect of choke-boring is to increase the effectiveness of the gun at long range. If we did all of our shooting at very long range, we would be induced to use a choke-bored gun, or at all events, to have the barrel choke-bored; but for our own customary service we prefer a gun not choked, for the reason that we have found that the Kay concentrating cartridges produce the effect that is claimed for the choke-bores. Thus we have the choice, at all times, between the straight and the choke, which gives us an advantage in shooting which we should not have if restricted to one or the other.

In the following illustrations we very accurately show some of the best guns now in our market, together with many of the parts:

Figs. 7, 8 and 9 represent rifles made by the Whitney Arms Co., Whitneyville, New Haven, Conn.

Fig. 7 is a sporting rifle. It is simple of construction, strong, made of the best material, easily manipulated and safe. The firing pin can not reach the head of the cartridge until the breech is fully closed; therefore the piece can only be fired when the breech is locked. The shells can be re-loaded. Fig. 8, a target rifle, withdraws the firing pin by positive motion. It withdraws the cartridge shell clear from the chamber. It loads on the half-lock. The breech block is securely locked the instant it is closed. It is fired by a center lock. It has an extra notch on the hammer and can be carried loaded without fear of accidental discharge.

A Creedmoor target rifle is made which is smaller and of less weight, and is calculated for the young amateur.

Fig. 9, the cavalry carbine, is one of the best manufactured. Its component parts are all of the best material and it never misses fire.

In Fig. 4 we illustrate the "Parker" Breech-Loading Double-Barreled Shot-gun.

The construction of this gun is so simple any person with nothing but a screw-driver can take it apart for

FIG. 11.—*Loading Plug.*

cleaning or repairs. The springs used, aside from the locks, are such as can be made by any one.

Fig. 12.—*Cleaning Rod.*

Fig. 11 represents a loading plug which can be used either for loading shells or extracting caps.

The cleaning rods shown by Fig. 12 are made from the finest imported wood; the joints brass or nickel-plated and have patent implements accompanying them. In Figs. 13 and 14 we give illustrations of the adjustable cleaning rod.

They represent the cleaner open and closed. The self-adjusting action of the spring brings the cleaning implement to bear upon every portion of the inner surface of the gun, thus cleaning a gun choked on any principle. In loading accurately the powder and shot measure (see Fig. 10) and capper (see Fig. 15) are necessary.

The capper, hand shell-extractor and a screw-driver may be all combined in one. There is also a good combination screw-driver (Fig. 16), which will be found convenient and serviceable.

The cartridge belt, Fig. 17, revolves around the body. Gives perfect ventilation to the chest, carries any size of shell and holds them open end up, thereby preventing the wads starting in loaded shells.

All guns, of any value, should have a case. The protection thus afforded will keep a gun in better condition and for a longer time than one

Fig. 13.—*Adjustable Cleaning Rod, Closed.*

could hope to without a case. We present several different kinds. Fig 1 represents the shell-top gun case. It is first quality, extra heavy sole leather and steel frame, with compartments in cover holding 75 shells, sliding stock tray so as to fit any style and loading tools. Barrels placed in tray over stock. Figs. 2 and 3 are simply gun cases. They are made of heavy

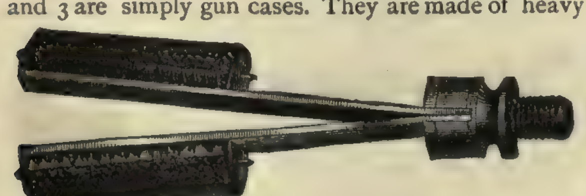


Fig. 14.—*Adjustable Cleaning Rod, Open.*

bridle leather with pockets for cleaning rods. The foregoing accompaniments to a gun are all made by Parker Bros., Meriden, Conn., a good, reliable firm.

The single breech-loading gun, Fig. 5, Will H. Cruttenden, General Agent, Cazenovia, New York, has a top lever for opening the gun, which serves as an indicator showing when the gun is securely locked. The lug extends through the break-off and is very wide. The actions are all well fitted so that the gun is not liable to shoot loose.

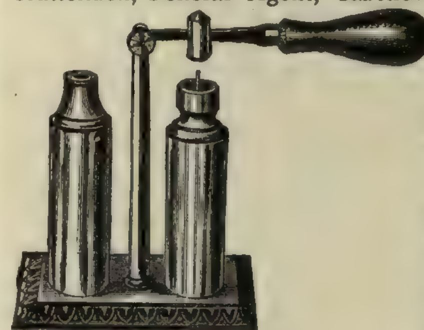


Fig. 15.—*Capper.*

Gunning: How to Shoot. In firing, press the gun firmly against the right shoulder, place the index finger of the right hand on the trigger, with the thumb over the grip just behind the hammer. Support the other end of the gun by letting it rest on the left hand at a point about one-third the length of the barrel. The novice should practice bringing the gun up with breech and sight on the same level. The gun should be raised with a firm, quick motion to the center of the object to be shot at, and the trigger pulled the instant the sight is taken; the first sight is always best, and the best shots those that shoot quickest. The beginner should practice on a mark with shot, and should learn to aim with both eyes open. Target shooting with a rifle at rest requires the shutting of one eye. A rabbit in motion affords a splendid opportunity for a novice to test his marksmanship, and when he can kill one with ease he may feel assured of his ability to hit almost anything. But never shoot a rabbit while it is sitting. It is too much like murder, and even a novice should be above that. To be a "crack shot" with a rifle one must have a steady nerve, and all flinching or perturbation common to beginners must be overcome. It will disappear by practice. A good means of testing one's steadiness, is by balancing a half dollar on the end of the barrel of an unloaded rifle, and, after aiming and drawing

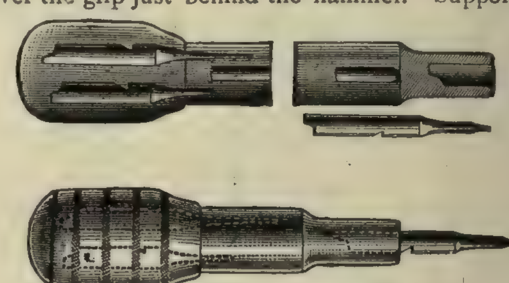


Fig. 16.—*Combination Screw-Driver.*

Fig. 17.—*Cartridge Belt.*

the trigger, if the coin remains the nerves are sufficiently steady. For long-range shooting it is best to kneel, resting the left arm on the left knee.

Loading and Carrying. The handling of breech-loading guns, and the using of shells, is too well known to require direction. In muzzle-loading no wadding is used. The bullet is put on a small round piece of flannel, felt, or thin skin, called a patch, with just enough grease spread over it to make the bullet go down easily. Ram only hard enough to bring the ball down to the powder. If the cap will not go down on the end of the nipple, it can be forced home by gently letting the hammer down and pressing on it. In doing this rest the but of the gun against the thigh, and keep the barrel always pointing at right angles to the body. At no time tap the hammer when it is on the cap, for it may be too violent and end fatally. Never bring the hammer from a full to a half-cock, but first let the hammer clear down, and then re-adjust it. All fire-arms, when not in use, should be oiled well and kept in a dry place. Clean thoroughly, inside and out, before and after using.

To be a successful sportsman one must always keep his gun in readiness, and to do this it should be carried in the hollow of the left arm, with the muzzle pointing back, or with the stock under the right arm and muzzle toward the ground, which is safest, especially when hunting with a companion. Too much caution cannot be used in handling a gun, and it should never be carried in any other than the three ways—the two just mentioned and over the shoulder. If one becomes accustomed to these ways he will think of no other.

While passing through thick bushes *always* carry the gun under the arm, as this prevents its accidental discharge by the trigger or hammer catching.

There is more to be dreaded from a companion's weapon than your own; do not allow him to hold his gun so that you can see down the barrels.

When going through or over a fence, put your gun at half or full cock, for if it should catch in anything, it will not explode as it would if the hammer rested on the cap and was slightly raised and loosed. Keep it well in front, muzzle upwards, with the hand in front of the trigger guard. If you should be in company the one following should bring his gun through the fence pointing backwards.

When expecting game, the gun should be carried on the left arm if your companion is on the right side; or in the left hand, with the muzzle sufficiently upwards to be safe.

The finger should never touch the trigger until the game is moved; for if a stumble or fall occur in walking, and the finger is inside the guard, it is almost certain to cause an explosion.

The hammers should never be resting upon the cap or striker; it is very dangerous, as a very slight blow or concussion from a fall would cause a discharge.

If snow or mud gets into the barrels be careful to clear it well out before shooting, Many good barrels are either burst or bulged from some substance, even a wad, being left in the muzzle. When getting into or out of a wagon, do not pull your gun after you. Keep it in front with the point well up. A breech-loading gun need scarcely ever be loaded except when expecting game; but a few shells should be kept in the most convenient place in case of hurry. Never take a loaded gun into a house, but either draw the shells or take off the caps. Under no circumstances whatever attempt to de-cap or re-cap a loaded shell, but carefully draw the charge first. If a metal shell, keep it well in front, so that the charge would be clear of you in case of explosion; and if a paper shell, better lose the shell by cutting it through to save the ammunition, than run the risk of taking off the primer. In loading shells keep them well away in front, and be careful that the primer does not rest upon any hard substance, but have holes drilled out in the center of the stand. Have metal shells properly fitted for the chamber of your gun, and do not lend them, for if used in a gun of slightly larger caliber than your own, they will burst or bulge, and be useless for your own afterwards. When loading a gun place the butt upon the foot and incline the muzzle well outwards quite clear of your head. If one barrel is fully loaded it should be turned farthest away, keeping the hand clear of it, and only the smallest portion of the finger that is necessary should be over the loaded barrel in using the ramrod. Both barrels should be at half-cock, as the escape of the gas allows the powder to be driven well into the tube. Take care not to leave tow or rag in the breech when wiping out the gun; it may be fired by the first discharge; and igniting the powder in reloading may cause a fatal accident by exploding the contents of the powder flask. Have the caps properly fitted to the tube, so as not to burst in putting on; they will be easily taken off, and not liable to be lost. A spare tube and wrench, a shell extractor, knife, screw-driver, piece of cord or string, and some small money may be found useful to a hunter. Never put away a gun without wiping and oiling outside, and examine the locks often for fear of water and rust. Wash the barrels of a muzzle-loader very often, for in damp weather a large portion of the powder will be wetted, and become caked when forced down into the breech. Be careful that your shells are properly loaded, and carry at least two sizes of shot for ordinary use. A few with buck and B B shot should be kept very conveniently for large game, or long shots at flocks of geese or ducks. Great caution should be taken if the wad over the shot should become loose, to remove it before putting in another cartridge; for if the weight of shot should force the wad to the muzzle of the gun, it would be almost certain to burst or bulge the barrel at the next discharge. Many fine guns are spoiled by this simple thing, and either the maker of the gun or the powder (particularly if Dittmar or any other new explosive should be used), gets blamed for a casualty over which they have no control, and the real cause is never known. It is not very likely that the strength of any powder (even if 20 drams were used) would be powerful enough to damage a barrel which has been

tested to stand many times that power before leaving the factory. In resting a gun upon the ground never place the hand over the muzzle; it is very dangerous.

In shooting birds for mounting purposes, load as lightly as possible. Put in no more shot than is needed to kill the bird, and not enough powder to send the shot clear through, making two holes instead of one. "Dust shot" is best for small birds, but No. 12 will answer. For ducks and large birds, No. 8 is about the right size.

To Shoot Game near the ground and moving from you, aim well over the head, or the charge will fall too low. For birds above the gun and flying from you, aim low, or the shot will pass too high. In cross-shooting at close range aim a foot or so in advance. Allow more distance for longer range. Cross shots are alway best, especially for quails, as an easier mark is presented, and a more vital part exposed. A cross-shot may generally be had by walking around, and coming up toward or in front of your dog while pointing. Game should always be approached from the direction in which the wind is blowing, and with birds in a body, aim at those that are farthest away. Do not take your eyes off a flock of birds after firing till they have flown several hundred yards, as some of the birds, though mortally wounded, may not fall at once.

In order to become a good judge of distance, measure out, say 30, 40, 50 and 60 yards at your own homestead, and familiarize yourself with the respective distances.

The pull of the trigger, the quickness of the powder, of which the small grain is said to be the best for snap shots (although perhaps not quite so strong), have all to be considered, bearing in mind that three-fourths, if not more, of the shots missed, are from being behind rather than in front.

This remember and treasure up as the greatest secret in shooting: Never allow your gun to be brought upon a bird from above, or before it; but always from behind if cross shots, or below if rising shots. The course of flight being in direct opposition to the motion of the gun, unless that instruction is followed, it would require at least double allowance to be made, and even then we very much question, unless in very experienced hands, whether one shot in twenty would be effective.

The greatest care should also be used that the gun be held level, so that the line from the eye in taking sight should be along the center of the rib, from the screw at breech to the sight on muzzle.

With ground game the same principle applies more or less, remembering that whereas with birds above your level going right away, you shoot under them; hares or rabbits, and even birds, near the ground being below your level, it is requisite to be well over them, carefully calculating whether it is rising or falling ground, and with side shots be well in front, as explained before.

If a hare or rabbit is crossing you in brush or timber, and you only just get a sight, snap shoot three or four feet in front of where you saw it, and you will be almost sure to find that you have killed. So with a woodcock; shoot after him in the direction he was taking, although you have lost sight, for, being a very soft bird, a single pellet may kill him at 50 or 60 yards. It will be found to answer very often.

HINTS ON PRAIRIE SHOOTING. "The 15th of August," says Mr. Hallock, "is the opening day of the season for pinnated grouse, or 'chickens,' as they are usually called out West, and during the remainder of that month and the first two weeks of September much larger bags can be made than later in the season."

But by deferring the time until the latter part of September, we can have, say, a week's shooting for grouse, and at the end of that time the snipe and ducks will begin to visit the lakes and marshes which abound in the West and Northwest, and afford most excellent sport. In order to have the best sport, it is important that each shooter should take with him at least one good, steady, well-broken dog, and in condition to work day after day, and by all means one that is a good retriever.

Early in the season, use No. 8 shot; later, No. 6.

HOW TO LOAD FOR GAME. A ten-bore will chamber about five buck-shot; put in about four layers and four drachms of powder. Pinnated grouse, three and a half drachms of powder and one and one-eighth ounces No. 8 shot. Ruffed grouse (partridge), three and a half drachms powder and one and one-fourth ounces No. 8 shot. Woodcock and snipe, three drachms powder and one and one-eighth ounces No. 10 shot. Powder, No. 6 Laflin & Rand's. Some years ago fine-grain powder was generally used; the coarse grain gives better penetration and less recoil. Either the brown or blue shells can be loaded again, provided they are intact and not injured anywhere.

BLINDS, DECOYS, CALLS, AND OTHER DEVICES. *The Sink-box or Battery*. The sink-box is about six feet three inches long, one foot two inches deep, two feet wide at the top, one foot eight inches at the bottom. To this box is fastened a platform about 12 feet long and seven feet wide, and to this platform is fastened a frame covered with muslin, as follows: Width at head, nine inches; width at sides, two feet. This box is carried to the shooting grounds by placing it on a boat, and is then anchored at the head and foot, head toward the wind. The shooter then places his decoys at both sides, and strings them towards the foot, so the decoys will form a V-shape; but place most of your decoys on the left, so that the ducks will come on your left, as this is the easiest shooting. After this is done the shooter gets into the box, and places weights in it, so that it will be sunk even to the water. The shooter then lies down in the box with his face to the leeward, so that he can see every dart made, and thus have an easy shot. Where ducks are plenty this is a most destructive contrivance, as the ducks can see nothing until they get over the decoys, and then it is too late, for at this moment the shooter rises up and pours in his deadly fire.

Blinds. A blind is a concealment. Blinds are

WILD TURKEY SHOOTING.

contrived in a dozen different ways to suit varying exigencies. Properly they are imitations of nature, or such close resemblances to natural objects that the birds to be decoyed are wholly unsuspicious of them. If a man is hunting along the margin of a river which is lined with rushes, he bends the rushes over the boat and hides beneath them, taking care that his garments shall be the same color as surrounding objects. If he is among willows on shore or by the river side he partly lops off the branches and lets them hang over him. If he is by the sea-shore, where the waves pile up the kelp and algæ, he makes a suitable pile of his own and uses it for a blind. If logs and drift-wood line the banks of the shore or margin of a stream, a canoe or boat turned over looks like a log and affords a blind. If birds are to be hunted in fields or near cover, a shock of corn or pile of brush answers the best purpose. If in mid-winter, when snow is on the ground, or ice moving in the rivers, blocks of ice set up, or bleached cotton cloth made fast to stakes driven into the ground, make an effectual concealment, and can scarcely be distinguished from the adjacent landscape. The shooter's dress should then be as nearly white as possible. Blinds should never be built higher than the shoulders of the person erect, and the interstices should always be so covered as to conceal his form and movements.

Decoys. Select a clear stick of timber of cedar or pine (cedar is the best), about five by seven inches. Cut it in pieces twelve inches long; make a pattern of pasteboard about the shape of a duck, viewing it from above. Mark out the pieces of wood by the pattern, and rough them out with a hatchet. Make another pattern of the side view of the duck's head and neck when shortened or drawn in, and mark out some heads on a piece of inch and a half board, so the grain of the wood will come lengthwise of the duck's bill. Saw them out with a key-hole saw. Cut a square place in the body of the decoy about three-quarters of an inch deep to receive the base of the neck. Fit a neck to each body, and bore a hole lengthwise through the head and neck into the body; make the joint of the neck with glue, and fasten the heads on the decoys by driving a pointed, tight-fitting piece of wire through the hole already made. When the heads have been fastened, shave them in form with a draw-knife, rasp them off smooth, put the finishing touch on the heads and crook of the necks with a jack-knife, and sandpaper them thoroughly. Buy some white lead, boiled oil, and dry colors, and paint them as near as possible like the ducks that are to be hunted. They may be made to look more natural by putting glass eyes in the head, set in holes in plaster. When used, anchor them from a staple driven in the fore part of the body, so the ducks will always head to windward, as live ones are in the habit of doing.

Dead Ducks as Decoys. Having killed the duck and secured him, take a stick, a reed or the stalk of a strong weed that is stout and strong, sharpen one end to a point, which insert under the skin of the duck's breast and along up the neck just beneath the skin, into the head. Do this so that the head will hold a natural position to the body, and the neck is not awry. Then wade out and plant the other end of the stick in the mud over which there is a foot of water or a little more. The body of the duck must then rest on the water as that of a live duck does, and after having smoothed the feathers nicely. It is best to keep on setting these decoys until you have seven or eight, and if you increase the number it will be all the better.

Stools for Snipe, etc. Stools are made of wood in imitation of the birds to be decoyed; or dead birds may be used as above. They should be placed at a proper shooting distance from the blind where the shooter is concealed.

Live-Geese Decoys. In bar shooting they should not be staked out for the following reasons: Very few Canada geese or brant used for decoys become properly reconciled to their captivity. They remain more or less wild, and when fettered, are apt to lose their footing, on account of sudden frights, etc , and fall forwards all in a sprawl. There they remain prone, tagging and straining for hours until relieved. If wild geese are in the vicinity where this occurs, good-bye to the game; it will not be deceived. Moreover, the gunner should retain control of his decoys, in order to be able to get them away, when necessary, from the spot towards which the wild birds are heading.

Turkey Calls. Make a little box of Spanish cedar two and one-half inches long, three-fourths to seven-eighths deep, and one inch wide. Cut a piece of smooth slate so that it will lie nicely in the bottom of the box; have the top smooth and even and no rosin will be needed. Make the box of the same material throughout, and put together with brass pins. Brads or glue spoil the sound, not giving sufficient vibration. If made from pieces of cigar box, be sure that no paper remains on the box, and use the thinnest portions. Another call consists of a short piece of Spanish cedar, with a good sized nail driven half through it; draw a piece of slate across the nail.

To operate either of these calls, hold the slate between the thumb and middle finger of the right hand, while the call is held by the thumb and middle finger of the left. Above all things do not make over five strokes for a single call—oftener four. If you exceed this number you will get no turkey, for a turkey can count.

Still another call is made in this wise: Take a piece of dry cedar two inches long and one and a half inches wide and a quarter inch thick, and with a narrow chisel hollow this out so that the sides are about as thin as a piece of tin, or it may be a little thicker, so that it is not too delicate. It should be hollowed out within a quarter of an inch of the bottom and end, and your call is complete. Take both ends between your thumb and fingers and rub it crosswise against the but plate of your gun, or rub it on

your gun barrels. You require no rosin or anything else; simply the naked wood as made. In one hour's practice you can perfectly imitate a gobbler or a hen at your pleasure. One beauty about this is, you never make a mis-call or screech; it is perfect every time. Many hunters, however, prefer the old-time hollow bone of the turkey's wing.

Whistle for Calling Bay Snipe. Carefully dry the leg of a curlew, push out the marrow with a red hot knitting needle, plug up one end and then practice.

A Plover Whistle. Take a round miniature tin box three-quarters of an inch in diameter and a quarter of an inch thick, or less, and a small hole exactly through the center. If it does not answer fully on trial, ream out the hole a trifle. We have seen

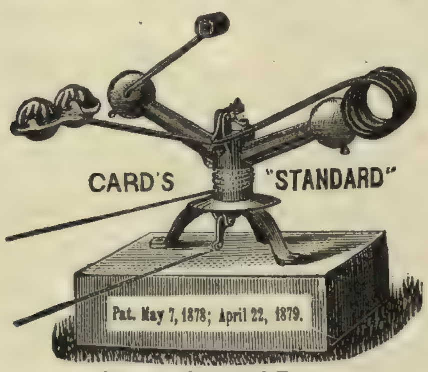


Fig. 19.—*Standard Trap.*

these whistles on sale at toy stores. A little practice will enable you to call any whistling bird.

The farmer who has not plenty of wild game on which to practice, may become proficient in marksman-

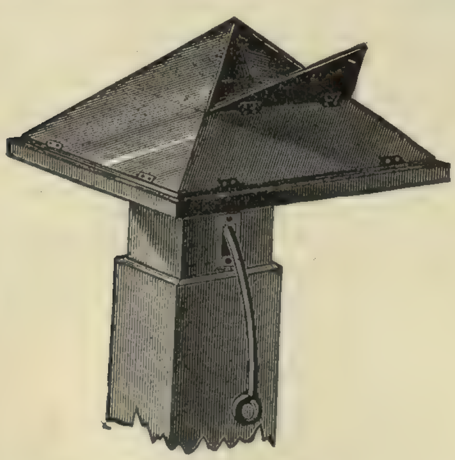


Fig. 20.—*Pigeon Trap.*

ship by a small outlay in the purchase of a trap and balls We give in Fig. 19 an illustration of a trap for this purpose. William H. Cruttenden, of Cazenovia, N. Y., agent. The balls may be either glass or wood. Fig. 20 represents a trap for pigeon practice. It is handy, cheap, durable and sure to work.

Gutter, a small and narrow surface drain; but the word is used in a restricted and technical sense in the practices of irrigation.

Gyp (jip), a name applied by sportsmen to the young female pup.

Gypsum (jip'sum), the hydrous sulphate of lime; land plaster. It consists of 40.1 per cent. of sulphuric acid, 28.5 of lime, and 18 of water, or of three equivalents of sulphuric acid, one of lime, and two of water, or, of one equivalent of sulphate of lime and two of water. It can easily be artificially formed by mixing a solution of muriate of lime with any soluble sulphate, or by pouring sulphuric acid upon common quicklime. In the latter case a violent heat is evolved, and when the mixture is ignited water is given off; and if the sulphuric acid has been in sufficient quantity, the resulting substance is all gypsum; and if not, the substance is partly gypsum and partly quicklime.

History of Gypsum as a Manure. The grand value of gypsum to the farmer, and even the chief interest of it to the merchant, are its uses as a manure. Virgil, in commending the use of ashes to the Roman farmers, speaks of the value of a very impure variety of gypsum; and the early inhabitants of Great Britain and the farmers of Lombardy made use of it in some such way as the Romans But none of these parties were acquainted with its real nature; and even the chemists, till a comparatively late period, were unable to distinguish it from limestone or other calcareous substances. About the middle of the 18th century, a substance which was, long afterward, shown to be an impure gypsum, which had been used as a fertilizer in the neighborhood of Hanover, drew the attention of Mayer, a talented Protestant pastor in the principality of Hohenlohe, and was found by him to possess such manurial powers as promised to be of great and general service to agriculture. He recommended and published the substance by both example and writing, and he speedily made a deep and extensive impression in its favor. Many agriculturists subjected it to experiment, and Schubart in Germany, Tschiffeli in Switzerland, and Franklin in America wrote in recommendation of it, pushed it into notoriety, and both won for it a host of friends and provoked against it a host of foes.

The use of gypsum extended rapidly in various parts of Europe, particularly in the district around Paris, and was so zealously propagated in North America as to occasion exportations from the quarries of Monmouth to the western side of the Atlantic; and gypsum rapidly obtained the fame, in both the old world and the new, as being one of the most powerful auxiliaries of vegetation.

H

HACK, a horse, or coach, or other carriage, hackneyed or let out for common hire; a hackney coach; also a family horse used in all kinds of work as distinguished from hunting and carriage horses.

Hackberry, a tree of the elm kind, growing sparingly in all our forests and bearing sweet, edible fruits the size of a small cherry.

Hackle, an instrument with teeth for separating the coarse part of flax or hemp from the fine; a hatchel; any flimsy substance unspun, as raw silk; a fly for angling, dressed with feathers or silk; a long, shining feather on the neck of a cock.

Hackney, let out for hire, as a coach.

Hail, a species of snow or snowy rain, which has undergone several congelations and superficial meltings, in its passage through different zones of the atmosphere, some temperate and others frozen. It is generally formed by sudden alternations in fine season. Hailstones are often of considerable dimensions, exceeding sometimes the length of an inch. They sometimes fall with a velocity of 70 feet a second, or about 50 miles an hour. Their great momentum, arising from this velocity, renders them very destructive, particularly in hot climates. They not only beat down the crops, and strip trees of their leaves, fruits and branches, but sometimes kill even large beasts and men. The phenomena attending the formation and fall of hail are not well understood. An explanation offered is, that they must have been originally formed at an altitude in the atmosphere where the temperature is greatly below 32°, and that, in consequence of their extreme coldness, they acquired magnitude during their descent by condensing on their respective surfaces the vapors contained in the electrified cloud and atmosphere through which they passed. The difficulty, however, is not altogether obviated by this conjectural explanation. In this country hailstorms seldom assume any remarkable appearance, but in some other countries, especially in the southern districts of France between the Alps and the Pyrenees, hailstorms are so violent, and the hailstones so large, as frequently to lay waste large districts of country. Of late years some very disastrous hailstorms have occurred in portions of the Western United States and Western Ontario. These storms have invariably been accompanied with thunder and a violent squall or whirlwind. Individual hailstones have been known to weigh as much as five ounces, but there are stories in existence of much heavier ones. These large particles of ice are seldom globular, but rather of an irregular and angular shape. Hailstorms generally occur during the hottest period of the year, and seldom during night or winter.

Hair. The hair of the human scalp is an important charge, both in regard to health and to etiquette.

Fine hair has been, in all ages, considered as a beautiful ornament, and the proper management of it is well deserving of attention; as this will be assisted somewhat by a knowledge of its structure and mode of growth, we shall first describe these.

Each hair is a hollow tube attached to a root or bulb, which grows in the skin. The shaft of the hair is of a horny substance, but the bulb is furnished with vessels and nerves, as is evident from the pain which is felt in pulling the hair by the roots. When the roots are pulled out, the hair does not grow again. Although the hair is tubular, if it has never been cut it is closed at the points, which are sharp, as may be seen in the large hairs that form the whiskers of animals, and from the hair of which camel's-hair pencils are made, which becomes useless if the points are cut off. There is probably a circulation of some fluids in hair, although, from its minute structure, this cannot be ascertained; but it may be inferred from the change that takes place in its color. It is well known that the hair of the human head is almost always lighter, and sometimes of a different tint, in childhood than it becomes afterward; and as old age advances, it experiences, in most people who do not become bald, the remarkable change into gray. The time at which hair turns gray varies remarkably in different persons; and it is frequently accelerated by great anxiety of mind, of which singular instances have been recorded. The turning gray is very different from falling off; the latter appears the consequence of some decay at the roots, whereas they are only the most permanent hairs that ever become gray; the strongest and darkest colored are the most liable to the change, and are longer in being shed than those which have preserved their color. Hair when gray appears to be in some degree transparent, and has a remarkable silvery or glistening appearance.

The color of hair is various, but limited within certain boundaries. It varies from very light flaxen to a deep raven black, and goes through the shades of yellow or golden, to reddish and red, auburn or light brown, and dark brown, and blackish brown.

The proper management of hair is very simple. It

should be kept as clean as possible, by daily brushing and removal of the dandruff that forms upon the skin, and occasionally washing with pure water, which will have no injurious effect on the health, providing the hair is not very long, so as to make drying it difficult. To assist in drying it thoroughly, dip the brush in a very little hair powder, and brush it out again; after that a little good perfumed pomatum may be brushed in; too much not only makes the hair greasy but injures it. There is a natural oil secreted by the hair, which serves to keep it in good order; sometimes this is defective, and the hair becomes dry and harsh; it is then proper to supply the deficiency by a little pomatum or oil. The use of these gives to hair a fine gloss just in the same way as a mahogany table is made to shine by rubbing it with wax, which fills up all the minute cavities with a smooth substance. A multitude of hair oils are sold by the druggists under various names, their compositions being kept secret; and each of them is said to have extraordinary qualities. Most of those which are advertised are expensive, and persons who have tried them agree that their pretended virtues are extravagantly overrated.

When hair is allowed to grow very long without cutting, it is observed that it splits at the points, which injures its growth; an inch or two should then be cut off. Curling is best effected in the usual way, by papering. Using hot irons is apt to injure the hair.

The plentiful growth and agreeable appearance of hair is usually promoted by general health and simple management; and more dependence may be placed on them than on any arts which the perfumer may pretend to.

The loss of hair which occasions baldness is a usual effect of old age; but it takes place not unfrequently at early periods of life. Premature loss of hair is indicative of some derangement of the bodily system, by which the ordinary functions of the skin are in the defective state. The causes of this may be various, and are not easily investigated. Though the hair has begun to come off, this effect will sometimes cease with the return of perfect health; and whatever can restore the proper action of the skin will contribute most effectually to preserve the hair. But when baldness has actually taken place for some time, it may well be doubted whether any application can reproduce hair upon the part from which it has disappeared, particularly after the person has advanced to a certain time of life. This defect is almost peculiar to men; women at an advanced age, though their hair becomes white, are seldom affected with this disease. When the hair is observed beginning to come off, the defect is frequently owing to a dryness of the skin and some want of nourishment at the roots; in that case a little good pomatum may check the evil, and prevent its extending.

In the daily papers are seen numerous advertisements of preparations for restoring the hair which has fallen off; and we are confidently assured that, through their virtues, thousands of persons who had been bald are now adorned with luxuriant tresses. It is really amusing to observe how far impudence can go, and credulity can lead to being duped; and one would imagine that the extravagant style and gross ignorance displayed in these puffs would be sufficient to expose them. The best of these nostrums, that is, those which contain nothing deleterious, are little more than some of the ordinary fats or oils, colored and perfumed, and which any person may prepare for himself at one twentieth of what they cost in the stores to say nothing of the latter being totally useless as to the purpose for which they are recommended. See page 55.

Although there is a very general idea that the fat of the bear, or bear's grease, promotes the growth of hair more than other material, in consequence of the extravagant advertisements by which its sale is announced, yet it is, in fact, no more efficacious than common pomatum, which it much resembles. Indeed, it is more than probable that the greatest part of that which is sold for bear's grease never came from that animal. Real bear's grease has a very disagreeable smell; and this is imitated, it is said, by using the fat of an old goat, or rancid hog's lard. The least evil is, that the weak and credulous will throw away their money; but there is the greater danger that they may be seriously injured by compounds made up by persons ignorant of the nature of the ingredients they put together, and totally unfit to be trusted when health is so much concerned.

Hair Powder, at one time universally worn, is now scarcely used, except for occasionally drying or cleaning the hair, and similar purposes. It is merely wheat starch powdered very fine. It was formerly made of various colors, and perfumed.

To Cleanse the Hair. Ammonia should not be used on the hair; it injures the gloss and softness, causing the hair to become harsh and dry. The best way to cleanse the hair and keep the scalp healthy is to beat up a fresh egg and rub it well into the hair, or if more convenient, rub it into the hair without beating. Rub the egg in until a lather is formed; occasionally wet the hands in warm water, softened with borax; by the time a lather is formed the scalp is clean; then rinse the egg all out in a basin of warm water, containing a table-spoonful of powdered borax; after that, rinse in one clear warm water.

Dandruff may be removed by an application of borax and warm water, or the yolk of an egg beaten up in warm water. Another good wash consists of powdered camphor 1 ounce, and pulverized borax 2 ounces, mixed with 2 quarts of boiling water poured over it; bottle when cold.

Hair Dyes are all injurious, no matter what the advertisers and uneducated fops may say. When gray hairs begin to appear, at first awhile they may be plucked out, but afterward let nature take its course. Gray hairs often have a charming effect, even when associated with a comparatively youthful face.

To Make the Hair Curl, apply a mixture of 1 pound olive oil, 1 dram of oil of origanum, and 1¼ drams oil of rosemary.

Pomade. Take the marrow out of a beef shank-

bone, and put it into a jam pot; set the pot in a saucepan of water, and boil until the marrow is quite melted. Then strain and add scent to liking; ottar of roses is nicest. Lard, 5 ounces; olive oil, 2½ ounces; castor oil ¼ ounce; yellow wax and spermaceti, of each, ¼ ounce. These ingredients are to be liquefied over a water bath; then add, when cool, the following perfume: essence of lemon, essence of bergamot, of each, 60 drops; oil of cloves, 15 drops.

Making Hair Grow. If the head be perfectly bald, nothing will ever cause the hair to grow again. If the scalp be glossy and no small hairs are discernible, the roots or follicles are dead, and you might as well cause an arm to grow again after it has been amputated. However, if small hairs are to be seen there is hope. Use the following every day: Brush well, and bathe the bald spot three or four times a week with cold soft water; carbonate of ammonia, 1 dram; tincture of cantharides, 4 drams; bay rum, 4 ounces; castor oil, 2 ounces.

To Restore the Hair after Illness. Equal parts of best brandy and strong black tea, shaken well together and rubbed well into the roots of the hair once daily, will usually restore the hair after long illness. Be careful not to scratch or irritate the scalp with rough combing and brushing. The mixture should be made at least once in three days, even in cool weather.

To Keep the Hair from Turning Grey. Take the hulls of butternuts, say about 4 ounces, and infuse in a quart of water. Then add ½ ounce of copperas. Apply with a soft brush every second or third day. This preparation is harmless, and, we have reason for believing, has never been published. It is far better than those dyes made of nitrate of silver.

The hair should be in good trim. The gentleman will keep his hair cut to just such length as will set the neatest and most gracefully; will divide it by a straight line an inch or a little more to the left (or right) of the middle of the forehead, and comb and brush thoroughly, until every stubborn lock and hair is made to take its place.

A lady's hair should be brushed for at least ten minutes three times a day,—morning, noon and night, with a brush of moderate hardness. The hair should be separated, one lock after another, in order that the head itself may be well brushed and the scurf removed. In brushing or combing begin at the extreme points; in combing, hold the portion of hair just above that through which the comb is passing, firmly between the first and second fingers, so that, if it becomes entangled, it may draw from that point and not from the roots. Jerking the comb violently through tangled hair breaks off much of it, rendering it uneven and uncontrollable. About once a month it is well to clip off the ends of the hair with shears, to make it even.

Halter, a loose rope-bridle, or strap, without bits or curbs, and used simply for leading a horse or tying him up. The plain or common halter is a very simple affair; but when this can be slipped by a tricky horse, a halter is used with head-gear, two straps and a second throat band.

Ham, To Cure. Cover the bottom of the cask with coarse salt, lay on the hams with the smooth or skin side down, sprinkle over fine salt, then another layer of hams, and so continue until the cask is full. Make a brine in the following proportions: Six gallons water, 9 pounds salt, 4 pounds brown sugar, 3 ounces salt-peter, 1 ounce saleratus. Scald and skim, and when cold pour the brine into the cask until the hams are completely covered. The hams should remain in the pickle at least three months, and a little longer time would do no harm. A handful each of mace and cloves scattered in the brine will greatly improve the flavor of the meat. If it is desired to give a red coloring to the hams use eight ounces saltpeter to two pounds salt.

The following is another method used successfully by many: Put a layer of salt on the bottom of the cask, and put in the hams, sprinkling salt freely over each layer. Make a pickle in proportion of 1½ lbs. of salt and 1½ lbs. sugar to a gallon of water; boil, skim, and when cool pour over the hams. In six weeks or two months they will be sufficiently salted, when they are to be taken out, dried, and smoked.

In pickling meat, salt and sugar are all that are really needed, but saltpeter and potash are often added. The only use of saltpeter in pickling meats is to preserve the red color; potash is thought to make them more tender.

Besides the method of pickling hams they may be cured dry. For this, place a table or platform of boards where the drip will do no harm, or so arrange cleats as to direct it into a pail. Mix one pound of brown sugar with every four pounds of salt; rub the hams, etc., with this daily for a week, and afterwards every two or three days for two weeks more. Brush off and smoke.

Preservation of Hams. To preserve hams according to the commercial method, case each one in canvas, after it is smoked, for the purpose of defending it from the attacks of the bacon beetle (see page 55), which soon fills the ham with its maggots. The canvas should then be whitewashed. This troublesome process can be avoided by the use of pyroligneous acid. With a painter's brush, dipped into the liquid, one man, in the course of a day, may effectually secure 200 hams from all danger. Care should be taken to insinuate the liquid into all the cracks, etc., of the under surface. This method is especially adapted to the preservation of hams in hot climates. For directions concerning smoking hams, see "Bacon."

Mutton Hams. To pickle for drying: First take weak brine and put the hams into it for 2 days, then pour off and apply the following, and let it remain on from 2 to 3 weeks, according to size: For each 100 pounds take salt, 6 pounds; saltpeter, 1 ounce; saleratus, 2 ounces; molasses, 1 pint; water, 6 gallons, will cover these if closely packed. The saleratus keeps the mutton from becoming too hard.

To Boil a Ham. Put a ham in a boiler, while the water is cold; be careful that it boils slowly. A ham of 20 pounds takes four hours and a half; larger and smaller in proportion. Keep the water well skimmed. A green ham wants no soaking, but an old one must be soaked 16 hours in a large tub of water.

To Steam a Ham. If the ham has been hung for some time, put it into cold water and let it soak all night, or let it lie on a damp stone sprinkled with water for two days to mellow. Wash it well, put it into a steamer—there are proper ones made for the purpose—over a pot of boiling water. Steam it for as long a time as the weight requires, the proportion of time given above.

This is by far the best way of cooking a ham. It prevents waste and retains the flavor. When it is done, skin it and strew bread-raspings over it as usual. If you preserve the skin as whole as possible and cover the ham when cold with it, it will prevent its becoming dry.

Ham and Eggs. Chop finely some cold boiled ham, fat and lean together, say a pound to 4 eggs; put a piece of butter in the pan, then the ham; let it get well warmed through, then beat the eggs light; stir them in briskly.

To Bake Ham. Take a medium-sized ham and place it to soak for 10 or 12 hours. Then cut away the rusty part from underneath, wipe it dry, and cover it rather thickly over with a paste of flour and water. Put it into an earthen dish and set it into a moderately heated oven for 4 hours. When done, take off the crust carefully and peel off the skin; put a frill of cut paper around the knuckle and raspings of bread over the fat of the ham, or serve it glazed and garnished with cut vegetables.

Hamburg Fowls, a species of domestic fowl: see page 524.

Hames, a pair of curved pieces of wood or metal in the harness of a draught horse, to which the traces are fastened and which lie upon the collar.

Hampshire Down Sheep, a breed of English sheep. See Sheep.

Hand, a lineal measure of height. It is the usual or average breadth of the fist or clenched hand, and is commonly reckoned at four inches. This measure is used in computing the height of horses; so that a horse of five feet in height is technically said to stand 15 hands high.

Hand-Drill, a drill sowing implement driven or drawn by hand. See page 367.

Handicap, a race in which the horses carry different weights, according to their age and character for speed, etc., with a view to equalize the chances as much as possible; an allowance of a certain amount of time or distance in starting, granted in a race to the competitor possessing inferior advantages, or an additional weight or other hindrance imposed upon the one possessing superior advantages, in order to equalize, as much as possible, the means of success; as, the "handicap was five seconds," "ten pounds," etc. The term is similarly used in marksmanship.

Hands. For the prevention and treatment of chapped hands, see Chapping.

Hand-saw, a saw to be used by one hand. Those hand-saws which have teeth slanting forward, or downward, for cutting wood in the direction of the fiber, are called "rip-saws," or "ripping-saws." Never give a hand-saw a "temporary" filing by merely sharpening the points, as that will almost spoil the saw and increase the labor of the regular saw-filer. In filing, lay the file evenly upon the whole of one side of a tooth, and, with considerable pressure downward, thrust the file steadily out. Two or three cuts of this kind are generally sufficient for one side of a tooth; sometimes even one thrust is sufficient, if the file is good and the work skillfully done. To keep the saw from rusting, keep it dry and slightly oiled,—well rubbed with sweet oil or any grease or oil in which there is no salt and out of which all the water has been driven by heat.

Hanging, or Strangling. After taking the cord from the neck, proceed with artificial respiration, as for drowning.

Hard Water. The tear and wear of clothes by the system necessary for washing in hard water is very important in the economical consideration of the question. The difference in this respect between hard and soft water is very striking. Hard water almost always contains carbonate of lime or chalk, as well as selenite. By boiling the water this is separated, and forms the fur or crust on the inside of tea-kettles; so that hard water is rendered somewhat softer by boiling, but not quite soft. For chemical purposes this property may be wholly obviated by adding to the water a small quantity of barytic solution. It is this selenite or gypsum which gives the water its hardness. Such water curdles soap, and is therefore unfit to wash with. The sulphuric acid of the selenite attaches itself to the alkali of the soap whilst the oil and lime are separated in flakes, and give the appearance of curdling. It is a common practice to add wood-ashes or concentrated lye or potash to hard water when it is required for washing purposes; in this case the alkali of the ashes or potash decomposes the selenite. Peas and vegetables retain their color better when boiled in hard than when boiled in soft water, but they are not so soft and tender. Soft water is best adapted to most manufactories, as brewing, dyeing, etc. In dyeing, if hard water is used, the selenite, or its earthy part, is deposited in the stuff and prevents the coloring particles from penetrating. In brewing, or any other process where water is used to extract the virtues from vegetables or from animal matter, soft water is best, because its solvent powers are greatest. In making tea, hard water will not extract as much as soft, unless the tea be powdered, for it has not so much power in softening and opening the tea leaves.

Harness. The harness of any draught animal, whatever be its parts, should in every instance exactly fit the animal and always be in good order. The collar and saddle, in particular, ought to be exact in size and shape, and thoroughly adapted to ease and comfort; for when they incommode the animal, or render him uncomfortable, or especially when they gall him, they make him restless and reluctant to work, destroy his temper and waste his powers. Even an improper adjustment of the harness or the girth may greatly distress him, and waste much, both of his strength and temper.

How to select good harness. The great difficulty, even to experts, of judging the quality of leather when manufactured, and of the honesty of the workmanship, is so great that the only safety lies in buying from dealers whose reputation is above suspicion, and buying nothing for which less than a fair price is asked. The following hints may probably be of some assistance: All good harness leather is made from the hides of neat cattle, tanned either with oak or hemlock bark, the former being very much the best. Leather tanned with oak bark alone has when cut a yellowish drab color, without the least tinge of red, while that tanned either wholly or in part with hemlock bark has a pronounced reddish cast. If this reddish hue is very prominent on cutting across the end of a strap, etc., do not buy that set of harness. When leather has been perfectly tanned, it is of the same color throughout its thickness; if in cutting across (as above) and moistening the freshly cut surface with the tongue it shows a lighter streak in the center, reject. See that the wrinkles which are always found on the black side of the leather run across, and not lengthwise of, the strap. Beware of varnished leather; the best quality does not need doctoring. Rotten or half-tanned leather is never so soft or pliable as fully tanned and good stock. Where good thread is used long stitches are better than short ones. The slits made by the dagger-shaped awl should not run in the direction of the stitching, as is sometimes done in cheap harness, as it weakens the leather by a too continuous line of cutting. With proper stitching the end of the slits show on either side of the stitches. Never buy harness with leather-covered buckles, turrets, etc., as such articles are apt to be weak.

COLLAR. The collar should be soft, spongy and elastic, fit snugly, except that there should be plenty of room under the throat, so that there be no danger of choking when drawing heavy loads up hill. The collar should not be too narrow opposite the sides of the throat. To fit one to a horse, soak it well in water and then let the animal draw heavy loads with it until dry; but even for this process a collar of the proper proportions should be selected. Those which are open at the top do not afford so firm a resistance to the draft, and break sooner than those made solid. The best are always lined with leather. Care must be taken that they are neither so tight as to obstruct the breathing, nor so loose as to gall the shoulders. The breast collar, for light work, is much better and handsomer than the English collar. For a horse collar, a good sweat pad is a great utility.

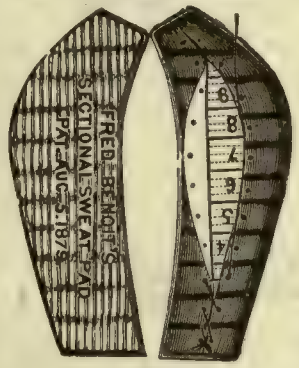


FIG. 1.—*Sweat Pad.*

Benoit's patent sweat pad for horse collars, as represented by Fig. 1, is composed of series of detachable sections enclosed in a case adapted to receive them. The object is to prevent the injury or discomfort arising from the pressure of a horse collar upon the shoulders of the animal, and the bruises and sores consequent upon the same; and to permit such to readily heal after they have been produced, by relieving the pressure, which is accomplished by detaching such section or sections as would bear upon the affected parts. This is the only philosophical theory and common-sense remedy known, and this device will readily commend itself to every one who has the welfare of the horse in consideration.

FIG. 2.—*Hayden's Tubular Hames.*

HAMES. Such hames should be selected as fit the *adjusted* collar; for otherwise the best collar in the world might be spoiled. Very often the collar is "blamed" for the mischief which the hames have slyly done. As to the material, etc., of this article, the iron tubular is probably the best, such as Hayden's patent, Fig. 2.

There is also manufactured a safety fastener for hames, which is a very great improvement in this line (Figs. 3 and 4). It can be lengthened or shortened, and is particularly serviceable where the horse has fallen down and the unhitching must be done instantly. It is as well adapted for light driving as well as for the heaviest truck. A good neck-

Fig. 3.—*Hame Fastener—Opened.*

Fig. 4.—*Hame Fastener—Closed.*

yoke adjuster, to go with the hames-strap, is illustrated by the two cuts of Fig. 5.

The "BACK-BAND" at the present day is uniformly made to work clear of the back-bone, so as not to gall that part of the animal. The sweat-pads or cushions underneath the band have a constant tendency to harden and become foul; hence they need frequent cleaning and oiling. In all justice, they should be thus renewed once for every day's work in warm weather, and once or twice for each week's work in cold weather. This cleaning and oiling should be done when they are taken off the horse, and while they are warm, otherwise it is a difficult task to do the work well. Oil or grease should not be left on the pads in slovenly quantities, but the surplus should be wiped off clean.

Fig. 5.—*Barnes' Neck-Yoke Adjuster.*

The subjects of the "belly-band," back-strap and of the "martingales" need no remarks. CRUPPERS should be large and soft. To keep them soft, however, they require treatment similar to that of sweat-pads, described on preceding page.

BREECHING is necessary only when a team is required to back a load occasionally, or in a hilly country where the wagon is not sufficiently provided with a brake. In all cases, however, it is safer to have good breeching, although its appearance is not "tasteful."

TUG. The most important improvement made recently with reference to tugs, or traces, is a spring link, which, as it works, catches and saves the force of a team in starting. It is especially valuable with quick starting, impatient horses, and is a great help in preventing that bad habit, balking.

Fig. 6.—*I. X. L. Spring Tug Link.*

REINS. Those which are rounded, folded or seamed are inclined to become hard or rotten, and are therefore not so reliable as those which are flat the whole length. Reins should be so strong that in case a trace or a whiffle-tree should break the team can draw the load by their mouths.

On the subject of the HALTER little need be said. To prevent that disgusting habit with some horses called "cribbing," "stump-sucking," etc., a kind of halter attachment (Fig. 7) has been invented, containing needles, which prick the under jaw when the animal opens his mouth very wide. The needles are so guarded that they operate at no other time, and cannot be broken. One or two trials with this arrangement cures the habit. See Bridle, Saddle and Horseback-Riding.

Fig. 7.—*Cribbing Halter.*

CARE OF HARNESS. It is best to have a closet or harness room where there is much fine harness to be kept, as the ammonia from the stalls consumes

the oil of the leather; at least they should be covered, if with nothing but a sheet. Dust and moisture should be carefully wiped from harness with a woolen cloth when taken from a horse, and the bits and plated mountings rubbed with an oiled rag. All harness should, two or three times a year, be thoroughly overhauled, cleaned, oiled and repaired. Take it all apart, soak and wash it thoroughly with a stiff brush in strong soap-suds, and then black it with the following preparation: equal parts of oil and tallow, with sufficient lampblack to give it color; or, what is better, Prussian blue, which will give it a new and fresh look. The latter should be sparingly applied but well rubbed in, with a quick motion. Another good harness polish consists of 2 ounces mutton suet, 6 ounces beeswax, 6 ounces powdered sugar candy, 2 ounces soft soap, and 1 ounce indigo or lampblack. Dissolve the soap in 1/4 pint of water, and then add the other ingredients; melt and mix together, and add a gill of turpentine. Lay it on the harness with a sponge, and polish off with a brush. The best waterproof harness blacking is made by mixing together 1 pound beeswax, 1 ounce Prussian blue ground in 2 ounces linseed oil, 1/4 pound ivory black, 3 ounces turpentine, and 1 ounce copal varnish; warm these and form into cakes. This is called "cake blacking." Harness needs special care after they have been in a soaking rain on the team. Taken wet from the horse after a rain or melting snow upon them, and hung up in a careless, twisted shape, it will dry or freeze in that shape, become unstitched and persistently out of shape for comfortable sitting on the horse. When the plated metal becomes tarnished, rub first with whiting alone, and then with a woolen cloth moistened with oil.

CHEAP COLOR FOR THE EDGE. Soft water, 1 gallon; extract of logwood, 1 ounce; and boil them until the extract is dissolved, then remove from the fire and add copperas, 2 ounces; bi-chromate of potash and gum arabic, of each 1/2 ounce; all to be pulverized.

This makes a cheap and good color for shoe or harness edge; but for cobbling or for new work, upon which you do not wish to use the "hot kit," but finish with heel-ball, you will find that if, as you pour this out into the bottle to use, you put a tablespoonful of lampblack to each pint of it, it will make a blacker and nicer finish. It makes a good color for cheap work, but for fine work nothing will supersede the first.

The common way of oiling a harness is to apply as much neat's-foot oil containing lampblack as the leather will take up, and then to wash off with Castile soap and water.

A most excellent method of coloring and oiling harness is the following: After the harness has been thoroughly cleaned, black every part with a dye made of one ounce extract of logwood and 12 grains of bichromate of potash, both pounded fine; upon this pour 2 quarts of boiling rain-water, and stir it until it is all dissolved; when cool it is ready for use. When the dye has struck in, apply neat's-foot oil to every part. The traces, breeching and such parts as need the most should be oiled again. They should again be gone over with a mixture of one-third castor oil and two-thirds neat's-foot oil. A few hours afterward, or the next day, wipe the harness thoroughly with a woolen cloth, to give a glossy appearance. The reason for using castor oil for the last coat is because it will withstand the effects of the atmosphere and the rain much longer than neat's-foot oil. One pint of oil is sufficient for one harness.

TO RESTORE OLD AND STIFF HARNESS. Melt over the fire, in a metallic vessel, eight pounds of very pure beeswax, stirring it until it is all melted; then introduce one pound of litharge, which has been pulverized in water, dried, and passed through a fine sieve. Leave it on the fire, and stir it until all of the soluble part of the litharge is incorporated with the wax; remove the vessel from the fire, and when the mixture shall have lost a portion of its heat, incorporate with it, little by little, one pound and a half of very fine ivory black, of the best quality; replace it on the fire, and stir it incessantly until the wax commences to boil again; then remove it and allow it to get nearly cool. Then add to it spirits of turpentine, until it is of the consistency of a paste. More turpentine may from time to time be added, as may become necessary.

Application. If the leather is old and stiff, or covered with gum, wash it with a brush with weak potash-water or soap, and then with pure spring-water; leave it to dry, and then blacken it with ink. When that is well absorbed, wipe it with a cloth, and then grease it abundantly with fish oil of good quality. Neat's-foot oil is probably preferable. When the grease has been thoroughly imbibed, pass over it a sponge moistened with spirits of turpentine, to remove the grease from the surface; then give it, with a shoebrush, a layer of the above preparation; finish by polishing with a soft and dry brush.

This process will restore the leather to a soft, pliable condition, and give it a beautiful appearance.

A Stitch in Time. The old maxim of the housewife that "a stitch in time saves nine" applies to harness as well as to garments. It is wise, therefore, to have in the carriage or wagon, or even in the field, such material and appliances as might be needed away from home for the prompt repair of the harness, such as strips of leather, strings, a small rope, rivets, awl, hammer, screw-driver, a buckle or two of each kind, etc. Sometimes a slight alteration of the harness, bridle or collar is necessary to prevent galling or fretting the horse. Very seldom a harness fits so perfectly but that an occasional slight change in certain parts will be a great relief; and it is quite an art to learn to notice the movements and actions of an animal acutely enough to see what is really needed at any time.

Harrier, a sub-variety of the hound division of the dog genus, kept specially for hunting the hare. It comprises three principal breeds,—the old harrier, the modern harrier, and the beagle. It also comprises some subordinate breeds, and it has been used, likewise, for producing some cross breeds. See article Dog.

Harrow, an apparatus consisting of a number of teeth, for pulverizing and stirring the soil. Almost anything dragged over the ground, when it is not too wet, serves the plants cultivated a good purpose; and the main question is, how to pulverize the soil sufficiently and with the greatest ease. To solve this problem harrows and "drags" innumerable have been invented or improved. Rollers with various forms of teeth, disc harrows, with their diagonally cutting wheels, and toothed harrows in a multitude of forms, have been in the market, and have been used. In this article we show a few of the best for the various purposes of the farmer, calling attention to the good "points" one must look for in constructing or purchasing a harrrow.

Fig. 1 represents a vibrator harrow, with eight feet cut, manufactured by Phelps, Bigelow & Co., Kalamazoo, Mich. The frame is connected by wrought-iron straps with bolt hinges. The teeth are so attached to it that, with simply a common wrench, they can be adjusted to cut the ground to any depth, from two to six inches. This adapts it to all kinds of work, and the fact of the tooth being rigid and frame vibratory and adjustable, makes it adapted to all kinds of soil. Each bar in the harrow works independently of all the others, which enables it to conform to uneven surfaces, such as dead furrows, etc., to pass obstructions, and to free itself from cornstalks and other trash which have a tendency to clog most harrows. It has draw-irons attached to both front and rear, and when drawn backward has no equal for covering fine seed and smoothing the ground. This comes from the peculiar shape of the back side of the tooth. When folded for shipment or for storage, it is very compact, and points of teeth are all turned inward. This is also a very easy way of taking the harrow to and from the field.

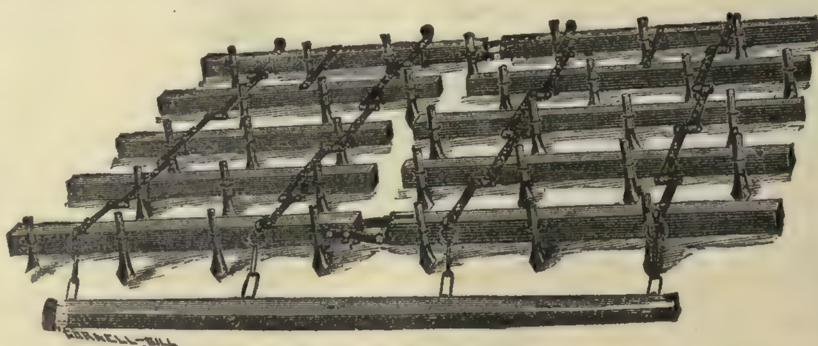


FIG. 1.—*Vibrator Harrow.*

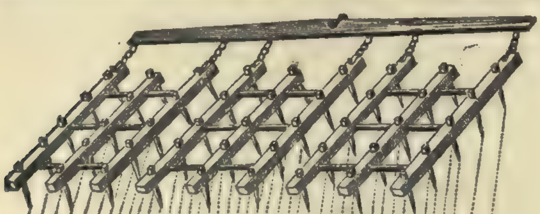


FIG. 2.—*Vibrating Harrow.*

Fig. 2 is a cut of a vibrating harrow made by Deere & Co., Moline, Ill., and Figs. 3 and 4 show other patterns made by the same company. Being in sections, these harrows do not skip the low places, but reach every point of ground alike, and are also easily managed, and easily loaded into a wagon and hauled about, shipped, etc.

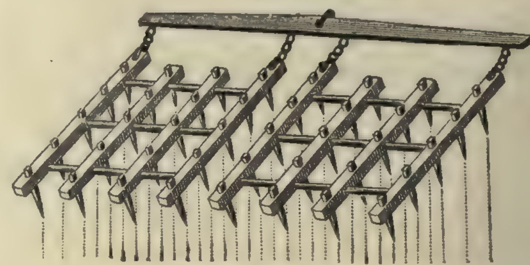


FIG. 3.—*Scotch Harrow.*

The smoothing harrow of Deere & Co. has the teeth swung on pins, so that when the team is hitched at one end the teeth are straight or vertical, as with other harrows, and when the team is hitched at the other end the teeth assume just such a slant as is needed to smooth the ground nicely, thus performing the work of a cultivating spring-tooth harrow; and it is, of course, cheaper and more simple and substantial than the latter.

A harrow made with the bars nearly parallel from front to rear, M-shaped, is stronger than any other form; for when a tooth catches upon a root or stone, the strain is thrown lengthwise upon the bar, instead of across it. In obtaining a harrow for a rough piece of ground, it is important to observe this principle. The cheapest smoothing harrow, or drag, is one made of brush, which is often used in pioneer sections of the country.

FIG. 4.—"*Glidden*" *Harrow.*

Barley's smoothing harrow also has reversible teeth, is made in three sections, and is nine feet wide. It has 45 ⅝-inch round steel teeth, which are firmly secured to the frame by means of an

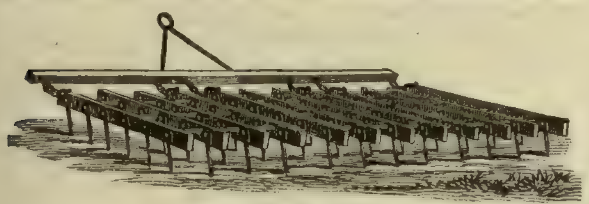


FIG. 5.—*Smoothing Harrow.*

eye-bolt and patent plate in such a manner as to change their position as described above.

All the proper work of the above harrows, as may readily be inferred from their lightness and

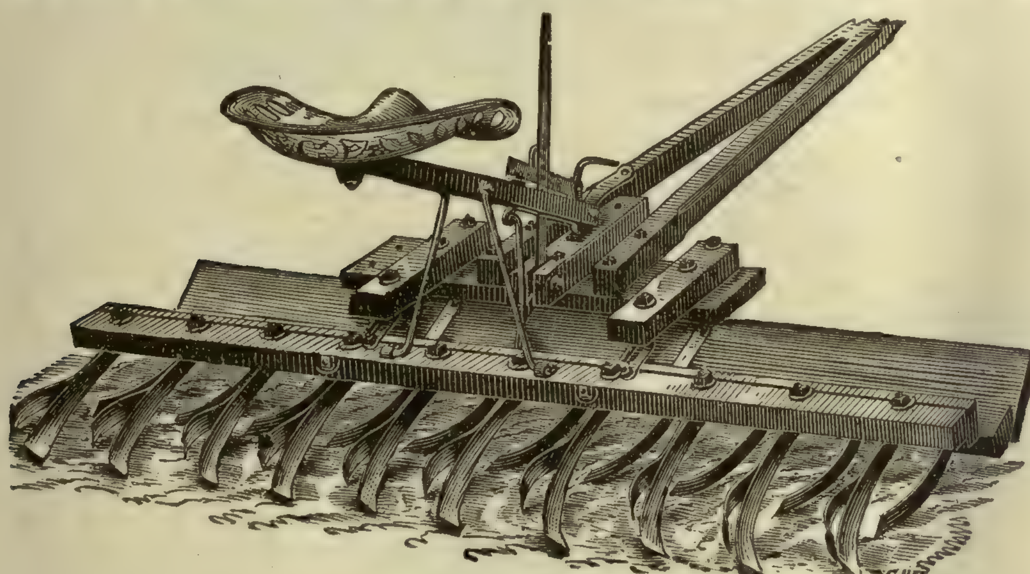


FIG. 7.—*The "Acme" Pulverizing Harrow.*

from the comparatively slight hold which they take of the ground, makes but a very gentle and easy load for the horses. Yet the irregularities of their motion, the starts and bounds which they

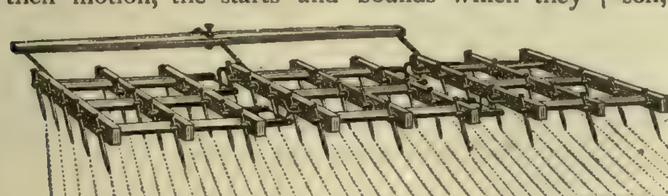


FIG. 6.—*Barley's Smoothing Harrow.*

make upon obstructions, and their alternations of skimming lightly when free from accumulations of weeds and rubbish, and of lumbering heavily when incumbered with these accumulations, sometimes occasions considerable labor. And, too, the mere sinking of the horses' feet in the soft and pulverulent soil, is frequently so laborious as to render it easier for a colt or pony to do the work than an ordinary farm horse.

The "Acme" pulverizing harrow is a superior clod crusher and leveler, having adjustable apparatus for these purposes. The leveling bar is provided, on its rear edge, with a series of steel coulters, and to the rear of this is another bar with the same kind of teeth. These teeth lift, cut and turn the soil. They are beveled and ground on the outside of the curve. The wear is entirely on the inside of the curve (the opposite side of the bevel), and they are therefore in a measure self-sharpening. They can be readily "drawn out" by a blacksmith in a short time, or ground; and if occasionally sharpened in this way they will last a lifetime.

Harvest, the season of reaping field crops. The earliest harvest of the year is that of the forage plants made into hay; the next is that of the cereal grasses, generally in the order of rye, early barley, wheat, early oats, late barley and late oats; the third is corn; then potatoes, turnips, carrots, mangel-wurzel, and other esculent root crops. The succession of the cereal grasses, however, is greatly modified by soil, climate, exposure, altitude, and the varieties of the several grains.

The season for each crop varies in different years, according to the comparative backwardness and forwardness of the season. Sometimes the season for the various crops is so progressive as to allow them to be reaped in regular succession, and sometimes so sudden and headlong as to demand the most prompt and sweeping exertions.

Every farmer ought to anticipate the work of the harvest, and thoroughly prepare for it.

Harvesters: see Reapers.

Hash. Meat minced up, stewed, and seasoned with pepper, and sometimes with onion. Potatoes

and other vegetables are also sometimes mixed with it. To make good hash, put a teacupful and a half of boiling water into a saucepan; take a tablespoonful of flour, mix it with a little cold water; stir it into the warm water and boil it three minutes; add a little salt and pepper and a tablespoonful of butter. Chop the cold meat into a fine hash, removing all the tough and gristly pieces; put it into a tin pan, pour over the gravy and let it heat ten minutes or so, but not cook. The reason that many people have poor hash is that they cook it too much, making it very hard and unpalatable; or they use tough pieces of cold meat, or they put in too much water and make it too vapid, or season it too strongly. If preferred, add equal quantities of chopped boiled potatoes, and if you have the gravy of the meat of yesterday's dinner, you may use that instead of the made gravy, and you will need less butter.

HASH BALLS OF CORNED BEEF. Prepare the hash by mincing with potatoes; make it into flat cakes; heat the griddle, and grease it with plenty of sweet butter; brown the balls first on one side and then on the other, and serve hot.

Hat. The most important feature of a good hat is ventilation, and the more ventilation the better, invariably. The scalp, naturally, needs no artificial covering; and when one does feel the need of it, it is because he has diseased his scalp and made it tender by the use of non-ventilating hats or caps. Silk crowned hats, usually styled "stove-pipe" or "plug," are the most unhealthful of all. The best color, as to health, is a light one, while taste, as formed by custom, generally indicates black, especially for winter wear. High hats appear better on tall men, and low, wide hats on short men. To a man laboring out in the hot sun, a "havelock" is more serviceable than even a hat. This protection is simply a handkerchief, or a piece of muslin the size of a handkerchief, attached by one edge to the back rim of the hat, and permitted to hang down loosely over the upper part of the back, to protect the spine against the excess of heat.

Hatch, to produce from eggs by incubation or by artificial heat. The natural processes are treated in the articles on the respective fowls and on page 391. Hatching by artificial heat is done with an apparatus called an "incubator:" see page 533. The term "hatch" has also the following significations: As many chickens as are produced at once, or by one incubation; a brood; the act of exclusion from the egg; a door with an opening over it; a half door, sometimes set with spikes on the upper edge; a frame or weir in a river for catching fish; a floodgate; a bed-frame.

Hatchel, an instrument formed with long iron teeth set in a board, for cleaning flax or hemp from the tow, hards or coarse part; a kind of large comb. To "hatchel" is to use this instrument.

Haunch (hanch), the hip, or hind part, of an animal.

Havelock (hav'e-lok), a light cloth covering for the head and neck, used by soldiers as a protection from sunstroke. This is a precaution so important that when a field laborer once avails himself of it he will never afterward be contented without it on hot, sunny days. A handkerchief, with one edge fixed underneath the back side of the hat and the rest permitted to hang down over the neck and upper part of the back, is sufficient. White is the best color. Almost all the stupidity and sense of exhaustion and lassitude which a laborer in the field experiences on sultry days, especially for an hour or two after meals, would be prevented by this simple appliance. It is not only unhealthful but even dangerous to expose one's back to the hot sun very long, especially after eating or drinking heartily. The use of the havelock, even in its immediate effects, is far better than whisky, or any other stimulant, to *any* man.

Haw, several species of wild fruit. Of the common red haw there are several species, found in the books under the head of "thorn" and "hawthorn." Red haws flourish throughout the United States,—in wooded sections. The black haw is an edible fruit of the honeysuckle family: the species prevailing in the Northern States is mostly the "sheepberry." The red haws, by cultivation, could be made a fine orchard fruit; but as it belongs to the same order as nearly all our other fruits, the temptation to add it to the already long list is not very great.

Hawk, one of the largest birds of prey in North America, allied to eagles and falcons, buzzards, vultures, condors, etc. Of the hawks proper in this country there are Cooper's, Blue backed and Sharp-shinned; and several species of falcon, buzzard, etc., are also termed "hawks," as the Pigeon hawk, Sparrow hawk, Goshawk, Black, Brown, Red-tailed, Red-tailed Black, Western Red-tailed, Red-shouldered, Red-bellied, Broad-winged, Rough-legged, California, California Squirrel, etc. The night-hawk is not a true hawk, but a bird akin to the whippoorwill. More than any other bird, all parties are agreed upon the total destruction of all species of hawk, as they do mankind nothing but harm, by their slaughter of insect-eating birds as well as of domestic fowls.

Hawk Moth, the large winged insect, like a nummingbird in appearance, the larve of which is the large, green "tomato worm," called also "sphinx moth," etc. See pages 863-4. The moth is not injurious, but its larve is voracious upon tomato and tobacco. However, they are never so numerous as to create alarm.

Hawk-weed, a composite plant, several species of which grow in the East, but very many species in Europe. It is of no consequence in this country.

Hawthorn, several species of small trees of the rose family, as the English hawthorn, Evergreen and Washington thorns, and the so-called "red haws" and the "sugar haw" of the West.

Hay. Timothy, red-top and clover are the principal hay products of this country. These have been fully treated under head of Grass. To prepare good grass land, that is, for timothy and clover, first summer-fallow the ground for one season, destroying all the weeds and wild grasses. In

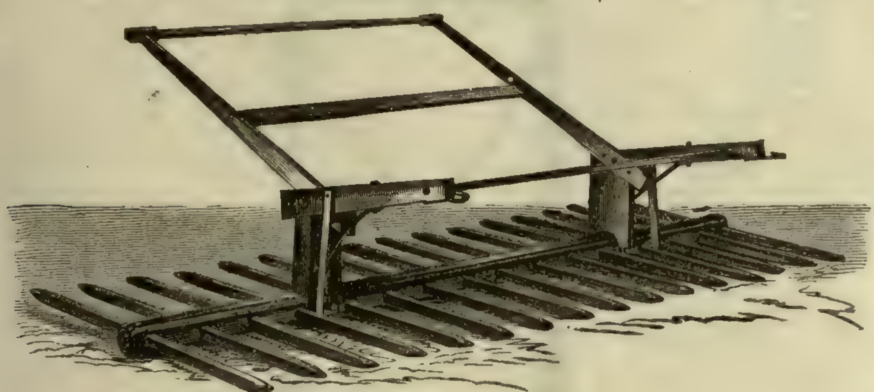


FIG. 1.—*The Tiffin Horse Rake.*

the latter part of the season, spread upon it an abundance of barnyard manure, and a liberal supply of ashes and gypsum; slightly work these in with a cultivator; then, about Sept. 1, sow six quarts of timothy seed to the acre, and in early spring four quarts of clover seed to the acre; the latter should be sown when the ground is honeycombed with frost and before it is settled. If the ground is reasonably fertile, wheat may be sown or drilled in at the same time with the timothy seed. When the ground is well settled in the spring, so that a team can be driven over it without injury, sow the plaster at the rate of 100 lbs. to the acre. This young meadow should not be pastured the first season. The best time for cutting either timothy or clover for hay is just at the beginning of their blooming season, when all the working force of the farm should be concentrated upon making hay until the work is all done. The point of perfection to be aimed at is, to cut in the morning as soon as possible after the dew is off, and quit about ten or eleven o'clock; the air should be dry and warm enough to sufficiently cure the grass by the middle of the afternoon, when it can be called "hay," and hauled to the mow or stack. If the day be cloudy, with this quality of the atmosphere, all the better. If too much of this freshly made hay is not put into a single mass at once, there will be no danger of molding. But this "perfection" of a day's hay-making can scarcely ever be had, and the farmer will have to adapt himself to more or less difficult situations. In the first place, it is important to forecast the weather as correctly as possible; and when, after all his care, a rain threatens to come up, he must protect the mown grass as well as he can. For this purpose he should have "hay caps," of muslin or ducking. Partly cured grass should not lie on the ground over night if it can be avoided; and when one is obliged to so leave it, it should be cocked and covered. The windrow is no protection. He should have a constant care, therefore, not to cut more than he can take care of the same day. Some farmers cut the grass late in the afternoon and in early evening, and the earlier part of next day it cures evenly and well. Dew or rain on freshly cut grass does not injure it so much as after it is partly or wholly dried.

FIG. 2.—*Bullard's Hay Tedder.*

With the modern appliances, as illustrated in the accompanying cuts, hay-making is carried on

with much greater pleasure and profit than it was a few years ago. Unless the crop is very light, the grass should be scattered out and turned over, either with a hand-fork or with a hay-tedder, such as Bullard's Hay Tedder, Fig. 2.

It was at first supposed, when mowers came into use, that in consequence of the grass being left so evenly spread over the ground, it would require nothing more to be done with it. But experience has since shown that it lies so much more compact than when cut with a scythe that only the surface will cure, and the under side remain for several days as green as when cut: and this fact gives rise to the necessity of a machine that would toss and turn it with sufficient rapidity, otherwise the full value of the mower could not be developed.

For hauling hay, a rack must be used on the wagon. Many forms have been devised, but the one shown in the accompanying illustration, Fig. 3, possesses more desirable qualities than any other:

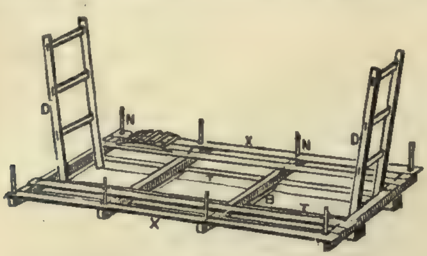


Fig. 3.—*Combination Hay Rack.*

T, *T*, are bed-pieces of pine or other straight-grained light wood, 14 or 16 feet in length, 8 inches wide and 3 inches thick; if of oak or other hard wood, 2½ inches thick will give sufficient strength. Four cross-pieces, *B*, of hard wood, 1¼ inches thick and 6 inches wide, are mortised and firmly secured to the bed-pieces. This constitutes the frame or foundation, and is shown in Fig. 4.

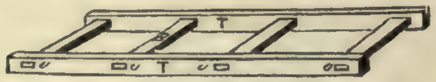


Fig. 4.—*Frame or Bed-Pieces.*

It is frequently used separately, to haul rails, boards, stones, manure, etc., and is a convenient, strong and handy arrangement for the purpose. In Fig. 3 is shown the rigging complete, of which its four cross-pieces or arms, *B*, are 7½ feet in length, 5 inches wide and 2½ inches thick.

If designed for a "sectional rigging," and to prevent side movement, a half-inch groove is cut into the lower sides of the cross-arms, *B*, so that they fit closely upon the bed pieces. To prevent a forward or backward movement, eight strong iron hooks are attached by staples to the sides of the cross-arms, and when placed upon the bed-pieces are readily hooked into the staples. Thus arranged, one man can easily place the rigging upon or take it from the wagon. Or, if desired, bolts may be used to fasten all together, by passing them through the cross-arms and bed-pieces; there is not twenty-five cents difference in the expense.

Fig. 5.—*Position when loaded.*

Fig. 6.—*Position when unloaded.*

Standards, *D*, can be either stationary, or hinged so as to be quickly lowered, raised or removed, by a small bolt, as shown in Fig. 3. The standards should be 6½ feet high, and quite strong, to withstand the pressure of the load, as well as to serve as a ladder. The boards *X* should be of the same length as the bed-pieces, and one inch thick and six inches wide, or straight-grained light wood. Wooden pins or stakes, *N*, are inserted as shown, and should be only slightly sharpened. Should the hind wheels project above the boards *X*, bridge over them. Wash with petroleum, and keep under shelter when not in use.

In loading and unloading hay with a hand-fork it is a great convenience to place on the wagon the forkfuls in some regular order, and take them off at the mow in exactly the reverse order. Both skill and care are required with every load, else there will be trouble or unnecessary lifting and tugging in that most severe of all farm work, unloading hay.

For stacking or mowing away the hay, various horse-forks and hay-carriers are devised. We call attention to the best. Figs. 5 and 6 illustrate the

"harpoon" fork, in the two positions. It has no exposed parts or points to be injured by contact with beams, etc. It penetrates the hay easily and compresses it from top to bottom, thus adapting it especially to the handling of fine, short and brittle hay, unbound barley, etc. From the manner of its hold in the hay, the forkful being wide and comparatively shallow, the hay is separated from the load with less power and is more easily placed in the load than with any other fork.

The "grappling" style of fork (Figs. 7, 8 and 9) are in general use, the Noyes style claiming the advantages of both the harpoon and the ordinary grapple. It is made with either two or four tines, which are so protected that they cannot catch under the beam or girt.

Figs. 7 and 9 represent a hay-carrier called the "Chapman's Railway Hay-Conveyor." The fork (Fig. 7) and the conveyor are both manufactured by Gardner B. Weeks, Syracuse, N. Y.

Porter's Hay Carrier (Fig. 12), made by Bristol & Co., Chicago, Ill., is designed for a wood track.

Figs. 10 and 11, from the U. S. Wind Engine and Pump Co., Batavia, Ill., explain themselves. Carriers can be put up in almost any barn, but the larger the structure the better will it pay to furnish it with a hay-carrier.

The cut, Fig. 13, shows a method of using the fork in stacking by employing stacking irons with ropes, pulleys and grapples.

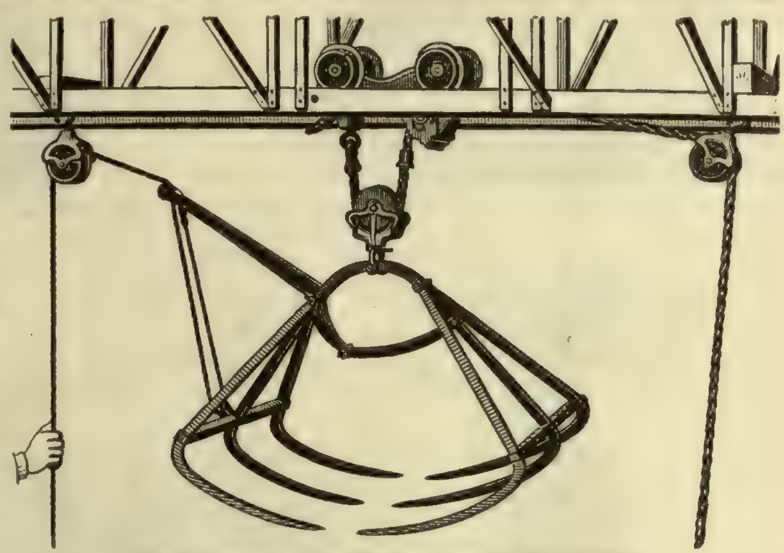


Fig. 7.—*Grappling Hay Fork and Railway Hay Conveyor.*

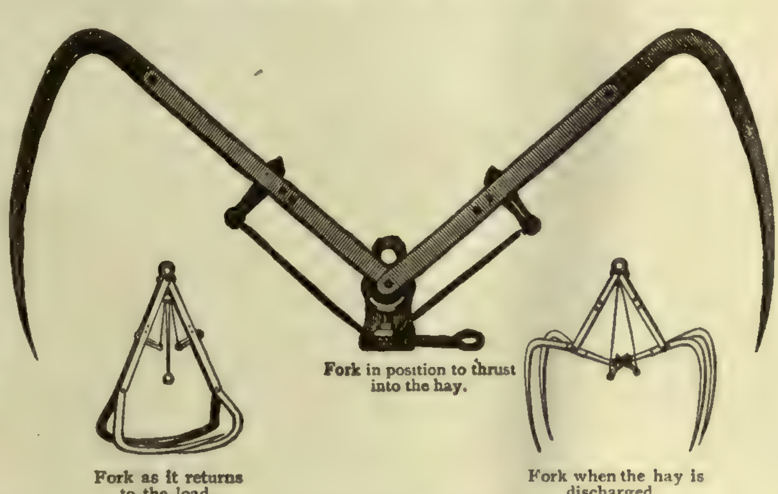


Fig. 8.—*The Noyes Grapple Fork.*

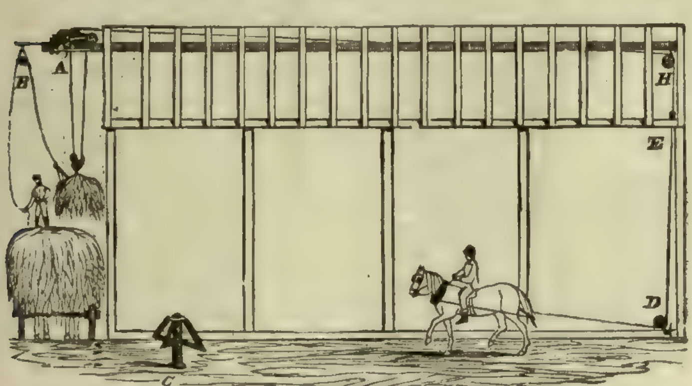


Fig. 9.—*Railway Hay Conveyor.*

The entire cost of the outfit, poles and ropes included, with the attaching grapples, stacking irons and fork, need rarely reach forty dollars, while twice that sum has often been expended on a single derrick only for working a fork. A second method of stacking would be to construct a strong permanent or temporary frame work to which the wooden rails could be attached and the car and fork used same as in barn.

Stacks of hay may be ventilated by making a hole perpendicularly through the center, with apertures through the base and top of the sides, to admit a current of air. This open shaft through the

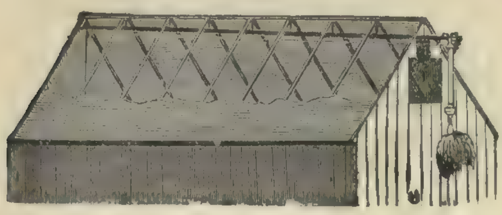


FIG. 10.—*Arrangement of track for taking hay in at one end of barn.*

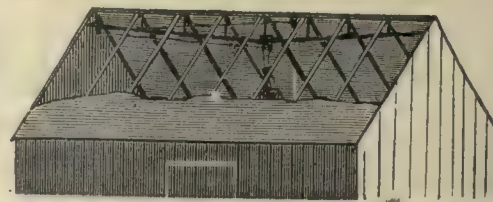


FIG. 11.—*Arrangement of track for taking hay in at center of barn.*

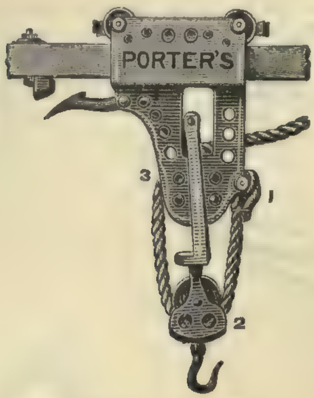


FIG. 12.—*Porter's Hay Carrier.*

FIG. 13.—*Stacking Hay.*

FIG. 14.—*The Neyes Field Pitching Apparatus.*

center of the stack can be easily made by filling a bag of the requisite size with hay or straw, placing it upright in the center of the stack, and drawing it upward as the stack rises. Some farmers set up three poles near each other, fasten them together at the top, and build the stack around them. By either method a chimney will be formed in the center of the stack, which will carry off the vapor and prevent molding. The top of this "chimney" should be protected by a roof to keep out rain.

Protection of hay-stacks by thatching, as practiced in old countries, is too tedious a process for United States economy.

In hauling hay to the main stack, rick or barn, sometimes much labor can be saved in those sections where they are sure to have sleighing during the winter, by building small stacks upon runners and platform in the hay-field, and hauling them in at the most favorable time during the sleighing season. These sleigh foundations may last for years. Indeed, stacks may be made upon them, of one to two tons, covered with caps, and hauled, when there is snow enough, to any part of the farm where they may be needed, or even to a near market.

Fig. 14.—*Sheltering Hay Rick.*

SHELTERING HAY RICK, Fig. 14. A straw or hay rick that can be used as a shelter for cattle, horses, etc., is shown in the annexed engraving. The frame of the stack consists of two square pens with a passage way between them. The passage is covered by a peak roof framed or tied, the rafters being formed of fence rails or thick poles, with their lower ends set a small distance in the ground. The hay is placed in the spaces enclosed by the fences and upon the rafters, and the stack is built up to the ordinary height. Very long stacks can be provided with two passage ways if desired. It is considered advisable to construct the frames of these hay-stacks as permanent structures.

SALTING HAY. As to the use of salt or lime on the hay in the mow or stack, there is a difference of opinion, owing mainly, perhaps, to experiments under varying circumstances. It is well known that both salt and lime absorb moisture and appear wet, thus drying the hay instead of moistening it, as it seems to do; and, furthermore, it is also well known that salt in any substance coaxes stock to eat it more; things unfit to eat will be often swallowed because of the salt in it. On this subject, as well as on the question of the time for cutting hay, there is difference of opinion, some declaring that their cattle fatten better on one, and some on the other, kind of hay. One party or the other must surely attribute the good condition of their stock to the wrong cause. Generally any

given effect is not due to any single cause, but to a combination of causes.

HAY PRESSING OR BALING is comparatively a new feature in most parts of the country, and even in the most flourishing hay sections. Only a few years ago the markets were filled with loose hay, and barges stowed with it in the same condition for transportation. To supply the large cities thus now would be hardly practicable, if possible. It is not difficult now to see the advantage of baling hay preparatory to marketing. Indeed, it has become a necessity to bale hay, for many reasons. For economy in room, cleanliness, neatness, and as a precaution against fire, the advantages of baled hay are well known, and consumers are also beginning to recognize the fact that hay, after baling, loses that dusty, dry and harsh nature, and becomes soft and pliable, more like newly cured hay; hence sweeter and more nutritious, occasioned, we presume, by the dampness the bales appear to absorb from the atmosphere.

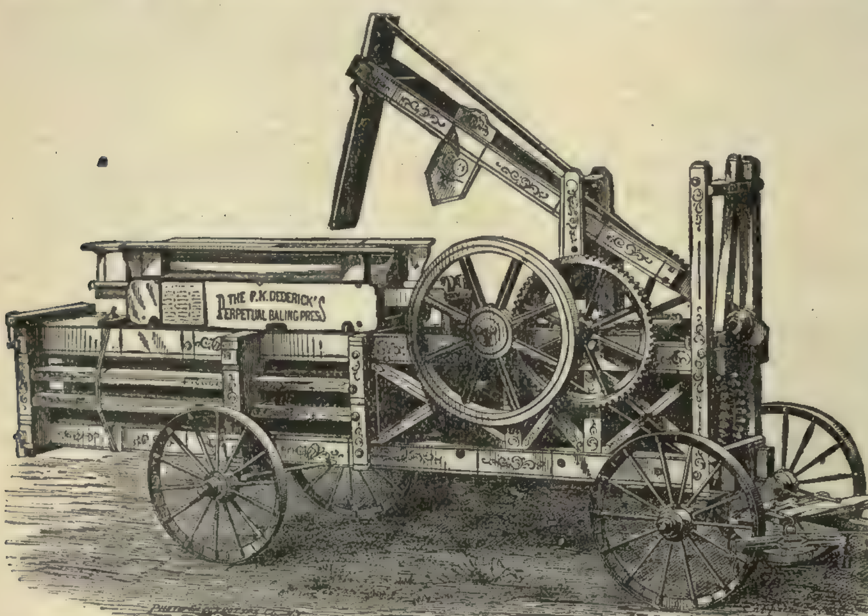


FIG. 1.—*Belt Perpetual Hay Press.*

Economy in the preparation and marketing of crops is of more than ordinary importance, when they are of such loose and bulky nature as to limit its transportation in consequence of excessive freights, which is the case with unbaled hay. Therefore, if the farmers of any location are far distant from market, and subject to heavy freights, it will pay to purchase machines for baling. When this has been decided upon, and the farmer intends to bale his own hay, and perhaps go into the business by baling that of his neighbors, too much care cannot be exercised to have everything convenient, and in securing presses adapted to the work required. Properly conducted, such business is safer and more remunerative than ordinary business investments, and may always be increased to any extent, or closed at pleasure, without the usual loss incurred in closing almost any other business. Making bales alone is not all that is required, but they should be of the proper size and shape to load or stow well, and at the same time so proportioned as to look well,

FIG. 2.—*Railway Hay Press.*

so smoothly and nicely packed as to show the quality to the best advantage—and if hay, the sooner marketed after bailing the better, as the outside of the bales soon become faded and bleached by contact with light and air—also, soon loses the smooth and neat appearance peculiar to newly baled hay, when properly put up. In consequence of all of which, such hay is rated much under its real quality. Indeed, the merchant frequently makes it profitable, and passes rough and faded bales as a much better grade by re-baling. It should always be borne in mind that consumers in

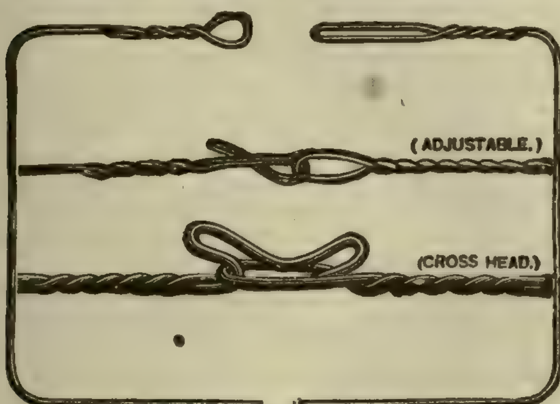


FIG. 3—*Bale Ties.*

most of our large cities are but indifferent judges of the quality of hay, and that their selections are based much upon the appearance of the bales.

We give in this connection illustrations of several styles and sizes of Dederick's hay presses. These are regarded as the best made in the country. They are manufactured by P. K. Dederick & Co., Albany, N. Y. By Fig. 1 we give the Belt Perpetual Press. The Perpetual presses are all continuous in operation, and bale right along without stopping to tie or remove the bale. By Fig. 2 we give the Railway Hay Press in operation. By Fig. 3 we show the style of Dederick's patent dimension and adjustable bale ties, and by Fig. 4 wood-hoop stretchers. These stretches not only prevent expansion, but draw the hoops so nearly even that they are much less liable to break.

FIG. 4.—*Wood-Hoop Stretchers.*

MEASURING HAY. The weight of hay cannot be determined with accuracy by measuring; but some experience or a few trials will enable the owner to ascertain approximately without great deviation. Fine, flexible hay will pack closer than coarse, stiff hay, and that which is cut early will become more solid than dry, stiff, late-cut hay. The degree of dryness when the hay is drawn in, also affects the result. The compactness will, of course, vary with the height of the mow or stack. As a general average, however, under a pressure of ten feet or more, and with a medium degree of the other influences we have mentioned, about 500 cubic feet of timothy will weigh a ton. More strictly, of new-mown hay 675 cubic feet will be required; on an average, 400 to 500 of well settled hay, and 275 of baled hay. To find the cubic feet of hay in a mow is very easy; to find the cubic contents of a circular stack, multiply the square of the circumference by .04 of the height. Six or seven hundred feet, or even more sometimes, are required for clear clover.

TABLE SHOWING THE VALUE, IN DOLLARS AND CENTS, OF HAY BY THE HUNDRED POUNDS, AT GIVEN PRICES PER TON.

PRICE PER TON.	50 lbs.	100 lbs.	200 lbs.	300 lbs.	400 lbs.	500 lbs.	600 lbs.	700 lbs.	800 lbs.	900 lbs.	1,000 lbs.	1,100 lbs.
$ 4.00......	10	20	.40	.60	.80	1.00	1.20	1.40	1.60	1.80	2.00	2.20
5.00......	12	25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75
6.00......	15	30	.60	.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00	3.30
7.00......	17	35	.70	1.05	1.40	1.75	2.10	2.45	2.80	3.15	3.50	3.85
8.00......	20	40	.80	1.20	1.60	2.00	2.40	2.80	3.20	3.60	4.00	4.40
9.00	22	45	.90	1.35	1.80	2.25	2.70	3.15	3.60	4.05	4.50	4.95
10.00......	25	50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50
11.00......	27	55	1.10	1.65	2.20	2.75	3.30	3.85	4.40	4.95	5.50	6.00
12.00.. ...	30	60	1.20	1.80	2.40	3.00	3.60	4.20	4.80	5.40	6.00	6.60
13.00......	32	65	1.30	1.95	2.60	3.25	3.90	4.55	5.20	5.85	6.50	7.15
14.00......	35	70	1.40	2.10	2.80	3.50	4.20	4.90	5.60	6.30	7.00	7.70
15.00......	37	75	1.50	2.25	3.00	3.75	4.50	5.25	6.00	6.75	7.50	8.25

Hay-Cock, a small, conical pile of hay, generally comprising about 100 pounds.

Hay Fever, a catarrh to which certain persons are subject in summer, characterized by sneezing, headache, weeping, snuffling and cough, sometimes attended with fever and general discomfort. In England the cause was formerly said to be the effluvium of hay; but this has proved to be an error. The latest theory is that the cause is the inhalation of the pollen of ragweed. Persons subject to it are generally relieved by going to some cool resort where neither hay-making is carried on nor the ragweed grows. For treatment, see Fever.

Hay Knife, a knife for cutting packed hay, either baled, stacked, or in the mow.

Hay Mow, an apartment in a barn, generally overhead, in which hay is stored.

Hay Press, an apparatus or machine for pressing hay into bales. See page 648.

Hay Rack, an arrangement to contain hay, straw or other fodder for the immediate use of stock.

Hay Rake, an implement for gathering and accumulating hay, in the process of hay-making. See page 643.

Hay Rick, a long stack of hay. See pages 646–7.

Hay Tedder, a machine for spreading and turning hay. See Fig. 2, page 643.

Hazel, a familiar shrub, bearing edible nuts. The English filbert belongs to this genus. The witch hazel belongs to an entirely different order. The engraving gives a magnified view of a weevil, the larva of which is often found in the hazelnut, a wriggling, maggoty worm.

Long-snouted Nut Weevil. (Balaninus nasicus).

Head, the part of the animal body which contains the brain and the higher organs of sense. In many animals, it is connected with the trunk by a neck, and is more or less movable; in some animals, however, it is immovable, and is merely a prolongation of the trunk. The head in animals is more distinct in proportion as the brain is more fully developed as the center of the nervous system. It is entirely wanting in the lowest classes of animals, which, therefore, from the intestinal worms downward, form a third class, in the system of Latreille, under the name of Acephala (headless animals), while those provided with heads are divided into two classes,—the vertebral animals, having distinct and proper heads, and the Cephalidia, having small and less distinctly formed heads. In this part the mouth, as the opening of the œsophagus, is always situated. In the second class of animals, in which the head is less distinct, that part of the body which is provided with the mouth, may be called the head end. In the vertebral animals (mammalia, birds, reptiles and fish), the head has a bony basis (cartilaginous only in the cartilaginous fishes). In fishes the bones of the head are not united with each other, and the formation of the separate bones are various. In cartilaginous fishes the head is more or less oblong and angular; in osseous fishes, it is less flattened, and composed of a considerable number of bones connected in various ways; in all fishes the cavity of the brain is very small and oblong. Equally various is the formation of the head in the different classes of reptiles. In general the head is composed of but few bones, and more rounded in proportion as the brain is well developed. In birds, the bones of the head are more closely formed into one whole, constituting a skull more or less round, which contains the brain, and to the fore part of which the beak is attached. But the head is most perfect in the mammalia, and resembles the human head more nearly, as the animal approaches more nearly to man. In general, the human head may be considered as the standard, which may be traced with gradual deviations through the different classes until it entirely ceases in the lower order of animals. Nowhere is its proper office to serve for the reception of the nervous system so distinct as in the human head, the cavity of the skull containing the principal organ of sensitive life—the brain. The great cavities of the trunk contain—the chest the organs of irritable life (the heart and lungs), and the abdominal cavity—the organs of reproductive life (the organs of digestion and generation). The superiority of the head over the other two parts just mentioned, appears also from the circumstances, that whilst it is pre-eminently the seat of the nervous system, it also contains organs essential for functions of the irritable and reproductive system, as the inspiration and expiration of the air are effected through the nostrils and mouth, and the entrance of food into the abdominal cavity, as well as the preparation of it for digestion, by mastication and production of saliva, is effected by the mouth; and these organs appear more prominent in the heads of animals as their sensitive system sinks lower in the scale. It must not be forgotten that the head also contains the tongue, an organ not only important in respect to nourishment, but also communicating the desires and thoughts, until it becomes in man the organ of oral intercourse, of language and of finest music—singing. The human head, and more or less the head of other animals, is divided into two chief parts, the skull and the face. The importance of the head as the noblest part of the animal system has occasioned it to be used metaphorically in all languages to denote that which is chief.

Headache. The most sensible cure of any headache is to remove the cause, and there are so many causes that we cannot even enumerate them here. Bathing the feet in hot water will relieve more cases than any other one thing. Warm hip-baths and cool head-baths come next in requisition. An emetic is sometimes just the thing, and very often such manipulations and passes as the "magnetic healers" administer are the best. Lying down is the proper relief of that which is caused by a lack of blood circulation in the brain, which is often taken for a "rush of blood" to the head, or a "fullness of blood" in the brain. Taking medicines into the stomach, even "herb teas," is the very last thing to do.

Head-cheese, a dish made of portions of the head and feet of swine, cut up fine and pressed into the form of a cheese. After thorough boiling, take the flesh and skin clean from the bones, and mince it up with salt, pepper and vinegar, and when cold, press it as solidly as convenient. Keep in a cool place.

Header, a reaper that cuts the heads only, leaving most of the stalk standing.

Head-gear, covering or ornament of the head.

Heading, material for the heads of casks or barrels.

Head-land, the strip or border of unplowed land left at the ends of the furrows.

Head-louse. See Insect.

Head-stall, that portion of the bridle or halter which encompasses the head.

Health: See Hygiene.

Heaps, to measure. If the bottom of the heap be square or rectangular, multiply the length by the breadth, and the product by one-third the height. If the bottom be circular, multiply the square of the

diameter by .7854, and the product by one-third the height. For ordinary purposes .7854 may be considered ¾. Hence, to estimate the heaped bushels in a round heap, square the diameter, in feet, divide by 6 and multiply by the height.

Hearing, the perception of sounds. The hearing of the horse is so acute as to receive vivid impressions from vibrations of the air too slight and faint to be possibly detected by the keenest human ear. The hunting horse, for example, hears the cry of the hounds, and erects his ears, and becomes excited and impatient a considerable time before his rider detects even the faintest sound. The fine condition of this sense in so useful an animal, like the keenness of smelling in the dog, and the peculiar development of the senses altogether in the species of animals which subject themselves to domestication, is a very palpable evidence of the bounty of the Creator to man.

Heart, Palpitation of the. This affection is a very strong pulsation of the heart, sometimes only occasional, but often continual. It arises from morbid irritability of the heart; it is often purely nervous, caused, in some cases, by the disordered state of the stomach and bowels, by alcoholic drinks, by excessive venery, by extreme grief, and disappointments preying upon the spirits, all tending to weaken the nervous system. It is sometimes a symptom of other diseases, as indigestion, hysteria. The beating is frequently so violent as to be heard at a considerable distance, and sometimes the tremor of the increased action of the heart may be seen on the outside of the clothes. The pulse at the same time is very irregular, and often intermittent. Palpitation of the heart is not to be neglected, as it may lead to serious consequences. The treatment of this disease is much similar to that for indigestion. The treatment must depend on the state of the body; for palpitation may be the effect of increased vitality, or fullness, or of debility and relaxation, etc. If the system be in a plethoric state (fullness) aperients and a spare diet must be enjoined. Avoid all stimulants. When it arises from disease of the heart, or of the large vessels, then avoid plethora, much bodily exertion, full meals, and excesses of every kind. After the cessation of palpitation, take tonics, sponge the breast with tepid or cold water, and gentle exercise in the open air.

Heartburn, a burning indigestion, caused by eating food too highly seasoned with pepper, vinegar, or other strong condiments, or too severe labor after a full meal. A dose of magnesia or carbonate of soda generally gives immediate relief, and afterward the causes here indicated should of course be abstained from.

Hearth (harth), the pavement or floor of brick or stone in a chimney, on which a fire is made; the floor of a fire-place, and from which is a passage for smoke to ascend. Figuratively, the house itself, as the abode of comfort to its inmates and of hospitality to strangers.

Heart's-ease, pansy.

Heart-wood, the central, old, and colored wood of trees; it is the most durable.

Heat. Heat is recognized as a principle rather by its effects than by any knowledge we possess of its essential nature. Every one experiences the presence or absence of it in the sensations of warmth and of cold; and we all witness the changes produced by it on other bodies, in causing them to expand or to melt; and likewise in the process of combustion. But if we inquire, What is this heat, the effects of which are so evident? the answer is not so easy.

By some, heat has been considered as an extremely subtile fluid, capable of insinuating itself between the particles of all bodies; of remaining there in a dormant and inactive state, or of being put in motion or activity, by which only it is rendered sensible. This supposed fluid has been named *caloric.*

By others, the existence of any such peculiar fluid is denied, and heat is said to consist merely in a rapid motion of the solid particles of bodies that are heated. The prevailing theory among modern scientists is that heat depends upon the rapid vibrations or waves of an inconceivably subtile fluid, or ether, which fills all space, and is quite independent of the ordinary matter appreciable by our senses.

Most substances are capable of being melted and vaporized by the application of heat; and most probably all would be so were we able to excite a sufficient degree of heat. By abstracting the heat, we again reduce all vapors to their fluid state, and fluids to that of solids. Pressure aids in condensation; and the gases are reduced to liquids by the application of intense pressure and the abstraction of heat at the same time. It is only when the temperature is raised to a certain degree that solids begin to melt, or fluids to be vaporized, and this degree is different for every different substance, but is always precisely the same for the same substance, provided all other circumstances are similar. Thus ice always melts when heated above 32°, as water always freezes when cooled below 32°; and water is always converted into vapor when its temperature is raised to 212°, provided the pressure of the atmosphere is the same. Wax has another degree at which it is melted, lead another, silver another, and gold another. The degree of heat at which spirits boil, or begin to be converted into vapor, which is the same thing, is lower than the boiling point of water, and that at which ether boils is a great deal lower still.

The point at which salt water freezes is lower than the freezing point of fresh water, and in the act of congelation its salt is deposited, and the ice is separated and melted and affords fresh water. Some of our navigators have observed this fact with great joy, and obtained a supply of fresh water where they but little expected to meet with it. The mountains of ice met with at sea in the polar regions are wholly of fresh water, and pools and basins of fresh water are often found on them from the partial melting of the ice. Although all these substances have their fixed points

at which they boil under similar circumstances, yet the pressure of the atmosphere has a very considerable influence in determining the point. The greater the pressure the greater the degree of heat requisite for making the liquor boil; and the more we can diminish the pressure of the atmosphere, as is done by the air-pump, the less is the degree of heat that is required to convert it into vapor. In this way ether, spirits, and even water are made to boil at the usual temperature of the air, when the pressure of the atmosphere is removed by means of the air-pump. So much is the boiling facilitated by this means that philosophers have gone so far as to assert that, if all pressure was removed from the earth, every substance, solid as well as liquid, would immediately be volatilized, or converted into vapor. Water, upon an average, is found to boil at 212°, and this is generally considered its boiling point; but in this country there is a considerable difference at different times in the weight of the atmosphere. In the barometer, which is the instrument for measuring this pressure, the height of the mercury varies as much as three inches, and a rise of one inch makes the water require two degrees more of heat to boil it. There is, therefore, in this country a variation of six degrees of heat in the temperature of boiling water at different times. When the barometer is at the lowest, water will boil at 209°; and when it is at the highest, it will not boil till it is heated to 215°. The more elevated the situation, the less is the pressure of the air, and consequently water will boil with less heat on the top of a mountain than in the valley. An amusing experiment, easy to be performed, shows this effect of pressure on the boiling water as well as any experiments with the air-pump. Half fill a Florence flask or other glass vessel with boiling water, and cork it tightly. The water is now at rest; but pour a little cold water on the upper part of the flask, and it will begin to boil; then pour hot water upon it, and it will cease; pour the cold water again, and it will boil, and so on for a considerable time. The explanation of the experiment is this. When you cork the flask the upper part of it is filled with vapor from the boiling water, and the cold water poured upon this part condenses the vapor. Now, as the air cannot get in, there is a partial vacuum—that is, the pressure of air on the surface of the water is considerably diminished. This being the case, the water will boil at a lower temperature, and the heat which it retains is sufficient for the purpose. In the next place, by pouring hot water upon it, that within is partly converted into vapor, which affords the same pressure as the air would do; the water, therefore, ceases to boil because its heat is insufficient under that pressure to make it boil. It has been said that by increasing the pressure on the surface of the water you retard its boiling. It is on this principle that what are called *digesters* are formed. When ice is melted it absorbs heat from all surrounding bodies, which heat has not the effect of increasing its temperature, but becomes latent. The water is not hotter to the feeling or to the thermometer than the ice was before it was melted, but it has absorbed and contains more heat. The same happens when a fluid is converted into vapor, and the same quantity of heat that is thus absorbed is again extricated when the vapor is condensed into a fluid, or the fluid frozen into a solid. The application of this fact assists us in explaining a variety of phenomena that, without the knowledge of it, would be inexplicable. Put a vessel of snow or of ice before a fire, and although it is all the time receiving heat from the fire, a thermometer immersed in it shows no increase of temperature; all the heat that is received being necessary to convert the snow into water; but as soon as it is all melted the thermometer begins to rise. Were it not for this circumstance, all the snow and ice would be instantly melted when the temperature of the air is above 32°, the consequence of which would be dreadful inundations after every winter. So much heat is absorbed when a solid becomes a fluid, that if we can suddenly effect the conversion we produce a great degree of cold; and on this depends the effects of freezing mixtures. When snow and salt mixed are melted in a warm room, so much heat is absorbed by them that a vessel of water immersed in the mixture becomes frozen notwithstanding the warmth of the room. In this way confectioners prepare different kinds of ices in the summer. Various mixtures of salts, when dissolved in water, produce the same effect without the addition of ice. Eleven parts of sal ammoniac, ten of saltpeter, and sixteen of Glauber's salt, mixed with thirty-two parts of water, will produce cold sufficient to freeze water. By dissolving chloride of lime in nitrous acid even mercury may be frozen. The heat that is given out when water is frozen tends to moderate the intensity of our winters, and accounts for the increase of warmth that is frequently observable after a fall of snow. When ether, spirits, or water are exposed to the air they are gradually evaporated, and in this process absorb heat as well as when they are made to boil, and are thus vaporized. To prove this, dip the bulb of a thermometer in ether and expose it to the air, and you will find the mercury fall considerably; or dip your hand into the same liquor, or into spirits, or even water, and then expose it to the air, and you will feel a degree of intense cold, in consequence of its absorbing heat from your hand to convert it into vapor. In warm climates the inhabitants cool water and other liquors for drinking by wrapping the vessels in wet flannels and suspending them in the air; or by keeping the water in porous earthen vessels, through which a part, gradually oozing, is evaporated, and cools the rest. It is this evaporation that makes a person feel so cold when his clothes are wet, although he is perhaps sitting near the fire; and it is the cold thus produced that injures the health much more than being exposed to a cold, sharp air. It is the absorption of heat by the vapor that prevents water from acquiring a greater degree of heat than 212°. If you boil water ever so violently or apply to it ever so intense a heat, it never increases in temperature, the heat that you communicate all going to the conversion of it into vapor. In cooking,

therefore, it is useless to apply additional heat to water that is boiling, to make it, as many call it, boil fast. If you keep the water just boiling, that is quite sufficient; and in many cases, indeed, articles will be as well done, and as soon done, by a heat considerably less than that of boiling. Having observed that vapors contain more heat than fluids, and fluids than solids, when their temperature is the same, we must now add, that among fluids, among solids, or among vapors, one kind contains more heat than another. Thus a pound of water contains more heat than a pound of mercury, and a pound of iron more than a pound of tin, and a cubic foot of common air more than the same quantity of inflammable air.

TABLE, SHOWING THE EFFECTS OF HEAT UPON CERTAIN BODIES.

Designation.	Fahrenheit.	Designation.	Fahrenheit.
Gold melts	1983°	Tin melts	421°
Silver "	1850°	Water boils	212°
Copper "	2160°	Alcohol "	175°
Brass "	1900°	Ether	93°
Iron, red hot in daylight	1077°	Heat of human blood	98°
" " twilight	884°	Water freezes	32°
Common fire	790°	Strong wine freezes	20°
Zinc melts	740°	Brandy "	7°
Quicksilver boils	630°	Mercury "	—39°
Linseed Oil "	600°	Greatest cold ever produced	—220°
Lead melts	594°	Snow and salt, equal parts	0°
Bismuth melts	476°	Acetous fermentation begins	78°
Tin and Bismuth, equal parts, melts	283°	" " ends	88°
		Phosphorus burns	68°

Heat, as a health agency: see Hygiene.

Heating Power. The following figures show the comparative heating power of substances of equal weight: Peat, 32; oak wood, seasoned, 46; oak dried on a stove, 59; pine, seasoned, 54; anthracite, 95; alcohol, 110; olive oil, 145; tallow, 150. Twelve pounds of fresh water water have been evaporated in tubes with one pound of anthracite.

Heaves, a disease of horses, characterized by difficult and laborious breathing.

Hectic, affected with hectic fever. The latter is characterized by a circumscribed flush of the cheek, debility and emaciation. It generally accompanies the advanced stage of an exhausting disease, as consumption. There is no remedy for it, except in the cure of the principal disease, of which it is symptomatic; and this is hardly ever possible.

Hedge, a fence of living plants. It serves the purpose of separation, shelter, or defense, and consists of plants which grow densely and ramify from the ground upward, and interweave their branches, and readily grow in a line from seeds or plants and admit of being cut and pruned into the form and compactness of a wall, to any width and height which the purposes of shelter and defense require. In most parts of the United States there is not stone enough convenient for building fences, and if barbed wire should fail on some account, the hedge will yet be the fence of the future,—that of Osage orange (Maclura) in most parts of the Union, and honey locust in the extreme North. It is a well-known fact that a large majority of those who have purchased hedge plants have failed in growing live fences. Some have failed from ignorance, not having been furnished with proper instructions, while some have failed from mere negligence, not having carried out the instructions furnished. Farmers, who are such practically, and who live on their farms, can grow their own hedge much cheaper than hedge companies, who have to travel from farm to farm. But if you prefer to have your hedge grown by others, be very careful with whom you contract, as some of those self-styled hedge companies have no practical knowledge of hedge-growing; neither are they responsible, as many who have been "taken in" can testify. A perfect stand the first season is the important point. This obtained, you will have but few difficulties to contend with, unless you live among gophers.

In starting from the seeds, soak them thoroughly in water, then plant them where it will be convenient to keep them thoroughly watered, in rich soil, an inch apart and covered one and a half to two inches. But with inexperienced hands there is so much risk in raising from the seed that it is best to purchase the plants in the fall of some honest nurseryman.

To Keep Plants over Winter, select a dry and rolling piece of ground. Open a trench, spade deep, and 10 or 12 feet long. Put in a layer of plants, 2 or 3 inches thick, and at an angle of about 50°. Cover by taking a spade of dirt from the front, and at the same time opening a trench for the next layer, and pressing the dirt firmly upon each layer with your foot. Repeat the operation until all the plants are trenched in. Next, dig a trench around the bed, about 3 feet from it, throwing the dirt on the bed, covering 1 foot above the top of the plants, and extending 2 feet beyond them. Let it remain till the ground has frozen from 4 to 6 inches deep, and then cover 2 feet with straw, and weigh it down with frozen crusts of earth, sufficient to hold it to its place. Should you use fresh manure from the stable instead of straw, it will not require to be so thick, the object being to keep the plants as near the freezing point as possible, without letting them freeze. Be sure that the covering extends at least 2 feet beyond the border of the plants. Plants may be kept in a cellar, packed down in moist but not wet dirt or sand.

When plants are received in the spring, they should be immediately trenched out, just as you trench in the fall, omitting, however, the additional covering.

Cultivation. The hedge-row should be plowed out the fall before the hedge is to be set, and finished with a deep "dead-furrow" on the line where the plants are to be set. In the spring, before setting, "back-furrow," slightly ridging the ground where the plants are to stand, and pass the harrow over it two or three times. On wet or sprouty ground do not open a furrow on the line in the fall plowing, but "back-furrow" each time the ground is plowed, thereby ridging up the bed where the plants are to stand. Plants set on low, wet ground are liable to be heaved out by the first winter frost. In dry ground the plants may be set out in the fall.

As soon as the cold weather is over, remove the straw from the beds. When the frost is out of the ground, and before the buds begin to swell, the dirt should be thrown off, and the plants taken out and carefully assorted into two or three classes according to size, all doubtful plants being thrown to one side. The plants should average 10 inches in length, 8 of this to be the yellow part, or root. As they are assorted they should be trenched in, each lot by itself, leaving 2 or 3 inches of the tops exposed to the sun, in which condition they may remain till they are wanted for planting. Should the plants at any time become partially dried, they can be revived by soaking in water or being buried so that each plant shall come in contact with the moist earth.

The best time to set the hedge is when the buds have started; though, if the season is favorable, it will do as late as the 15th or 20th of June. The buds may be kept back for late planting by leaving the winter covering on the beds until near the time the plants are wanted for the hedge-row. Hedge set early can be re-set the same season by reserving a few of the best plants until a seasonable time in June, when those that have failed to grow can be replaced by such as you know to be good.

Though a good hedge may be grown by using any number of plants from 16 to 50 per rod, a long series of experiments in hedging, in which the plants have been set from 4 to 16 inches apart, demonstrates that about 8 inches apart, or 25 plants to the rod, is the desired distance at which to set them in order to secure the most reliable fence. Some recommend from 12,000 to 16,000 plants per mile.

An even, perfect stand and uniformity of growth, in a beautiful straight line, are the things most essential to success. When the plants are taken to the field they should be distributed first along the line about 100 in a place, and heeled in until wanted, and never left exposed to the sun or frost. Procure a strong cord from 10 to 15 rods long, marked plainly with red yarn, 8 inches, or the distance you want your plants apart. There are two methods of setting. One is, to set with the hedge-spade (the blade of which is longer and narrower than the common spade), which you thrust in to its full length, slanting. You then raise the handle slightly, letting a boy push the plant down at least 3 inches deeper than it stood in the nursery, tramping the dirt firmly to the plant with your foot. If the ground is wet, omit the tramping, as it will cause the ground to bake. The other method of setting is that known as "setting in the furrow." In either mode the line should be carefully staked, but twice the number of stakes are required in the latter. In opening the furrow, use a good strong team and good plow, in the hands of an experienced plowman. Any slight crook may be straightened with the spade. After the furrow is opened and line stretched, take a bundle of assorted plants, and placing them against the "land" side, fill in a little dirt with a hoe, pressing it to the roots, and when the plants are all in, fill up the furrow with a plow. But be very careful not to disturb the plants with the singletree, nor allow the horse to misplace them with his feet. The roots of a sound, healthy plant, when cut, present a bright, white appearance; those of a yellow, dingy cast between the bark and wood, should be rejected as doubtful. A good heavy coat of mulching, applied immediately after the plants are set, will be of great advantage in keeping back the weeds, preventing injury by drouth and furnishing protection to the hedge the first winter.

If you fail in getting a perfect stand the first season, procure enough extra strong plants the second season, and fill up all gaps as soon as the buds begin to swell. Re-setting after the second season is of little use.

If well mulched, the hedge will require but little further attention the first year; otherwise it should be kept clean and free from all weeds and grass, and covered up with a furrow from each side before the ground freezes, a two-horse plow being used. In the spring uncover, and cultivate as you would a row of corn, which cultivation should be repeated every season until the hedge is five or six years old. Manure should be used in all places in the hedge-row where the soil is too thin to give a good yield of corn under good treatment.

The treatment for the second year is simply to cut off in the spring all above one or two buds on each branch, and to leave all level on top to the height of some two or three feet. The trimming is done by using hedge shears. The treatment for the second year is the same in cultivation. No weeds or grass sods are allowed to interfere, in order to have the growth of all the trees alike. The reason that it is necessary to leave a bud at starting of the growth for the second year, is that the small tree wants leaves wherewith to draw support from the atmosphere. Each of these buds will throw out a lateral or limb.

In the spring of the third year treatment is similar. Clean culture is strictly observed. No trimming is needed this year.

In the spring of the fourth year some of the limbs are six to eight feet high. With the use of the hedge shears cut them back. For the fourth year's growth, in August, as soon as some of the limbs are eight to ten feet high, too high to reach with the shears, use a hedge knife. The handle is some three feet long, the blade a foot or more long and two to two and a half inches wide, tapering to a point at the end. The edge is curved a little to prevent the limbs from moving away from the operator on being struck. At this trimming we only cut away limbs of the most rampant growth and crooked snarls.

In the spring of the fifth year's growth we find it as in Fig. 1, trimmed to Fig. 2. From this (Fig. 2) we start for the fifth year. By this time our trees are six or seven feet high, and from one to two inches in diameter at the ground. In August of the fifth year we head in by taking off all side limbs up to six or seven feet high, when the hedge will resemble Fig. 3.

We now have a row of trees resembling a row of

cornstalks stripped of leaves with the tassels all complete. During the next spring after the four years' growth, with trees two to three inches in diameter, we are prepared to commence and to convert it into a hedge. With heavy buckskin mittens and with a

FIG. 1. FIG. 2. FIG 3.

sharp hatchet commence at one end of the row by hacking a tree half off or more, close to the ground, and bending it over in a straight line with the row, so that the top will be about three feet from the ground. As fast as the work is done, stakes are driven into the ground in the hedge row, from four to five feet apart; and as the trees are bent over they are braided alternately on each side of the stakes. In this way every tree is directly over the others. After all is laid and carefully woven, and each at a uniform distance apart, the few straggling top limbs are cut away. As these small stakes are unsightly to some, every fifth or sixth tree is allowed to stand to braid by, and keep the hedge true in place. This cut off on a level with the top of the hedge row. In this way the standing stump grows very vigorously. Of the two modes many prefer the stump way, as it adds more to the beauty of the hedge, and is more firm than a stake. Where stakes are used they can be taken out after the first year, as the new limbs are very compact, and as they grow they lap by and grow up between the bodies, somewhat resembling a willow basket. It is not uncommon to count fifty limbs sprouting out of a single tree

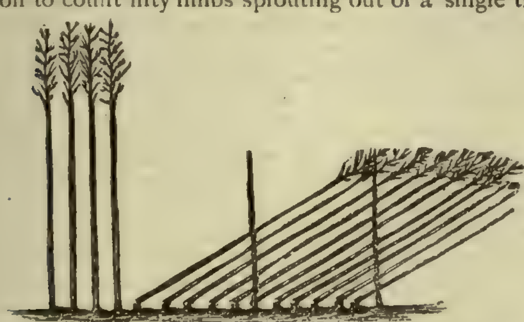


FIG. 4.—*Laying the Trees.*

the first year after being lopped. No trimming is needed after the first year, but clean culture is important. Each year after the first lopping cut back within about six inches of the previous year's growth. After carefully lopping and properly weaving every tree, we have a hedge that is a beauty, and when in leaf, skirting our fields, doubly so.

Fig. 4 sufficiently represents the hedge after being lopped and made ready for the sixth year's growth. Fig. 5 is in the fall of the sixth year's growth.

From each stub near the ground several sprouts will come up. They too will, as they grow, weave in between the slanting tree bodies. As the roots of the Osage naturally grow deep in the ground, care must be taken to have the hedge row well underdrained on land that is inclined to be wet. No outside sprouts away from the base of the tree, from the roots, ever appear, as some have erroneously supposed. When the hedge is built as described above, it occupies no more land for a few years than a common post and board fence. In August or the first of September of each year, shear the sides and keep the top level.

With a little care a hedge can be grown close to a gate post. Hedges made in this way have no gaps, and are found a perfect barrier to all domestic animals.

COST OF HEDGE. The cost of growing an Osage hedge to five years, when ready to plash, is shown by the following figures:

The cost of preparing the ground is very little where

Fig. 5.—*The Finished Hedge.*

there are no stones to hinder the plowing. If there are they must all be taken away, at least where the line is drawn, by the side of which the plants are placed at the time of setting out. Where there are no stones to be disposed of and a stubble ground is used, one plowing, by turning to the left and leaving the last furrow exactly on the desired line, will be sufficient; and the furrow should be a foot deep or thereabouts, as a deep, mellow bed is needed for the young plants. This work can be done in the spring; if delayed till the fall, which is a better time for the first plowing, the frost pulverizes and makes the ground mellow. Just before setting the plants in the spring, commence to plow by throwing the furrows back by turning to the right. Passing twice may be needed to form a slight ridge. Twelve feet is wide enough for the ridge, which should be finely harrowed. If a strip is desired, now occupied by sod, fall plowing is the best, as the sod will fairly rot if stirred up early in the spring, in time to set the hedge row. We think that 160 rods of ground, free from stones, can be put in the best order by one man and his team in one day's work—all told, say $3. One day's work with the hoe in cleaning and straightening the furrow made by the shovel plow, ready to draw the line for setting the plants, $1.50. Total first year, 160 rods, $4.50.

Second Year—Cost of Plants and Setting. Usually nurserymen buy the seeds of seed dealers, who in

the West buy largely from Texas, the home of the Osage. There the oranges are gathered from the native trees, rotted and the seeds washed out from the pomace, dried and made ready for the market. The drills are prepared to receive the seeds as a gardener drills for raising peas. The rows are two feet apart, so as to be cultivated with a horse-hoe or cultivator geared for the purpose. The growth of the first year varies from two to three feet high. After the leaves are off in the fall, with a scythe or shears cut off within about four or five inches of the ground, as a nurseryman does his seedling apple roots for grafting. Assort and tie into bundles of one hundred each, and bury in pits to keep moist during the winter, or in boxes of soil placed in cellars. In the spring these are sold to customers. During the last fifteen years or more the price has varied from $2 to $3 per 1,000. After the ground is made ready in the spring, and the plants assorted so as to have equal size and equal vitality, a man with a boy to place the plants at the side of the line, as previously described, can put in a row of one-half mile (160 rods), and do it well in one day. Sixteen plants to the rod, 160 rods, is 2,560 plants, costing, at $3.00 per 1,000, $7.68; labor for man and boy, $2.25; total cost for the second year, $9.93.

Cost of Cultivation each Year for Five Years. A little more cultivation than for a row of corn is required, as the space is six feet each side of the hedge row. Cultivating and hoeing twice during the season will be—two days' work with a man and his hoe, one with horse and cultivator, $4.

Cost of Trimming. This is stated in the table in the next column.

Cutting Back, Staking and Plashing. If the stems and trunks have been kept free from limbs, as previously described, two men being employed to bend the tree, the other using the hatchet, or a light, thin-bladed, sharp axe, they will plash or properly weave in between the stakes, or where one tree in five is allowed io remain uncut at the ground to use as a stake, 40 rods in a day, at $3.00—four days for 160 rods, $12.00.

Eighth Year. After the hedge has finished increasing in height, etc., it is kept in form by side and top trimming for many years. We know of many that are ten years after plashing, fifteen years in all, that remain perfect barriers. As yet we have seen none requiring a second plashing. Two careful trimmings a year will keep all right.

Fifteen or 20 years ago this mode of plashing was introduced, and now all our best hedges are of this pattern. A good cattle fence can be made without plashing, and do very well. But in the old way more or less of the plants, or trees even, will be harmed. The weaker are overcrowded and die out, leaving open places, soon made larger by the passage of cattle and hogs. By the plashing system the hog is mastered, for once at least. At the time of plashing the trees may be eight or ten feet high even, and will better weave in between the stakes.

Recapitulation. Total cost for 160 rods for first five years, including plashing and weaving for the sixth year's growth:

Tilling the ground for planting in perfect order						$ 3.00
One day's work in cleaning out and straightening furrow						1.50
Cost of plants and setting them out						9.25
Cultivating five years, $4 each year						20.00
Trimming the second year, 160 rods, two days' work						3.00
do.	third	do.	do.	three	do.	4.50
do.	fourth	do.	do.	four	do.	6.00
do.	fifth	do.	do.	five	do.	7.50
Cutting back, starting and plashing						12.00
						$66.85

It must be understood that all this work has been done in its proper season. If not done then, as in most other things, more work is needed to repair delays.

It must be remembered this hedge should be protected on one side by a wooden fence (not a stone wall, as that would shade it too much), and neither cattle nor hogs allowed to pass over it by getting between the hedge and wood fence while growing, ready to plash. After plashing they may try it at their pleasure, if pleasure it be.

Ever after the completion of the hedge, it should be trimmed every summer and fall.

HONEY-LOCUST HEDGE. To make a good hedge of the honey locust, it is essential, in the first place, to procure plants with good roots, and if these vary in size they should be assorted, placing those of equal size together, so that the line may be even, and not with large and small plants mixed together. Secondly, the ground must be well prepared, giving a deep and mellow soil. With care in setting out there need not be any gaps, and the trees will be uniform in size. Thirdly, the soil, for some feet on each side, must for some years be kept clean and well cultivated, and not allowed to grow up with weeds and grass. The hedge should be as well treated as a row of potatoes or corn, of which no farmer would expect to yield a crop in a grass sod. Fourthly, the young trees must be cut back sufficiently to give a broad, dense mass of horizontal shoots at the bottom. This cutting should be done early in the spring, and at no other time. If deferred till the buds have swollen, or the leaves have opened, a severe if not fatal check will be given to the hedge.

It is usually best to allow the hedge plants to grow a year or two, to become well established before cutting back, then to cut down in the first place to within three inches of the ground; this will cause numerous shoots below the cut. The second year the cuts should not be more than three or four inches higher; the third about six inches, and so on, increasing the height each successive year until the hedge has reached the desired height. It will require several years to make a good hedge. Many prefer to make longer cuts, or about a foot each year, so as to have a hedge in half the time we have indicated, and in doing so they never get one deserving the name, but merely the skeleton or shadow.

The importance of cutting back in spring before the buds swell, will be well understood by any one who will leave a small portion of his hedge until the

leaves have opened. The result will be that the growth, instead of being strong and vigorous, will be feeble and thin, with only a few small shoots.

Evergreen Hedges are much admired on account of keeping green through the entire year. Perfect barriers may be made of them by enclosing barbed wires along their whole length. These wires are placed in position by stretching along the line on light, temporary posts, in successive years, so that the growth of the hedge may enclose them and hold them among its numerous branches where they cannot become displaced. When the plants are about 20 inches high, stretch the first wire, just resting on their tips or upper forks. The hedge soon grows and encloses it. Additional wires, as may be needed, are placed in position in successive years. Two wires will be quite enough in most cases. One alone would exclude nearly all intruders. Three might be needed for inclosing fruit gardens. These wires, when once covered, cannot be bent or thrust aside; they are stiffly held by innumerable branches. Such a fence has not the objection of being invisible to animals. Norway spruce is the strongest-growing evergreen; hemlock and arbor vitæ may be made efficient by the enclosed barbs. Among deciduous plants the buckthorn would doubtless prove the best, as it is easily raised from seed, is transplanted with great facility, is perfectly hardy, has a natural hedginess, and, except on rich ground, has a very moderate growth. The wire used for these purposes should be galvanized, and not painted, as it is to remain many years.

In starting an evergreen hedge, the young plants of Norway spruce are placed about two feet apart. The distances might be greater if longer time could be allowed for the branches to meet and fill the spaces between. If placed two feet apart, and the line of the hedge is kept properly cultivated, the spaces would be well filled in three or four years; if three feet apart, five or six years might be required. It may not be necessary to cut back evergreens like deciduous plants, but if the Norways, after they are fairly started, are pinched back early in summer, so that no side shoots shall be over six inches long, and no leaders more than a foot, the hedge will be more compact and beautiful.

A hedge should never be sheared, so as to form a smooth wall of verdure. It should be cut back by taking off every longer shoot at a fork, leaving no stump. This work may be performed rapidly after some practice, either with a knife or with shears. When the exterior is smoothly sheared, a close, dense stratum of foliage is formed, shutting out the light from the interior, which in a few years becomes a mass of bare branches. Such a hedge, usually left broad at the top, causes the lower branches gradually to die, and the whole hedge perishes sooner than if properly pruned. If simply cut back with a knife or with shears, leaving an irregular surface, the interior foliage will be fresh and dense for a long time, and the hedge itself will live longer. Norway spruce trees, if planted eight feet apart, will meet and form a continuous screen in eight or ten years. These will answer well for some of the subdivisions of the farm, and for the windward boundaries of barnyards.

The cost of evergreen hedges and of screens may be readily ascertained by procuring from nurserymen their wholesale prices and calculating the length of line reached by a thousand. If two and a half feet apart, a thousand will extend about half a mile. The prices vary much in different seasons, and with different dealers, according to the supply or surplus on hand. In some years, when nurseries were overstocked, trees a foot and a half high could be purchased for $30 or $40 a thousand, or even less; but more commonly the price is double or triple this sum. Smaller trees may be had at lower rates.

It is not probable that hedges of any kind will ever be generally adopted as farm barriers; the labor of keeping them cut back will deter farmers generally from planting them extensively, but they will answer well for enclosing fruit gardens, and the taller screens will be valuable for cattle yards.

Other Hedge Plants. The buckthorn, although of slender growth, forms a tolerably good hedge. It has a glossy and lively green foliage, which it retains until very late in the fall. The common English maple makes a beautiful hedge, being compact in its habit of growth and requiring very little pruning. It is neat, hardy and free from insects. The European hornbeam is a good hedge plant; dense, of slow growth and requiring but little or no pruning. The purple-leaved barberry makes an ornamental hedge, when well cultivated and trimmed. But for rapid growth, easy propagation and an ample foliage of a shining deep-green color, no plant is superior to the Japan privet. This is not the common privet; it retains its beautiful green foliage until very late; it is almost an evergreen. For sheltering gardens and orchards, the best deciduous trees are Osage orange, white birch, English bird cherry, honey locust, English maple, European larch, English alder, and some of the willows. But the best screen hedge is of course one consisting of evergreens, such as the Norway spruce, arbor vitæ, the white and the Austrian pines.

Heel In, to lay trees or shrubs (which have been taken up) in a trench at an angle of about 45° and covering with earth up to about the middle of the tree. The tops of the trees should be laid toward the south to prevent sunburn.

Heifer (hef'r), a young cow; a female calf, which bears the name until her fourth year, after which time she is called a cow.

Height of tree or other tall object, to measure: see Tree.

Helix, a genus of shell animals, including the garden snails; they are injurious to herbage, and may be kept off by sprinkling with lime, or destroyed by hand picking.

Hellebore (hel'le-bore), a medicinal plant, of which there are several species. They are all acrid and

poisonous, and are used in medicine as cathartics and alteratives. The white hellebore is often called veratrum. Medicinal preparations from these plants are too dangerous for unprofessional hands to deal with. It is recommended for poll-evil in horses, where a piece of the root is inserted in the fistulous opening. Some veterinarians discard it. When one is poisoned with hellebore he experiences an acrid, biting, bitter taste, choking sensation, dryness of the throat, retching, vomiting, purging, pains in the stomach and bowels, and difficult breathing. As antidotes, give emetics of camomile, mustard, or sulphate of zinc; large draughts of warm milk, or other bland fluids; foment and leech the belly if necessary, and give strong infusion of coffee.

Hemlock, an herb and a tree. 1. An annual herb of the parsley (or parsnip) order, with perennial roots, flowering in July, and growing sparingly in the United States, especially in old settlements along roadsides and in waste grounds. It is poisonous, yields a fetid odor like that of mice or cat's urine, and as a medicine it is a sedative in small doses and narcotic in large doses. It was formerly recommended by veterinarians for inflammation in horses and cattle. It is undoubtedly of benefit, in the form of a poultice, to cancerous sores. 2. An evergreen tree of the spruce family, ornamental, not poisonous, growing abundantly in some parts of the Lake region. The bark is much used in tanning, and the wood is useful for various purposes.

Hemp, a genus of hardy, cultivated annual plants of the nettle family. The soil and climate of the United States are favorable to the production of hemp, and the reason we have not in this country manufactured it in its various forms as extensively as the people of Europe, is the absence of pauper labor and competitive struggle for existence which exist to so high a degree in the old country. We are justified therefore in describing here its cultivation, and giving everything that may be of practical value to the farmers.

Cultivation. The best ground in which to raise hemp is an alluvial or vegetable loam; but it will thrive in a moderately tenacious clay if it is rich, drained and well pulverized. It does well on reclaimed muck beds when properly treated. New land is not suited to it until after two or three years of cultivation. A grass sod or clover field is best adapted to it when plowed in the fall or early winter. This secures through pulverization by frost and the destruction of many insects, especially the cut-worm, which is very injurious to it. The land should be replowed in the spring, if not already sufficiently mellow, as fine and deep tilth is essential to the vigor of the crop.

Sow as early as will be out of danger of severe freezing; but where a large quantity is to be raised it is well to make two or three plantings, so that time will be found to harvest it all. It is very important that all the seed be good, as too thick sowing required by the suspicion that the seed is poor, may cause too many to take possession of the ground at once and thus smother themselves. At the same time it is important to have the ground well covered. Sow, of the last year's crop of seed, four to six pecks to the acre. The best seed is indicated by its bright color and good weight. In sowing broadcast, harrow lightly both ways, and roll the ground. It is better to plant in drills, as that method requires less seed and allows of better cultivation. If the soil be dry, plant deeper.

Harvesting, etc. In properly prepared ground no after cultivation is necessary; and as soon as the blossoms turn a little yellow and the leaves begin to drop which usually occurs three to three and a half months after sowing, it is time to cut the hemp. But if it stands a week or ten days longer than this, no injury will follow except that it will not rot so evenly and thus become more laborious to break. If the hemp is not above six feet high it can be cut with strong cradle scythes made for the purpose, at the rate of an acre per day; if the crop is stouter, a brush scythe is required, in which case a half acre per day is good work. As fast as cut, spread the hemp on the ground where it was grown, taking care to keep the butts even, when, if the weather be dry and warm, it will be cured in three days. As soon as dry, bind into convenient sheaves and stack it in a dry place near the pools where it is to be rotted by the water process; build it in round stacks and thatch them. If designed for dew-rotting, stack it in large ricks in the field where grown. The idea is to expose as little of the hemp as possible to the weather, and thus secure it from decay of the fiber. The ricks may be 30 to 50 feet long and 15 to 20 feet wide. Make the foundation of large rails or logs, laid six feet apart, and across these, rails about a foot apart. As the hemp is bound in sheaves, let it be thrown into two rows, with sufficient space for a wagon to pass between them. While the picking up and binding are going on, a wagon and three hands, two to pitch and one to load, are engaged in hauling the hemp to the rick and stacking it. The rick may be in a central place, so as to save distance in hauling. In this way five hands will put up a stout rick in two days and cover it. The roof may be made of long hemp, with the leaves beaten off.

In laying down the hemp, begin with the top ends of the bundles inside; and if they do not fill up fast enough to keep the inside of the rick level, add, as occasion may require, whole bundles. Give it a rounded elliptical form at each end, and as it rises it must be widened so as to make the top courses shelter the bottom ones; after reaching a height of 12 feet, commence for the roof, by laying the bundles cross-wise, within a foot of the edges of the rick, carrying up the roof at an angle of about 45°. Then cover by laying up the bundles at right angles to its length, the butt ends down and the first course resting on the rim of the rick as left all around, one foot in width. Lap the bundles in covering the roof in courses, precisely as if in shingling a house. The first shingling thus finished, commence the second by

reversing the bundles, placing the top ends down, and then proceed lapping them as before. The third course of shingling begin with the butt ends down again, letting the first course hang at least one foot below the edge of the roof as eaves to shed off the rain. Unbind the bundles, and lay the covering at least one foot thick with the loose hemp, lapping well shingle fashion as before; and for a weather board let the top course come up above the peak of the roof about three feet, and be then bent over it, toward that point of the compass from which the wind blows the least. The roofing is then finished. If possible, the rick should be made when the weather is settled and rainless. It is better to employ ten hands, on the plan above described, so that a rick can be finished in one day.

The best time for spreading hemp for dew-rotting is in December; but in case of a large crop it is often desirable to commence breaking in January, and then the spreading out for rotting may be done as early as the middle of October; earlier than this is too warm. To test the friable condition of the stalk, try it in a break. When sufficiently watered, the stalk loses that hard, sticky feel which they retain till the process is completed. The lint also begins to separate from the stalk, and the fibers will show themselves somewhat like the strings of a fiddle-bow attached to the stalk at two distant points and separate at the middle. This is a sure indication that the hemp has had a good rot.

When the hemp is ready to be taken up, it should be immediately put in shocks, without binding, of suitable size. If dry, the shocks should at once be tied with a hemp band by drawing the tops as close together as possible, in order to prevent the rain from wetting the inside. If carefully put up and tied, they will turn rain completely. Each shock should be large enough to produce 50 to 60 pounds of lint. If the hemp is damp when taken up leave the tops of the shocks open until dry.

For hemp-breaking, cool, frosty weather is preferable. When conditions are favorable a man will break and clean 200 pounds per day, but an ordinary task is about 100 pounds. The hand hemp-break is made precisely like that for breaking flax, but is much larger. The under slats are 16 to 18 inches apart at the hinder end, and at the fore end they approach to within three inches of each other. After breaking out the hemp it is twisted into bunches and sent to the press house to be baled, and afterward transported to market.

Water-rotting is done in vats under cover, where the water is kept at an equable temperature. Seven to ten days are a sufficient time for the process, when the weather is not too cold, after which, when the hemp is dried, it is of a bright greenish, flaxen color. These vats are easily constructed and managed, and where a company of planters join together the expense to each is comparably inappreciable. Before putting into the vats the hemp is first broken by a steam or horse power machine; but this is not essential. If it be rotted in spring or river water, artificial pools or vats must be formed for this purpose, and should not be more than three feet deep, else the hemp will be liable to unequal rot. Keep it well under water by stones upon planks.

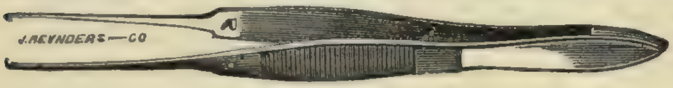
To raise hemp-seed requires a somewhat different mode of cultivation. The best ground is an old pasture or meadow, heavily manured and plowed in the fall, and well pulverized in the spring. The seed should be planted like corn, either in hills or drills, allowing but two stalks to the hill. Soon after the hemp is up, a small shovel plow should be run through both ways, once in a row; but if the ground is not foul the plowing may be delayed till the hemp is a few inches high, and then the young grass and weeds can be covered up by the plow. The hoe should follow the second plowing, and cultivation should be so strict during the growing season as to keep out all the weeds and grass. When the hemp has so far advanced as to distinguish readily the male from the female plants, let all the "blossom" or male hemp be cut out, except one stalk in every other hill and every other row. This will leave one stock of male hemp for every four hills; and after fertilization has taken place, remove the remaining male plants. Some farmers top the seed plants when five or six feet high, to make them branch more freely; but this is not necessary where but one or two seed-bearing plants are allowed to each hill.

A seed-bearing hemp crop is a great exhauster of land. The seed yields an oil of inferior value, and when cooked it affords a fattening food for animals.

Hemorrhage, a morbid or accidental flow of blood from an animal. Hemorrhages from deep or lacerated wounds, or from the cutting or rupture of moderate arteries, have far less morbid power in cattle and horses than in the human subject; and often are attended with no danger whatever in the former when they would be fatal in the latter; for, in consequence of the elasticity of the external tunic, the ends of the cut or ruptured vessel retract within the cellular substance and close their orifices, and the flow of blood, though at first copious and alarming, soon becomes slow, and eventually forms a coagulum or clot, which plugs up the wound and prevents all further flow. Yet hemorrhage in cattle and horses may frequently be serious enough to make a great reduction of both condition and strength; and in every case, therefore, it ought, with all possible speed, to be artificially stopped.

Styptics, such as flour, puff-ball, alum, vitriol, and other finely pulverulent or powerful astringent or corrosive substances, where applicable in the form of powder or in that of lotion, act either by mixing the blood into a thick paste or by astringing it into a coagulum, but have little or no effect upon a hemorrhage of either ox, cow or horse. Compression by means of a tassel of lint, or a pledget of tow, or a piece of soft sponge, made fast with a bandage, is often effectual in any ordinary case of hemorrhage, and is peculiarly suitable when the place of discharge is beyond the

reach of more special manipulation; and even when the application but partially closes the bleeding orifice, it may occasion the speedy formation of a firm clot upon the hole. The passing of a ligature of waxed silk or thin twine around the bleeding vessel, is still more successful; and this may often be effected by means of a tenaculum, or of any small hooked instrument which can lay hold of the vessel, and draw it a little from its place; or it may be effected by seizing the ends of the vessel by a pair of small forceps (see



Forceps.

figure) or, in the least practicable case, it may be managed by taking up some of the flesh or cellular membrane in two or three places around the vessel with a crooked needle, having a waxed silk thread attached to it, and closing the included vessel by the constriction of the ligature upon the flesh. The tourniquet is seldom applicable to the horse; yet in the form of twisted ligature it may sometimes be advantageously used in cases of docking and of wounds in the legs. The cautery may be applied when a bleeding artery or vein is not broken or cut asunder; for it readily stops the hemorrhage either by searing up the tubular cavity of the vessel, or by plugging up the orifice with a coagulum; but it ought to be applied at such a temperature as nearly to sear the part and not to destroy its vitality; for a part made dead by it will afterwards drop off, so as to re-open the orifice and renew the hemorrhage. Yet, in the horse, the seemingly mischievous act of completely separating a partially divided artery, will stop the hemorrhage; for the ends of the separated vessel retract within the cellular substance, and close up their orifices with coagulum; and hence the safety of tearing out the testicles in castration. But when a large vein is divided, it requires to be secured by one ligature above and by another below; and even when any very large artery is divided, both ends should, in prudence, if not in necessity, be secured with ligatures.

Hemorrhage from the navel-string of calves is sometimes stubborn and dangerous. Blue vitriol, oil of vitriol, or some other powerful corrosive styptic is frequently recommended, but ought never to be used; yet, when the ligature already in use is so near the belly as not to allow another to be passed above it, a styptic becomes necessary, and one of the best is a pledget of lint dipped in a decoction of galls and made fast with a bandage, so as to combine the styptical action with the compressional one. But a simple ligature above the original one, whenever there is space for it, is decidedly preferable. Much swelling and inflammation generally follow, and these must be reduced by a sedulous and persevering course of fomentation, and eventually, if necessary, by poulticing and by artificial discharge of morbid secretions. See the article Bleeding.

Hemorrhoids (hem'o-roids), Piles, which see.

Hen, the female of the domestic fowl. See page 422.

Henbane, a poisonous plant of the nightshade order, generally known as hyoscyamus (hi-o-si'a-mus) among medical men. It is a narcotic, anodyne, and soporific, to be used only by skillful hands. It is occasionally given to horses to relieve cough and irritation of the throat, the dose for this purpose being 1 to 2 drachms of the extract rubbed down in a little cold water, and repeated several times a day; but better drugs are now used. As a poison the symptoms are stupor, numbness, nausea, dilated pupil, delirium, convulsions paralysis, etc.; and the antidotes are the same as for Aconite.

Hen-House: see page 535.

Herbaceous (her-ba'shus), having the nature of an herb or annual plant.

Herbarium, a systematic collection of dried plants for botanical study. White blotting paper in sheets 11½ by 16 inches in size is used, one sheet to each specimen. The plants should be fastened down with a small drop of mucilage here and there, or with "gummed slips" of writing paper. Plants should be spread out before they are wilted, to dry, between sheets of porous paper, as newspaper, or blotting paper that is made purposely for this work, and can be had by ordering of the establishments East that deal in it. Of fleshy plants and fleshy parts of all plants only a thin slice need be taken that will show, in outline, the structure of the specimen. Change the drying sheets twice a day for three or four days, and then once a day a few days longer, and the specimens will be dry enough for their permanent place in the herbarium. To prepare sheets for transferring figures of leaves (or embroidery), take lard oil, or sweet oil, mixed to the consistence of cream, with either of the following paints, the color of which is desired: Prussian blue, lampblack, Venetian red or chrome green, either of which should be rubbed with a knife on a plate or stone until smooth. Use rather thin but firm paper; put on with a sponge and wipe off as dry as convenient; then lay them on colored paper or between newspapers, and press by laying books or some other flat weight upon them until the surplus oil is absorbed, when it is ready for use.

Herbivorous (her-biv'o-rus), subsisting exclusively on herbs, as cattle and horses in a state of nature.

Herbs. This term is used in the restricted sense of medicinal and savory herbs, of which the most popular in garden cultivation have been caraway, coriander, dill, sweet fennel, lavender, parsley, cress, saffron, sage, summer savory, sweet marjoram, thyme, rue, wormwood, chamomile, hop, spearmint, anise, balm, horehound, rosemary, tansy, sweet basil, pep-

permint, elecampane. See each of these in their respective alphabetical order. In the largest and most proper sense, however, herbs comprise all kinds of plants, except trees, shrubs and aphyllous cryptogams; but it is generally used, by many at least, to mean only annuals and annual-stemmed perennials; and others still mean by them only such plants as are supposed to possess medicinal properties. For medicinal purposes herbs should be cut on a dry day when they are in flower, and spread in a dry, shady place. The medicinal part, when dry, may be pulverized, passed through a hair-sieve, and packed in tin boxes. To preserve them for distillation and perfumery, see Flowers, page 503.

Herd, a number of grazing animals feeding on one pasture, housed on one farm, or congregated under one owner.

Herding is the taking care of a number of cattle, horses, or sheep in herds or flocks. It is most generally resorted to in States and Territories sparsely settled and noted for their numerous acres of wild grasses. The wild and nutritious grasses of Texas, Kansas, New Mexico, Nebraska, Colorado, California and other States and Territories, together with their mild climate, are the great inducements which the capitalists accept as positive assurance for the safe and profitable investment of their means in cattle or herding business. A large majority of the cattle herded in the Southwestern States and Territories are the "Texas cattle," elsewhere described in this work; although in Colorado, Kansas, Nebraska and some of the Territories, may be found numerous herds of California cattle. Texas may, nevertheless, be considered as the cattle-supplying State. Many thousands of these are yearly driven from Texas north into Kansas, Colorado and Nebraska, and there sold. They begin to arrive about the first of May and are purchased by parties for the purpose of "herding" and increasing them in flesh preparatory for the market; yet many of them, on arriving at a railroad, are immediately shipped to some Eastern market. In the latter case the meat is poor and contains none of the juice imparted by the rich and nutritious grasses where the cattle are herded.

Before Texas cattle are started on the drive, the owner is compelled to brand each and every one of them with what is known as a road brand. This is for the purpose of distinguishing the cattle. Their owners, during the drive north, are confined to certain limits, regulated by legislative enactment, on account of a contagious disease which Texas cattle invariably impart to domestic stock. Those who purchase for the purpose of herding and increase generally—in fact hardly without an exception—select yearlings, two-year-olds, or young cows with calves. Immediately on "cutting out" the cattle purchased are placed in a corral and the brand of the purchaser, previously recorded, put on them. This is done by lassoing each of them and applying a red-hot iron, made to represent the brand of the owner, to a certain part of the animal, and held there until the hide is burnt entirely through. The cattle are then turned loose and driven to the best grass by men called "herders," and herded until fall. Four or five men are sufficient to herd from two to three thousand cattle. The herding is always done on horseback; and it is a fact well known to the Texas herdsman that a wild Texas steer, which is always ready to run a man down and horn him when on foot, is perfectly docile when the man is on horseback. To an inexperienced man, herding Texas cattle is very dangerous. Often the herd is stampeded by fright, and then it requires great nerve as well as knowledge to prevent them from being scattered for hundreds of miles. There is but one way to stop the stampede, and that is by riding, with all possible speed, until you are ahead of them, when you must continue riding in the same way they are going until they stop. Sometimes, however, the herdsman is compelled to kill the leader before the herd is stopped; therefore, a reason for the "cow-boy" or herdsman always having a pistol hanging to his saddle. Should the "cow-boy's" horse stumble or fall, he is certain to be run over by the herd. Even this is not certain death to the herdsman, for if he lie perfectly still the cattle will either jump over or shy from him and pass on; yet he generally gets numerous bruises, and oftentimes is killed. The cattle are herded, kept together, until the fall, when, the grass having been burnt by the prairie fires, it is impossible to find a place with sufficient grass to supply any considerable number, and the cattle are turned loose to find their own sustenance. Then the festive "cow-boy" takes his vacation, and spends his accumulated wages in drinking and carousing in the frontier towns.

In the early spring, the general "round-up" commences. Every owner of cattle who has a recorded brand, sends a number of men, generally two to four, to the different States and Territories to assist in the collection of the cattle. These men scour the country, and collect all cattle which are branded, and drive them to a certain point previously agreed upon. When they are all collected, then commences the work of "cutting out," that is, separating. Each brand is "cut out" by itself until the brands are all by themselves, and each owner has his cattle. The young calves, and they will always be found with their mothers, are then branded with the owner's brand, and the cattle are herded on green grass, as before, for a few months, when they are either shipped to the Eastern market or held for still further improvement in flesh. Texas cattle are never fed at any time, and acquire their flesh altogether from the nutrition contained in the wild grasses; in fact, their wild, untamable dispositions will not permit their prospering in small enclosures, or when treated as domestic cattle.

The herding of sheep in the United States is mostly confined to New Mexico, although California, Arizona and portions of other States and Territories are extensively adapted and used for that purpose. Mexican sheep are purchased in New Mexico in the early

spring, at from 50 cents to $1.25, and driven to the States and Territories for the same reason that cattle are driven, namely, improvement and increase. The rapid increase of sheep is inducing many of our frontier farmers, where wild grass and good, cool water are abundant, to invest in them and resort to herding. In the herding of sheep it is necessary, for protection from wolves as well as inclement weather, to have a corral, in which the sheep should be placed at night. The herd is turned out in the morning and driven by the herder to the best grass, which must not be too far away, and returned to the corral just before dark.

The Spanish sheep dog is equal, if not superior, to a half-dozen men, as a sheep herder. He seems to understand the necessity of keeping the herd together, and not permitting them to wander away, as well as their safety in being corraled at night. There is no danger in the herding of sheep as in cattle, neither is it so laborious. True, there are small herds of domestic cattle and sheep herded by farmers throughout the United States, but the term "herding" is more applicable to the cases above mentioned.

Herdsman, a person who attends a herd of cattle. He drives them to their pasture, restrains them within certain limits, prevents them from hurting one another, observes their condition as to disease or health, and exercises a general care over them during the period of their absence from the farm yard. A boy or girl is usually employed to attend a small flock, and an elderly man a larger one. But since the enclosing of lands became general, herdsmen of any kind are seldom required, except in the Western States and Territories, where it is resorted to quite extensively. See Herding.

Herd's Grass, timothy, in New England and New York, and red-top in Pennsylvania. See Grass.

Hereford (her'e-ford), a breed of cattle. See page 200.

Hermetically Seal, in canning fruit, for example, is to seal air-tight.

Hermaphrodite, a term formerly applied exclusively to signify a human creature possessed of the organs of both sexes. The term is now applied to other animals and plants. It is well known that there is no such a thing as an hermaphrodite in the human species. In many of the inferior tribes of animals, the male and female parts of generation are found to be united in the same animal. There are both natural and unnatural, or monstrous hermaphrodites. The natural kind belong to the inferior and more simple order of animals; but as animals become more complicated, and each part is confined to a particular use, a separation of the sexual characteristics takes place and they are found united only in some particular cases. In the horse, ass, sheep and cattle, such instances sometimes occur. In the case of cattle, when a cow brings forth two calves, one a bull and the other a cow, to appearance, the latter, in most instances, is unfit for propagation. See the article Free-Martin. Among the invertebral animals, such as worms, snails, leeches, etc., hermaphrodites are frequent.

Hernia, or **Hernial Rupture** or **Burst,** a tumor of some part which has escaped from its natural place by some opening and projects externally. That of the abdomen is most common, and consists of the protrusion of an intestine between the muscles. Hernia is said to be "strangulated" when the protruded part is held out so tightly as to stop its proper function, cause swelling and great pain. All cases of hernia require the services of a conscientious surgeon.

Hessian Fly, a two-winged fly destructive to wheat. It has pale-brown or red eyes and black feet, wings blackish or tawny. It deposits its eggs on the young wheat plant; maggots are hatched, which work between the leaf and stalk, lives on the sap and destroys the plant. Late sowing and burning the stubble are methods of diminishing the number of this pest, which is very destructive some seasons.

Hessian Fly.

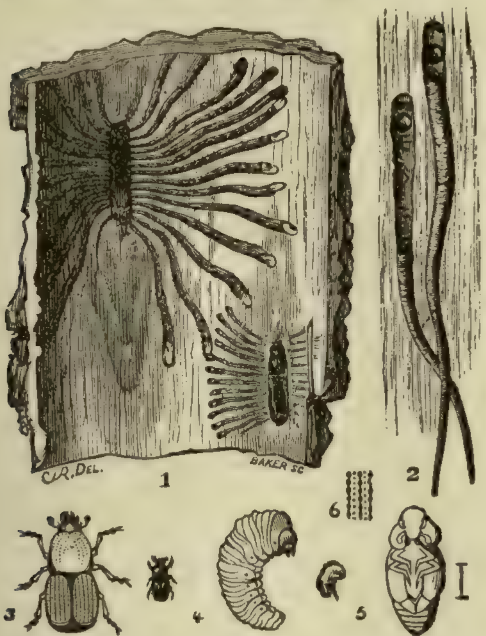
The Hessian fly is so called because it is supposed to have been introduced into the United States with the forage brought by the Hessian soldiers of the British Army during the Revolutionary war. It is shown by the accompanying engraving.

Hiccough (hik'up), or **Hickup.** Swallow a mouthful of water, stopping the mouth and ears. Or, take anything that makes you sneeze; or, 3 drops of oil of cinnamon on a lump of sugar. Standing or sitting perfectly still, holding the breath as if frightened and listening for the feeblest noise, will stop most cases of hickuping. This is the *rationale* of being frightened out of the hickups.

Hickory, the name of several species of a very valuable, well-known tree. The most popular hard, small hickory-nut is from the "shell-bark hickory," so called, and the larger nut is from the "Western," or "thick shell-bark" species. The pignut and the butternut hickories, and the pecan, are all of softer wood, when green, and the nuts are all soft-shelled.

The different species grow in a variety of soils, only the pecan in wet ones, and resemble each other in the quantity of the timber and in the grain and quality of their wood. In the qualities of hardness, weight and strength, combined with elasticity, it is unsurpassed. The timber until thoroughly seasoned, or if exposed to moisture, is peculiarly liable to the attacks of insect borers, and is liable to decay in the presence of heat and moisture. For this reason, when wanted for timber, it is immediately peeled when cut, and seasoned in the shade as quickly as possible. The least valuable species for timber is the bitter-nut hickory, and the most valuable, all things considered, are the shell-bark and the thick shell-bark. The second growth of pignut hickory, however, is considered as

being superior in strength and toughness, and is used for axletrees and handles for tools. The several species all ripen their nuts in the fall.



Hickory-Bark Borer. (Scolytus quadri-spinosus.)

In seasoning hickory, the bark should be peeled off that it may dry and harden as quickly as possible on the outside, to prevent the depredations of the borer, illustrated in the cut. It has short antennæ which terminate enlarged as in a club; the length is one-fifth of an inch; color black, with brown wing cases. The cut at 1 shows the burrows of the larvæ between the bark and the wood, growing wider as they diverge from the line where the eggs are deposited; 2, another view of the same, showing the hole made by the exit of the beetle; 3, beetle, both magnified and natural size; 4, larvæ, the same; 5, pupa, magnified. The female beetle, says Dr. Cyrus Thomas, selecting the trunk or larger limb of a hickory tree, bores through the bark and forms a vertical chamber next to the wood from half an inch to an inch in length, on each side of which she deposits her eggs, varying in number from 20 to 50. The larvæ, when hatched, feed on the inner bark, each one forming a track of its own, thus forming the radiating burrows so common on the under side of the bark of hickory trees. The larva is a soft, yellowish, footless grub, much like the larva of some of the curculios, and from which it can not easily be distinguished, except by its habits; it is very small, not exceeding the fifth of an inch in length when fully grown. The eggs are deposited during the months of August and September, and the beetle issues about the latter part of June or first of July. It attacks the bitternut, shell-bark and pignut hickories, and probably the pecan. No practical remedy is known, nor is there much probability of any extensive experiments being made until forest timber becomes more valuable than it is now.

Hickory trees cannot well bear transplanting, and they should therefore be raised from the seed. Keep the nuts over winter in moist earth or sand, where they will not be subjected to alternate freezing or thawing, and in the spring plant two or three together where it is designed one should stand, and afterwards remove the surplus plants, if any. Give clean culture until the trees are large enough to take care of themselves. Start the plantation with the trees four feet each way, and thin out as they grow up until they remain 32 feet apart. The taller and straighter the trees desired, the longer let them stand.

Hide, the skin of a cow, an ox, a horse, or any other large quadruped. The hides of cattle of good breeds are thin, movable, mellow, and well-clothed with fine, soft hair, yet not so loose as to offer no resistance to the touch, nor so thin as to indicate hardiness of constitution. See the articles Cattle and Breeding. A raw or green hide, in commercial language, is a hide in a fresh state, or when taken off the carcass; a salted hide is one which has been dressed with alum, saltpeter and common salt, to preserve it from putrefaction; a tanned hide is a salted and preserved hide which has undergone the process of tanning; and a curried hide is one which has been finally dressed by the currier, and possesses all the characteristics of leather.

To Cure Green Hides. Lay them flat, flesh side up, and throw upon them coarse salt, say about 15 pounds of salt to a 60 or 80-pound hide; in 12 to 20 days shake the salt out and use it again.

Hide-bound, a diseased condition of the skin of horses and cattle. The hide fails to possess the oily secretion which is requisite to keep it soft and mellow; it becomes hard, dry and unyielding; it appears as if glued firm to the muscles and bones, and it suffers such a refractoriness of the minute scales of its cuticle, that the hair is irregularly disposed, and forms a rough, ragged, staring coat. Yet hide-bound is not properly a disease itself, but rather the symptom of any one of many diseases. It results from grease, farcy, founder, chronic cough, worms, prolonged glanders, poor diet, all sorts of diseases of the digestive organs, and various disorders of obscure seat or ill-defined character. The grand remedy for it, of course, is to attack and overthrow the disease which causes it. But when that disease cannot be discovered, or even sometimes as an accompaniment to the main treatment when the disease is quite apparent, a few mashes, a little physic, an antimonial alterative and regular repeated frictions are often successful in removing hide-bound.

Highway, a public road, or road which any person has a right to use, whether the road be fit only for foot passengers, or fit also for wheeled carriages. Any road which has been used by the public, or open to all persons, during a certain number of years (different in different States), is permanently a highway, and any

road which has been used by the public during four or five years may continue without trespass to be so used until it is formally enclosed. Public roads acquire the name of highways from the raised causeways which constitute the roads of the Romans. See article Road.

Hinny, the offspring of the male horse—stallion—and the female ass. The mule has the greater external resemblance to the ass; so has the hinny the greater external resemblance to the horse; and a more minute examination shows that the mule, not only in outward form, but in temper and characteristics, has more of the ass in his nature—the hinny more of the horse. It is in a considerable degree by the knowledge of these facts, which are positive, that the breeder is led, when he insists that, to produce the greatest advantage on the offspring, the excess of blood and vital energy must be on the side of the sire, and not on that of the dam; since he finds invariably that from the jackass and the mare, whether the latter be the merest dunghill or as thorough-bred as Spiletta, the mother of Eclipse, springs the mule of the ass type.

The mule has long ears, slightly modified and shortened by the intermixture of the horse; the comparatively hairless tail; the narrow quarters and thin thighs; the erect mane, the elongated head, the slender legs and narrow, erect hoofs, and the voice of the ass. The hinny has a smaller, better formed head, the flowing mane and full tail, the general form, the finer coat, larger legs, broader feet, and the voice of the horse. What would at first appear remarkable is that the mule, or offspring of the male ass and mare, is a far larger animal than that of the stallion and female ass; and not only that, but frequently larger than either of his parents.

The hinny, although hardier, more patient, more enduring of privation and scanty fare than the horse, is infinitely inferior in all these qualities both to the ass and the mule, while he is at the same time gentler, more tractable, and nearer the horse in temper,—strong arguments, it will be observed, for seeking invariably to have the qualities of the blood, temper, courage, spirit, on the side of the sire, those of form and size on that of the dam.

Both the mule and the hinny are clearly modified asses,—that is to say, they have both more in their composition of the ass than the horse, but the proportion of that *more* depends on the male, and not on the female parent. It appears that the vital energy and power of transmitting organization is stronger in the ass than in the horse, probably because he is entirely in-bred, less changed by domestication, and nearer to his natural condition than the more cultivated or highly favored animals.

Hired Help. Every farmer who has to employ help wishes to have a good hired man. He desires that the wages he pays shall be earned, and when sure of this he is too frequently satisfied with his help. A man that works upon the farm is not a mere machine; he has a moral influence, and when surrounded by children may be dear at any price. The hired man should not only be able to earn his wages, but also to exert a good influence upon the young, with whom he is likely to be more or less associated. Pay good wages, and have only whole-souled, honest, upright men upon the farm, if you would raise the best crop that the farm can produce—a family of noble boys and girls.

The following general rules should be given by every farmer to his hired help, and insist upon their adhering to them:

1. Be regular and uniform in hours of labor.
2. Do every operation in the best manner.
3. Finish one job before beginning another.
4. Clean every tool at night or sooner when done with.
5. Bring in all tools and machines at night.
6. Treat all animals kindly and gently.
7. Never talk loudly to oxen or horses.
8. Study neatness in everything you do.
9. Never enter the house with muddy boots.
10. Never use profane language or get in a passion.
11. Take a general interest in the success of the farm.
12. Study to improve constantly in knowledge and skill in farming.

Those employers who cannot keep their hired help very long, or cannot get good help, are lacking in their own moral qualifications in some respect. They must surely have some disagreeable peculiarity in their character. See the section entitled "To the Farmer Boy," page 258.

Hit, in breeding, an instance of success.

Hives, an eruption common to young persons, consisting of irregularly shaped patches of pimples, which smart, burn or itch. These blotches rise up in thick whelks, irregular in shape, from the size of a ten-cent piece to several inches in extent, often running together, of a florid or purplish red color, and attended with intense itching, stinging, or burning sensation, very much like that produced from the sting of nettles;—hence the name of nettle rash. It usually appears suddenly, without any premonitory symptoms, and after tormenting the patient an hour or two, often disappears as suddenly as it came, though it frequently continues all night, and disappears in the morning, to return again at night. It is almost exclusively confined to children or young persons, between the ages of five and fifteen years.

Acetate of ammonia will generally effect a cure; or salt and vinegar, or salt water alone. Coxe's hive syrup has been popular for many years, but as it is somewhat poisonous, a doctor should be called before using it. A simple application is that of wheat flour, freely applied and rubbed over the surface, or wherever the eruptions appear. Therefore, rub the parts freely with flour, and if very extensive, apply flour to the whole body, and give the patient freely of saffron tea; or if that is not convenient, give sage and sassa-

fras tea. Then follow, as soon as urgent symptoms are relieved, with cooling physic, once a day for several days in succession. An excellent article for this purpose is cream of tartar and sulphur, three parts of the former to one of the latter, mixed with molasses until it is quite thick, giving a tea-spoonful of the mixture two or three times a day, for several days.

Attend also to the skin. Give the patient a warm bath every evening, or a sponge bath, by washing the whole body in warm saleratus water. Do this for several evenings, and at the same time let the patient drink a little sassafras or saffron tea, warm or cold, through the day. Whenever the blotches appear apply the flour freely.

Hoarhound, a plant formerly cultivated in every garden, the tea or decoction of the leaves being used for coughs colds, etc. It is now a common weed in many places.

Hoarseness. Wearing a wet cloth over the throat will remedy most cases. Patient should avoid all exposure to "catching cold," by remaining too long in rooms of confined air, etc. A good herb remedy is the following: Take 1 drachm of freshly scraped horse-radish root, boil it with 4 ounces of water in a close vessel for 3 hours, and make it into sirup, with double its quantity of sugar. A teaspoonful to be taken several times a day; one or two doses, however, sometimes proves effectual. Or, make a strong tea of horse-radish and yellow dock, sweeten it with honey and drink it freely; or, take four ounces of grated fresh horse-radish, saturate it in a pint of good vinegar over night, then add half a pint of honey, and bring it to the boiling point; then strain and squeeze out. Dose, 1 or 2 teaspoonfuls several times a day.

Another receipt for hoarseness or tickling in the throat is as follows: Take a small pinch of borax, powdered, place on the tongue, let it slowly dissolve and run down the throat. Repeat it often. It is also good to keep the throat moist at night and prevent coughing.

Hobble, or **Hopple,** to walk lamely, or limp; to fasten the legs of an animal loosely together, so as to impede free motion; an unequal, halting gait.

Hock, the joint of the lower part of the hind-leg of a horse, an ox or other quadruped, corresponding somewhat to the knee of the fore-leg of the same animal, and to the ankle of the human being. In the horse it is an important joint, and greatly contributes to the peculiarities of its individual conformation, to the comparatively high or low value of the animal, and is frequently the seat of disease and of seeming unaccountable lameness.

Hoe-cake, a coarse cake of Indian meal, baked before the fire, and sometimes on a hoe; a johnny-cake.

Hog: see Swine.

Hog. To "hog" the mane of a horse is to partially clip it so that the remaining portion projects up like the sharp ridge of bristles on a hog's back.

Hogging Down corn, to turn hogs into the corn-field, at any time after the ears are filled, to fatten themselves. It is considered a practice too wasteful to be commended.

Hogshead (hog'zed), a measure of 63 gallons; any large cask of indefinite contents, but usually containing 100 to 140 gallons.

Holiday (hol'i-day), originally a holy day; a religious anniversary; next, a day set apart in honor of some person or in commemoration of some event; finally, a day of exemption from labor and of recreation and gayety. Thus, utility has secularized what was once exclusively religious. A "legal holiday" is one in which legal processes, except for the preservation of good order, cannot be enforced. They are, Christmas, New Year's Day, February 22d (the anniversary of George Washington's birthday), the Fourth of July, Thanksgiving, and every day proclaimed by the Government as a day of prayer, fasting, thanksgiving, jubilation, etc. Some persons advocate an increase in the number of general holidays, and laboring men in the cities often have a half holiday, or less time, given them weekly by their employers. Exclusively from the standpoint of health, one should rest when he is tired, with no reference to days or hours; the holiday, therefore, is practically regarded more as a day for social intercourse and gayety than as a day simply of rest. The ancient Jews in Palestine let their land rest every seventh year, to allow it to recover its fertility; but the Gentiles attributed the custom to sheer laziness.

For the information of country school-teachers, we will say here that they will be safe in dismissing school on the days mentioned above, without consulting the directors, and that they will not have to "make up" for them, without a specific contract to that effect.

While, perhaps, there are not a sufficient number of National holidays, each family can have its own days of rest and recreation. Birthdays should be observed; for the children these days should be made happy by gifts and by a pleasant party, or by a pleasure-ride to some place which they specially desire to visit. Older people should take these days for thought, rest and recreation. It is fitting that these points of time should be observed, and that, as the years pass by, and age gradually but surely increases, the individual should recognize the fact that life is passing, and the time which he is to spend upon the earth is rapidly diminishing. They need not be sad days, but they should be remembered and suitably observed.

Parents should teach their children to remember these days. The custom which some writers advocated long ago, of planting a tree to commemorate the birth of each child, is to be strongly commended. As soon after a child is born as the proper season for transplanting arrives, let a fine tree, oak, elm, maple,

evergreen or one of similar nature, be planted in one of the yards near the house. This tree should be the special care of the child in whose honor it was put out, and as they grow in size and age the child will take a deep interest in the tree, and will soon come to regard it with feelings of affection.

Marriage anniversaries should also be observed by the married members of a family. They may well be celebrated by social unions of the family circles to which the married pair originally belonged. When this is impracticable, a visit to some near relatives, a tea-party or a pleasure trip will furnish the means for the appropriate observance of the day.

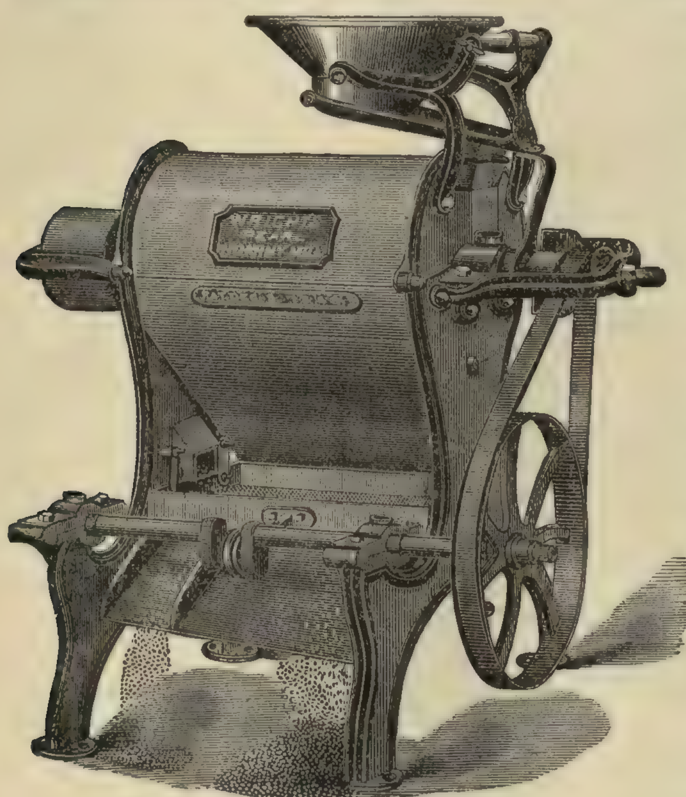


FIG. 1.—*Wright's Hominy Mill.*

Hollow. "Hollow-eye," an eye sunk in its orbit; "hollow-horn," leanness and bloodlessness, a disease of cattle (see Cattle); "hollow newel," an opening in the center of a winding staircase in place of a newel-post, the stairs being supported by the walls at the outer end; "hollow-ware," a general trade name for hollow articles, as cast-iron kitchen utensils, earthenware and the like.

Holly, an evergreen tree, with a fine-grained, heavy, white wood, much used to adorn churches and houses at Christmas time. The bark is used to reduce fevers, and the berries are violently purgative and emetic. The berries turn yellow or red about November 1st. This is the European species, which is best known. The American holly is native in the eastern portion of the United States, and is more hardy than the other. The tree, and especially the berries, are exceedingly beautiful.

Hollyhock, a tall, old-fashioned plant of the mallow family, producing large, fragrant flowers. It is well known.

Holstein Cattle, a breed of Dutch cattle. See page 204.

Home Adornment. Under the head of Landscape Gardening, Lawn and Residence, we fully treat of outside ornamentation, and here we would fully treat of parlor and chamber ornamentation had we several hundred pages of space; for it would require as much as that to present only a glimpse of the ingenuities and beauties found in the homes of civilization. The class of persons whom we particularly desire to read this paragraph are the comparatively idle girls living in large but somewhat unfurnished homes, with blank walls and ceilings. How much scope is there for their ingenuity and labor, devising and making brackets, wall pockets, flower boxes and vases, hanging baskets, fountains, imitations of birds and animals, illusions, what-nots and an infinite variety of fancy articles. There is scarcely a girl living but that would attain a sweeter disposition, and a better disciplined mind by having something "on hand" to do in adding to the beauties and attractions of home. We presume the Creator of this flowery world would have no objection, even to the most pious, making this world as much like heaven as possible. Heaven does not consist exclusively of psalm-singing, but of everything beautiful and elevating; and it is even our duty to make everything in this world serve as heavenly a purpose as possible.

The best method of learning what to make for home adornment is to observe what they may have at the well furnished homes you may visit, and the best way to learn how to make them is to be inquisitive about them when you are there.

Homestead Law: see Land.

Hominy, corn, usually of the smaller white flint kinds, bruised in a hominy mill or a mortar until the external covering is removed and sifted. Samp is corn broken coarsely in a mill. But the term "hominy" is often applied to "hulled corn," which see.

Hominy Mill. The wholesomeness of hominy as an article of diet, its nutritious quality, and its palatable taste when properly prepared, have now become so generally recognized as to multiply ten-fold the demand for this product which existed a few years since. One bushel of corn will make from 28 to 30 pounds of hominy. The several manifest advantages of

Wright's pearl hominy mill (Fig. 1) over older patterns are in its simplicity of construction and operation, economy of power, and avoidance of dirt and dust. It is a horizontal mill, occupying a space of but three by four feet square, and has a regular feed and discharge. The grain requires no soaking or steaming, but can be worked dry as well as when damp. The hominy and feed are separated before leaving the mill, the hominy running out on a shaking screen where the fine is separated from the coarse, leaving it in perfect condition for the market. The feed is deposited on the other side.

The Eclipse mill represented below produces a nice and even article of hominy, fully equal to any mill in the market. It separates the hearts, bran and meal from the hominy, making it a good and merchantable article. It requires 900 revolutions per minute. The motion must not check up when the charge is let into the mill. The largest size will make from 20 to 30 barrels of merchantable hominy in ten hours. It requires about eight-horse power, and a 12-inch pully, with eight and a half inch face. Put in three-fourths of a bushel for a charge. The corn should be dry. This mill requires a space seven feet two inches by three feet four inches.

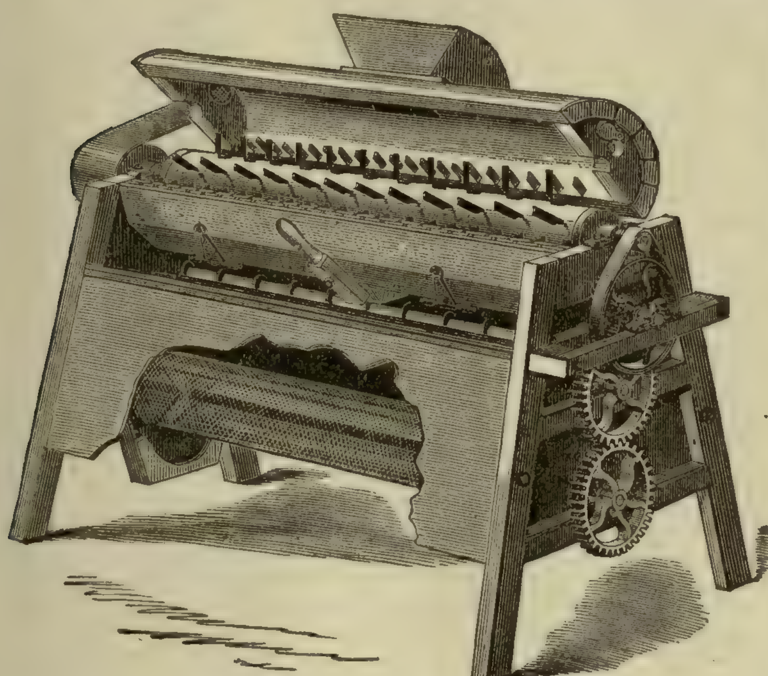


FIG. 2.—*Eclipse Hominy Mill.*

TO COOK HOMINY, take 3 cups of water to 1 cup of hominy, boil slowly for ¾ of an hour; the longer it boils the better it is; then add ½ teacupful of sweet milk to a cup of hominy, and boil 10 minutes more; stir it frequently while boiling.

HOMINY CROQUETTES. To 1 cupful of cold boiled hominy (small grained) add 1 tablespoonful melted butter and stir hard, moistening, by degrees, with 1 cupful of milk, beating to a stiff, light paste; then put in 1 teaspoonful of white sugar, and lastly, a well-beaten egg. Roll into oval balls with floured hands, dip in beaten eggs, then cracker-crumbs, and fry in hot lard.

BAKED HOMINY. To 1 cup of boiled hominy (small kind) allow two cups of milk, 1 heaping teaspoonful of butter, 1 tablespoonful of white sugar, a little salt, and 3 eggs; beat the eggs very light, yolks and white separately; work the yolks first into the hominy, alternately with the melted butter; when thoroughly mixed, put in sugar and salt and go on beating while you soften the batter gradually with milk; be careful to leave no lumps in the hominy; stir in the whites, and bake in a buttered pudding dish until light, firm and delicately browned.

Hone, a stone of fine grit, used for sharpening instruments that require a fine edge, and particularly for setting razors. Imitation hones are common nowadays, which seem to serve the purpose very well. Printed instructions accompany each article sold, whether hone or strap. See Whetstone.

Honey, fresh from the comb, is clear, translucent, slightly amber-colored, and viscous, becoming granular in time, with whitish, transparent crystals. In taste and smell, it is sweet, agreeable and aromatic. It should not irritate the throat when eaten, and its peculiar flavor should be so decided that it can be readily detected when mixed with other articles of diet.

Honey derived from the blossoms of plants of the mustard family granulates or crystallizes speedily—often, indeed, while yet in the comb before removal from the hive; while that from plants of the mint family and from fruit trees in general maintains its original condition unchanged for several months after being extracted from the comb. Honey produced in northern climates likewise crystallizes sooner than that from southern countries.

Crystalline sugar, analogous to grape sugar, may be obtained by treating granular honey with a small quantity of alcohol, which, when expressed, takes along with it the other ingredients, leaving the crystals nearly untouched. The same end may be attained by melting the honey, saturating its acid with carbonate of calcium, filtering the liquid, then setting it aside to crystallize, and washing the crystals with alcohol. Inferior honey usually contains a large proportion of uncrystallizable sugar and vegetable acid. When diluted with water, honey undergoes the various fermentations, and in very warm weather an inferior grade of honey will sometimes undergo a

change acquiring a pungent taste and a deeper color. The usual adulterations of honey are with various forms of starch, as those of the potato and wheat, and with starch and cane sugars. The starch is added to whiten dark honey, and to correct the acidulous taste which old honey is apt to acquire, as well as for the sake of increased weight. The presence of starch may be readily detected by the usual iodine test. Honey is now rarely adulterated by the old methods, in this country at least, as, owing to the large supply, the conditions that once made sophistication profitable now no longer exist. Since the manufacture of glucose has been so greatly extended of late years, this article supersedes nearly all others in the adulteration of honey. Indeed, what may claim in the market to be " pure extracted honey," may be nearly all glucose, with a little honey to flavor it. A thin strip of comb honey is generally placed in the mass, to aid the deception. Honey adulterated with glucose will not granulate. The best rule in purchasing honey is to select that which is granulated, or " candied," as some express it. Honey, as well as molasses and sugar, are sometimes made even from scrapings from the floors of sugar houses and groceries.

Management of Comb Honey. Comb honey in boxes should be taken from the hive as soon as it is finished, or as soon thereafter as possible. No apiarist can expect to have his honey sell for the highest market price if he permits it to stay in the hives for weeks after it has been sealed over, allowing the bees to give the combs a dirty yellow color, by constantly traveling over it. All box-honey producers know that there always will be cells next to the box that are partly filled with honey, but not sealed over, and when taken from the hive, if the box is turned over sidewise, the honey, being thin, will run out, making sticky work. The remedy for this is a small, warm room. Bees evaporate their honey by heat, and therefore, if we expect to keep our honey in good condition for market, we must keep it as the bees do, in such a position that it will grow thicker, instead of thinner all the while. The honey room should have a window in it and the south side should be painted a dark color, to draw the heat. While the honey is in it the mercury should stand from 80° to 90° Fahr., and when crated for market, you can tip the boxes as much as desired and no honey will drip, neither will any of the combs have a watery appearance: all will be bright, dry and clean.

Extracted Honey is obtained by the frames being uncapped and placed in the basket or frame-holder of a honey extractor, which being attached to a single rod in a large can and revolved, the centrifugal force throws out the pure honey from the combs, which runs down the side of the can and is drawn off and placed in jars or some other desirable receptacle. Extracted honey is the pure liquid minus the comb.

Honey must be " uncapped " before extracting; therefore a good honey knife is a necessity.

Honey can be extracted, if carefully done, without the least injury to the bees or the comb; the latter may be replaced into the hive, and such have often been refilled by the bees within three or four days.

When the breeding apartment becomes so full of honey that the queen has no room to lay, to extract it is a necessity. By the extractor, too, all the honey may be taken from partly-filled boxes—a small comb-holder being furnished with each extractor for that purpose, as well as extracting from pieces when transferring. By its judicious use, many pounds of honey can be obtained that would not be deposited in boxes by the bees. Empty combs in the spring are invaluable, and in the fall there are usually many surplus brood combs. By extracting the honey from these and carefully putting them away, you not only have the honey for use or sale, but also the much desired combs in the spring. Inexperienced bee-keepers are sometimes tempted to extract too closely, and thus ruin the colony. The extractor should only be used when there is a rapid storing of honey, and the outside frames of comb are nearly capped over. Capped brood will not be injured, but there is danger in using the extractor when the brood is uncapped. To prevent swarming, the honey extractor is successfully used by some. Its frequent use will usually control it. Many swarms and large yields of honey will not be obtained during the same season. The one will be at the expense of the other. Honey extracted before it is capped is liable to become sour. It needs " ripening;" if it be " well cured," and placed in a tight vessel, it will keep well.

Considerable confusion has resulted from consumers thinking " extract " and " strained " honey the same thing. The former is obtained as already described, and the latter is the result of hanging up combs, used in the breeding apartment of the hive, and pieces of comb containing bee-bread, dead bees, etc., and catching what passes through the cloth. That is " strained honey," and is quite different from the pure honey extracted as before described, still having the flavor of the bloom from which it came.

Artificial Honey may be made as follows: Common sugar, 4 pounds; water, 1 pint; let them come to a boil, and skim; then add pulverized alum, ¼ ounce; remove from the fire and stir in cream-of-tartar, ½ ounce; and water or extract of rose, 1 tablespoonful, and it is fit for use.

Another: Good common sugar, 5 pounds; water, 1 quart; gradually bring it to a boil, skimming well; when cool, add 1 pound of bees' honey and 4 drops of peppermint essence. For a better article, use white sugar and ½ pint less water and ½ pound more honey. If it is desired to give it the ropy appearance of bees' honey, put into the water ¼ ounce of alum.

Honey from Tomatoes. 1 peck ripe tomatoes; peel, and cook till fine, in plenty of water, then strain. To 1 pint of juice add 1 pint of sugar, let boil to a jelly; while boiling put in one dozen green peach leaves to give it flavor, and a shade of honey. Do not leave them too long, as it would be too dark, and then flavor with lemon or vanilla.

Honey-Comb, a waxen structure full of cells, framed by the bees, to deposit their honey in. The construction of the honey-comb seems one of the most surprising parts of the work of insects. The materials of which it is composed, which, though evidently collected from the flowers of plants, yet do not, that we know of, exist in them in that form, have given great cause of speculation. The wax is secreted, by the peculiar organization of the insect, in the form of small and thin oval scales, in the incisures or folds of the abdomen. The regular structure of the comb is also equally wonderful. The comb is composed of a number of cells, most of them exactly hexagonal, constructed with geometrical accuracy, and arranged in two layers, placed end to end, the opening of the different layers being in opposite directions. The comb is placed vertically; the cells, therefore, are horizontal. The distance of the different cakes of comb from each other is sufficient for two bees to pass readily between them, and they are here and there pierced with passages affording a communication between all parts of the hive. The construction of the cells is such as to afford the greatest possible number in a given space, with the least possible expenditure of material. The base of each cell is composed of three rhomboidal pieces, placed so as to form a pyramidal concavity. Thus the base of a cell on one side of a comb is composed of part of the bases of three on the other. The angles of the base are found, by the most accurate geometrical calculation, to be those by which the least possible expense was required to produce a given degree of strength. The sides of the cells are all much thinner than the finest paper; and yet they are so strengthened by their disposition, that they are able to resist all the motions of the bee within them. The effort of their thrusting their bodies into their cells would be the bursting of those cells at the top, were not these well guarded. But to prevent this, the creatures extend a cord, or roll of wax, round the verge of every cell, in such a manner that it is scarcely possible they should split in that particular part. This cord, or roll, is at least three times as thick as the sides of the cell, and is even much thicker at the angles of the cells than elsewhere, so that the aperture of each cell is not regularly hexagonal, though its inner cavity be perfectly so. The cells which have served or are to serve for the habitation of the worms of the common and one of the male bees, are often made also, at other times, the receptacles of honey; but though these are differently made to serve either use, there are others destined only to receive honey. The celerity with which a swarm of bees, received into a hive where they find themselves lodged to their minds, bring their works of the comb to perfection, is amazing. There are vast numbers at work all at once; and that they may not incommode one another, they do not work upon the first comb until it is finished, but, when the foundation of that is laid, they go to work upon another, so that there are often the beginnings of three or four stories made at once, and so many divisions allotted to carrying on the work of each.

Honey-Dew, a sweet liquid or viscid substance sometimes found on the leaves of trees and other plants in small drops like dew. Two substances have been called by this name: one secreted from the plants, and the other deposited by a small insect. It is probable, however, that both substances are essentially one, being abnormal exudations from the plant caused by insects, microscopic and larger, puncturing it. Bees feed upon honey-dew with great avidity.

Honeysuckle, a shrub, much admired for the beauty or fragrance of its flowers. There are several species. The most common kind growing wild in the Northern States is called the American honeysuckle, or "woodbine." The true woodbine, however, is a European variety, bearing yellow flowers and red berries. The trumpet honeysuckle has bright scarlet flowers, which are yellowish within and scentless. The name "honeysuckle" is said to be derived from the practice of children sucking the flower to obtain the drop of sweet juice at the base.

Hoof, the horny portion of the foot of animals. See Cattle, Horse, etc.

Hoof-bound, having a dryness and contraction of the hoof, which occasions pain and lameness.

Hooping-Cough, a kind of contagious cough, attended with a shrill whoop, and is more common among children. The older the patient is, the lighter the disease. This affection is easily recognized. Treatment—*Hygienic:* Keep the child from all exposure, but do not confine him to a close, warm room, even for five minutes; do not wrap cloths around the throat, or dose with any medicines whatever, not even herb teas; keep the diet steady, and consisting of only the easily digesting aliments; diet rather lightly; keep the extremities warm; and give hand friction twice a day. Do not permit the case to expose other children. *Herbal:* Give lobelia, in slightly nauseating doses, once in two or three hours. Sweetening the dose is beneficial, and the drug may be either in substance, infusion or tincture. "Oxymel of lobelia" is the best preparation.

Another: Onions and garlic, sliced, of each, 1 gill; sweet oil, 1 gill; stew them in the oil, in a covered dish, to obtain the juices; then strain and add honey, 1 gill; paregoric and spirits of camphor, of each, ½ ounce; bottle and cork tight for use. Dose, for a child of 2 or 3 years, a tea-spoon 3 or 4 times daily, or whenever the cough is troublesome, increasing or lessening, according to age.

Another: Drink freely of a tea of red-clover blossoms, either green or dry. This is the best medication of all.

Hoove, Hoven, or **Blown,** is an extremely flatulent distension of the rumen, paunch, or first stomach of cattle and sheep. It is accompanied with excessive pain, and if not soon reduced it speedily proves fatal. See page 230, and article on Sheep.

Hop, a hardy, perennial-rooted, twining plant. Its popular name is an abbreviation of the Saxon word

hoppan, signifying "to climb." The principal use of hops is in the manufacture of beer, and it will be many years before they will be superseded, if ever. The importance of this crop compels us to give some details as to their

CULTIVATION. Very rich land is required. If it has been impoverished, renovation by fresh barnyard manures and alkaline composts will be necessary. After a plantation is started, manuring is done in winter upon the hills, and when in the spring the runners are dug up for sets, the manure is dug in around the outside of the roots just where the young rootlets are starting. You might manure annually if you have sufficient manure. Plow deeply, 9 to 12 inches, and pulverize well. Mark out the ground at intervals of 6 or 8 feet each way, and plant at the crossing of the furrows. If the ground is not sufficiently rich, place three or four shovels of manure in each hill. The planting is done by taking new roots from the old hills. Each root should be 6 or 8 inches long and contain two or more eyes, one to form the root and one the vine. Six plants may be in each hill. The first season the intervening ground may be planted with potatoes or some low crop. No poles will be required the first year. Hoe the plants and keep them clean of weeds. The second year they should be supplied with tough poles 12 to 15 feet long, two or three to each hill. When the plants have reached a length of 3 or 4 feet, train them to the poles, winding them in the direction of the sun's course, that is, heading west on the south side of the pole. Tie them gently in this position by cotton twine, rushes, tough grass or woolen yarn. Go through the plantation every day and tie up again such as may have slipped out of place. Another method requires fewer poles and the use of strong twine stretching from one pole to another; but this is more laborious.

A slightly different plan, more in detail, is this: Cheap stakes 6 or 8 feet high are used, to which the growing vines are tied. Along the ends, half-way between the rows, oak posts rising 12 feet above the surface are set and strongly braced. From the tops of these are stretched, between the rows, No. 9 wires, which are kept from sagging under their load by cross wires upon posts set every five hills in the rows. From the top of every stake ordinary wool-twine is passed over the wire obliquely to the stake in the hill next ahead in the next row. The vines readily follow up the twines and make a succession of beautiful arbors, truly picturesque. The wire for an acre weighs about 400 pounds and costs about $20, varying, of course, according to the price of the wire. You may use about 60 pounds of twine per acre, costing 8½ cents a pound. The wire and twine are cheaper than poles, and much more convenient. The stakes remain in the ground, only the twine being taken down with the hops. In the fall, plow over the hop-yard, turning the furrows toward the hills, as there are no poles in the way.

Hops ordinarily blossom about the last of June or early in July, and remain in bloom about 25 days. Humphrey's Seedling blooms seven days earlier, and remains in bloom only 12 days.

HARVESTING AND PRESERVATION. When the hops have acquired a pretty strong scent, which averages about the first of August, gather them. The seed is then brown and the leaves begin to change color. First cut the vines at the surface of the ground, and pull up the poles and lay them in convenient piles. Strip the hops off the vines and throw them into large baskets, keeping them free from leaves and dirt. Cover each hill with compost, which remove in the spring; run the plow on the four sides as near as possible, laying bare the roots but not injuring the plants; cut the roots with a sharp knife within 2 or 3 inches of the main roots; trim the latter if spreading too far. It is well to break or twist down the first shoots, and allow those which succeed to run, as they are likely to be more productive. The cutting should be done on a sunny day, to prevent too profuse bleeding.

To dry hops, spread them out thinly upon a platform in a shade, and stir them occasionally. A very large quantity is more safely cured in a kiln, which should be very particularly constructed. It should be in a dry hillside, dug the same size at the bottom as at the top; lay the side walls up perpendicularly and fill in with solid stone to give it a tunnel form, 12 feet square at the top, 2 feet square at the bottom, and 8 or 10 feet deep. On the top of the walls lay sills, and let joists into them as for a floor; on these nail laths 1½ inches wide and ¾ of an inch apart; and over these again spread a clean linen cloth and tack its edges to the sills. Then, on each side of the kiln, set up a board about 1 foot wide, to form a bin for the hops. Plaster the inside of the kiln to make it airtight. Charcoal is the only proper fuel to be used in drying hops, and it is better to have it of yellow birch or maple. Thoroughly heat the kiln, and then put the hops upon the cloth; keep the heat steady and regular, but gradually increasing during the process to 100°. Fifty pounds of hops when dried is the largest quantity that should be dried at one time in a kiln of this size; less would dry better. Don't stir them. After lying a few days subsequent to the kiln-drying, the hops will gather little moisture, seeming to undergo a sweat; this will begin to subside in about a week in average weather, at which time, and before the sweat is off, they ought to be bagged in clear, dry weather. In testing from time to time the degree of the sweat, thrust the hand into the middle of the heap and carefully examine them; if you find them very damp and their color altering, they should be re-dried in the open air; or, if the weather be damp, in the kiln. Hops should not remain long in the bin or bag after they are picked, as they will very soon heat and become insipid. In bagging them for market they are pressed in compactly through a box made for the purpose and managed with a screw. The bags may be but five feet long and large enough to contain 250 pounds. A bushel, when dried, weighs 1¾ pounds. The bags are made of coarse, strong tow cloth, or of

Russia hemp. Building houses over the kilns is a good practice in vogue; but they should give good ventilation by doors, windows and a large opening over-head. The apartment in which the dried hops are stored should be so thoroughly partitioned off from the kiln-room as to preclude all moisture from those which are drying.

Hops are liable to attack from various insects, blight, mildew, etc.; but there is no effective remedy for these pests. A white grub frequently gets into the hop-vine just below the surface, and sucks the juice until the vine withers. Lice also sometimes attack the leaves and make quite destructive work. The best preventives are new or fresh soil, which is rich in ashes and the inorganic manures, and in a fine tillable condition to insure a vigorous growth. The best varieties are the English Cluster, the Grape and Humphrey Seedling. The latter originated in Wisconsin, ripens ten to fifteen days earlier, is productive, hardy, not subject to fire-blight or winter-killing.

Hornet Stings: see Stings.

Horse. The family to which the horse belongs comprises animals which have only one apparent toe and a single hoof to each foot; although under the skin, on each side of their metatarsus and metacarpus, there are spurs representing two lateral toes. The family consists of a single genus, equus.

The history of mankind abundantly testifies that every possible use and application of this animal, whether in war, commerce or pleasure, seems to have been anticipated by the most ancient peoples and old-world nations which, ages ago, most largely employed the horse, and which were the great centers of antique civilization. Indeed, it may be asserted that but for the horse the human race could not have reached its present state of progress or refinement, or have been enabled to contend against the numerous obstacles to advancement and material happiness which surrounded it; and it has been well said that, next to the want of iron, the want of horses would have been one of the greatest physical barriers to the perfecting of the arts of civilized life. In all ages and climes, the horse has been the devoted servant of man, whether toiling at the tread-mill or straining every muscle in the race. Beyond all other animals his only equal in usefulness is his iron namesake.

History of the Horse. Fossil bones, supposed by some geologists to be those of the horse, have been found in various parts of the earth, buried deep in depositions of an older date than the era of the creation of man. Some have been recently discovered in our own country, mixed with those of extinct species of animals, although we have no positive proof of their being the bones of the horse. The native country of the horse cannot, with certainty, be traced. He has been found, varying materially in size, in form, and in utility, in all the temperate, in most of the sultry and in many of the northern regions of the Old World. In the Sacred Volume we are told that as early as 1650 years befoie the birth of Christ the horse had been domesticated by the Egyptians. When Joseph carried his father's remains from Egypt to Canaan, "there went up with him both chariots and horsemen." One hundred and fifty years afterwards, the horse constituted the principal strength of the Egyptian army. Pharaoh pursued the Israelites with "six hundred chosen chariots, and with all the horses of Egypt." Fifty years after the expulsion of the Israelites from Egypt, and 1450 years before the birth of Christ, the horse was so far naturalized in Greece that the Olympic games were instituted, including chariot and horse-racing. We have, therefore, sufficient evidence that the horse was, at a very early period, subjected to the dominion of man. A long time must certainly have elapsed before man was able to ascertain the value and peculiar use of the animals that surrounded him. The writings of Moses show us that after the ox, the sheep and the goat, man subdued the ass, and then the camel, and last of all the horse became his servant; and no sooner was he subdued, and his strength and docility and sagacity appreciated, than the others were comparatively disregarded, except in Palestine, where the use of the horse was forbidden by Divine authority.

From Egypt the use of the horse was propagated to other and distant lands, and probably the horse himself was first transmitted from Egypt to several countries. The Bible decides another point: that Arabia, by whose breed of horses those of other countries have been so much improved, was not the native place of the horse. Six hundred years after the time just referred to, Arabia had no horses, "but all the horses for his own cavalry and chariots, and those which he supplied the Phœnician monarchs, he procured from Egypt." The horses of Arabia itself, and of the southeastern parts of Europe, are clearly derived from Egypt; but whether they were there bred or imported from the southwestern regions of Asia, or, as is more probable, brought from the interior or northern coast of Africa, cannot with certainty be determined.

The Israelites were forbidden to use horses for either battle or pleasure, and commanded to hamstring such as they captured in war; yet about five centuries after their exodus from Egypt, they so fondly domesticated horses and so greatly multiplied them that Solomon had 1,400 chariots and 12,000 cavalry. The Egyptians, the Ethiopians, the Medes, the Persians, and the Greeks successfully paid great attention to horses, and maintained them in a spirited and well-trained condition for the purpose of war and the chase; the Greeks introduced either fine breeds of horses themselves, or a taste for possessing and improving them, into Arabia, Barbary, Spain and Southern Italy; and the Romans afterwards diffused them throughout the central, the western, and the northern parts of Europe. William the Conqueror owed the victory of Hastings, in a main degree, to the superiority of his cavalry; and the barons who accompanied him, being made land owners of a very considerable

Fig. 14.—HAMBLETONIAN (RYSDYK'S).

portion of the kingdom, rapidly diffused a valuable mixture of the characters of the Norman and the Spanish horses among the British breeds. A century later King John made some importations from Flanders to give weight and substance to draft and cavalry horses. The improvement of the various breeds were afterwards pursued with more or less judgment and zeal by other British monarchs. It has already been stated that the earliest records we have of the horse trace him to Egypt, whence he gradually found his way to Arabia and Persia, and the provinces which were colonized from Egypt; and thence to other parts of the Old World. But Egypt is not now a breeding country, and it does not appear to possess those requisites which could have constituted one; therefore it is natural, in giving an account of the most celebrated and useful breeds of different countries, to begin with those of Africa. At the head of these is the Barb, remarkable for fine and graceful action. The Barb has chiefly contributed to the excellence of the Spanish horse, from which sprang the wild horses of America; and when the improvement of the breed of horses began to be systematically pursued in Great Britain, the Barb was very early introduced. Next we have the East Indian, the Persian, the Toorkoman, the Tartar and Calmuck, the Turkish, the German, the Swedish, Finland and Norwegian, the Iceland the Flemish and Dutch, the French, the Spanish, the Italian, and the English horses, all of which, more or less, have directly or indirectly contributed to our American breeds.

The first or ancient mode of using the horse was in chariots—a rude vehicle without springs—or riding on horseback without saddle or bridle; hence the Elgin marbles representing the rider on the bare back of his steed without a bridle. After the establishment of the Olympian games, about 775 years before the Christian era, saddles and bridles were invented. They rode about four-mile races in public competition for prizes awarded to the winner. The Olympian games were held once in four years in Greece. They were devoted to athletic sports and horse-racing. Eloquence, poetry and the fine arts were cultivated in these conventions. They were patronized by the most distinguished statesmen and orators of Greece. Alcibiades, the Athenian general and disciple of Aristotle, sent from his stable to one meeting no less than seven-four horse chariots. He came off victorious with three, and drew three prizes. The great object of these four-mile contests was to improve their war horses. Equestrian skill was a profession of the ancients. It gave great distinction to the cavalry soldiers of Greece and Rome.

The horse was early devoted to war—used by tyrants to destroy the human family. Ambitious rulers have used them to extend the dominion of empire, and to protect kings and conquerors in their dominions. Romulus, the reputed founder of Rome, 753 years before the Christian era, selected his body-guard from the youthful sons of the wealthy Roman families, because the monetary aristocracy would mount their sons on gallant chargers, to defend the city, free of expense. This was the institution of the mounted Roman legions that served the State at their own expense. They were called " Knights," a title of honor, conferred for their patriotism and bravery, second only in distinction to the title of a Roman senator. The martial spirit of these young mounted cohorts protected the city, at their own expense, from the barbarous hordes that surrounded it.

Cæsar depended for his cavalry upon horses procured from Gaul, which could ride over the Roman chargers at the battle of Pharsalia as if they were infants in cavalry tactics. Pompey the Great, who had been victorious upon a hundred battle-fields, and made twelve crowned heads submit to the power of Rome, could not stand before the powerful cavalry of Cæsar. He was ignominiously defeated by the great conqueror of three hundred nations or tribes and eight hundred cities, who, in a sixty days' fight made himself Dictator of Rome.

The Grecian horses could not stand before the more powerful chargers of the Persian cavalry. Their irresistible charges would break the line of Grecian cavaliers, and scatter them like chaff before the wind. The Greeks instituted chariot racing, breeding stables, and imported Persian or foreign stallions to breed up a more powerful race of horses, so that the great lawgivers of Athens might extend their dominions against the more formidable cavalry of the surrounding nations.

The Greeks first drove the horse to a rude chariot, and then found they could manage him while on his back, with the voice or a switch and without either saddle or bridle. This ingenious people soon invented the snaffle bridle, and both rode and drove with its aid. The curb bit was a Roman invention, whilst shoeing was not practiced by either Greeks or Romans. Saddles and harness were of skins and sometimes cloth. Among the semi-civilized Tartars of middle and northern Asia, and some other rude nations, the flesh of the horse is used for food, and mare's milk for domestic purposes, the latter forming, when fermented, an acid drink which is intoxicating.

The horses found in the wild state on the pampas of the South and in the prairies of North America, are undoubtedly descendents of the Spanish chargers, escaped or let loose in the exploring expeditions of De Soto and other adventurers, especially from the horses that escaped in the Spanish wars with Mexico and Peru, increased by those abandoned at Buenos Ayres. The blood of the Barb predominates in the Spanish horse, a breed brought into Spain by the Moors. The Mexican ponies to this day show unmistakable marks of oriental blood.

Horses are not supposed to be indigenous to the western continent; at least none of the first discoverers have left on record any evidence of their existence. We know that Columbus, in his second voyage to this continent, in 1493, brought over horses, the first probably that ever saw the light of the sun in the western hemisphere.

In 1864 a French lawyer, M. L. Escarbot, brought horses and other domestic animals from France into Acadia, from which descended the French horses now in that country. In 1609, the English colonizing ships, landing with emigrants at Jamestown, Va., brought over from England six mares and one horse. In 1625, a stock of horses was imported from Holland to New York by the Dutch West India Company. In 1629, Francis Higginson, an English emigrant, brought over horses and mares to Massachusetts, from which descended the first stock of New England.

From these early periods and beginnings and subsequent importations many millions of horses have spread over the United States. Some of the noblest steeds and greatest performers in the world are numbered among our running and trotting celebrities, and our draft and road horses are taking rank with the best breeds of England and France.

ANATOMICAL CHARTS.—PLATE VI.

Upon this plate are illustrated the superficial muscles of the horse. These constitute what is known as flesh, and form the chief bulk of the soft parts external to the three great cavities—the cranial, thoracic and abdominal. On the trunk they are spread out in layers, varying in thickness so as to form a protection to the organs within, being easily capable of extension or contraction, and are means of moving the several parts upon each other.

The muscular system of the horse is studied by what is known as comparative anatomy, *i. e.*, the various muscles are compared with the corresponding muscles in man, which are very fully treated in this volume under the head of anatomy. The following are the names of the various muscles represented by the figures upon this plate, and the general observations given under the head of Plate I, upon the actions of muscles, are precisely what may be said upon those of the horse.

No. 1, occipito frontalis; 2, the muscles of the ear; 3, orbicularis oris; 4, depressor labii inferioris; 5, the zygomatic muscles; 6, platysma myoides; 7, sterno-cleido-mastoid; 8, trapezius; 9, infraspinatus; 10, deltoid; 11, latissmus dorsi; 12, the triceps; 13, the biceps; 14, supinator brevis; 15, flexor carpi ulnaris; 16, extensor carpi ulnaris; 17, extensor ossis metacarpi pollicis; 18, flexor brevis pollicis; 19, linea alba; 20, oblique; 21, the chest; 22, adductor longus; 23, pectineus; 24, rectus femoris; 25, vastus externus; 26, peroneus longus; 27, tibialis anticus; 28, the annular ligament; 29, the soleus.

Besides the muscles there are fibrous tissues, tendons, cartilages and ligaments. The former exist very generally throughout the body, and are found under three forms, as white, yellow and red fibrous tissue. These tissues are very flexible. Ligaments are glistening and inelastic bands, and are of all forms. Tendons are constructed like ligaments, but usually in larger and more rounded bundles, and like ligaments are composed of white, fibrous tissue, and are used to connect muscle with bone.

PLATE VII.

We have here a very interesting illustration of the lateral section of the horse, showing the contents of the thorax and abdomen, the intestines being removed. The thorax is the cavity formed by the vertebræ, ribs and their cartilages with the connecting muscles, the sternum, the diaphragm and the inner margin of the first rib. It contains the central part of the important organs of circulation and respiration, and gives passage to the œsophagus as it connects the pharnix with the stomach. The principal organ, the heart, shown by 15, lies far forward. No. 14 represents the lungs, a section of the outer covering being removed, showing the circulation. No. 4 shows the œsophagus, and 5, the trachea.

Lying immediately behind the thorax, and separated only by the diaphragm, are the organs of digestion, and the space in which they are packed is called the abdomen. The contents of the abdomen are the stomach, shown by 10, 11 and 12; the liver, the spleen, pancreas, the large and small intestines, the kidneys and the mesenteric gland. Some of these organs lie close to the spine, as the kidneys, 17, and the pancreas. The stomach lies immediately behind the diaphragm, 13, and resembles in shape the Scotch bagpipe, and has two openings. The first, shown at 11, is formed by the termination of the œsophagus as it passes through the diaphragm, and the latter, at 12, communicates with the duodenum.

No. 3, on this plate, represents the spinal column, while 2 represents the cerebrum or anterior portion of the brain; No. 20, the cerebellum or posterior portion of the brain; No. 6 represents the tongue; and No. 8, a section of the anterior portion of the upper jaw; No. 7, the Schneiderian membrane; No. 9, the spleen; and No. 17, the kidneys.

PLATE VIII.

This plate illustrates the general circulation, showing the larger arteries as they arise from the heart and ramify throughout the body, and the veins—the blue lines—as they in turn gather the blood from all portions of the body and return it to the heart. The action of the heart is similar to that in man, which is explained in the article on anatomy, as are also the arteries and veins.

PLATE IX.

Upon this plate is shown the skeleton or framework of the horse, which is quite fully treated on page 676, so it is unnecessary for us to give more than an explanation of the figures on the plate:

1. Cranium.	10. 10, False ribs.
2. Lower jaw.	11. Cartilages of false ribs.
3. Cervical vertebræ.	12. Humerus.
4, 4. Dorsal vertebræ.	13. Upper end of the ulna
5, 5. Lumbar vertebræ.	14, 14. Radius.
6, 6. Sacrum.	15. Scapula.
7, 7. Coccygeal vertebræ.	16. Os pisiform.
8. Sternum.	17, 18, 19, 20, 21 and 22. Carpal bones.
9. True ribs.	

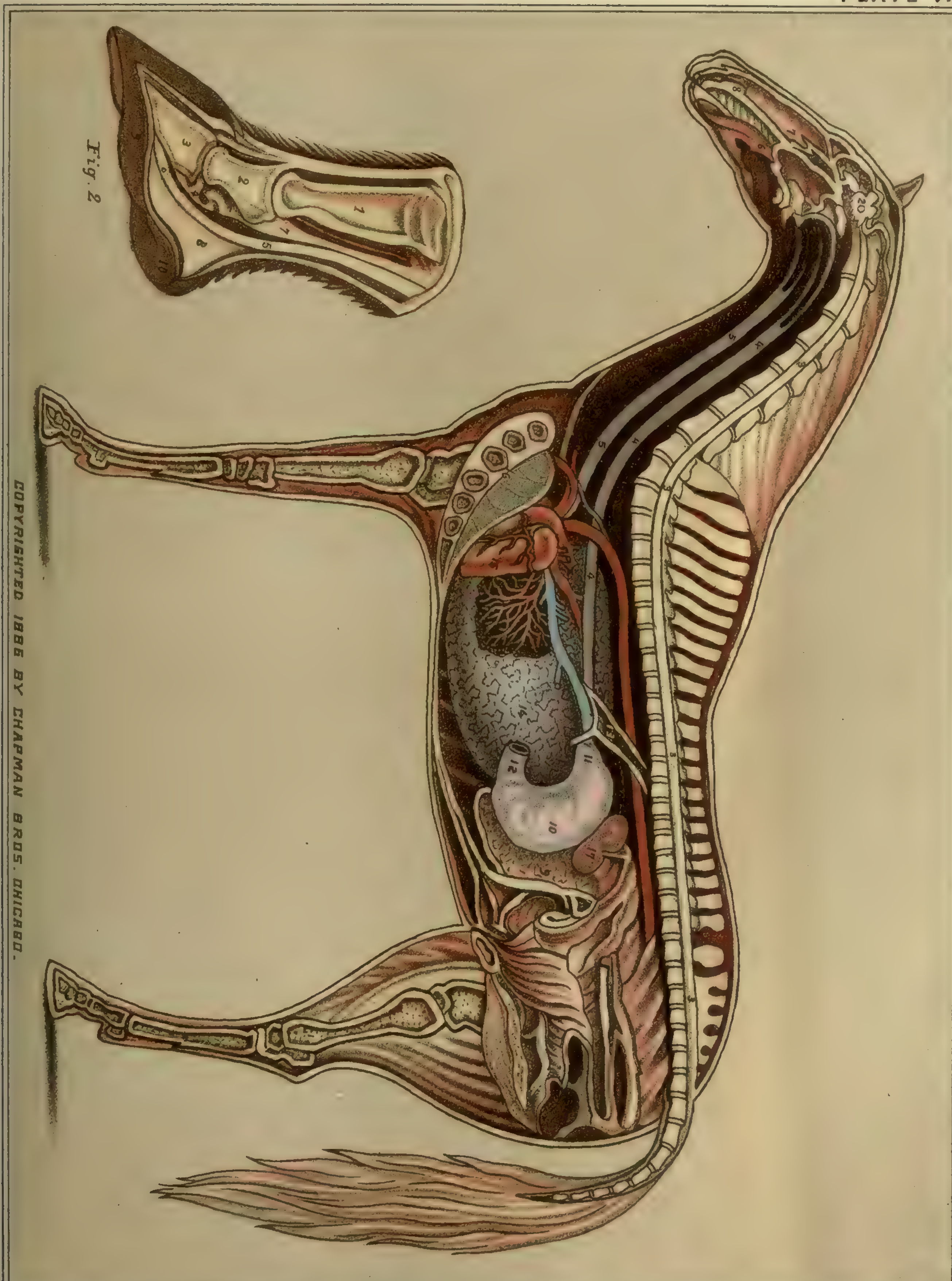


Fig. 2

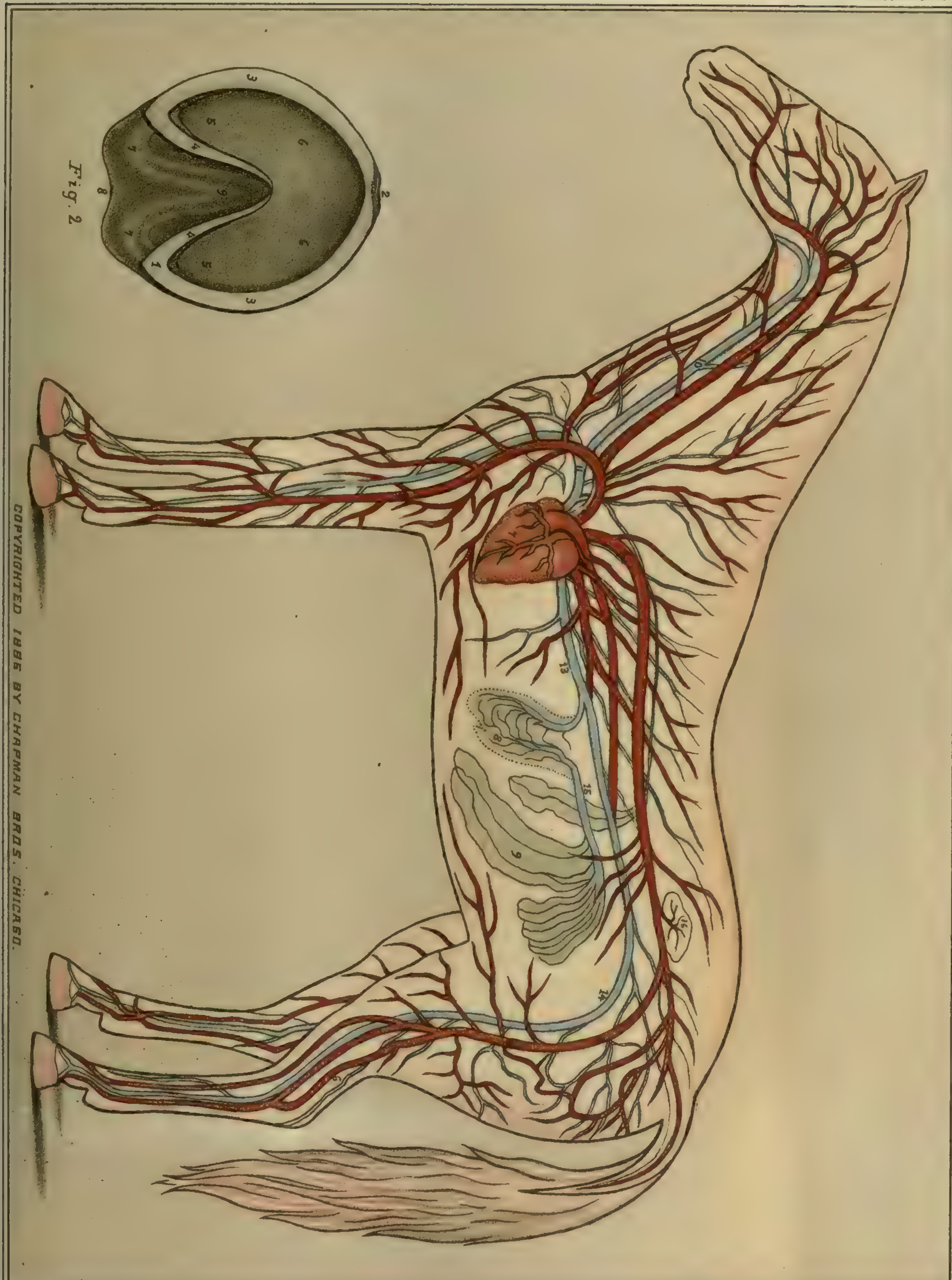


Fig. 2

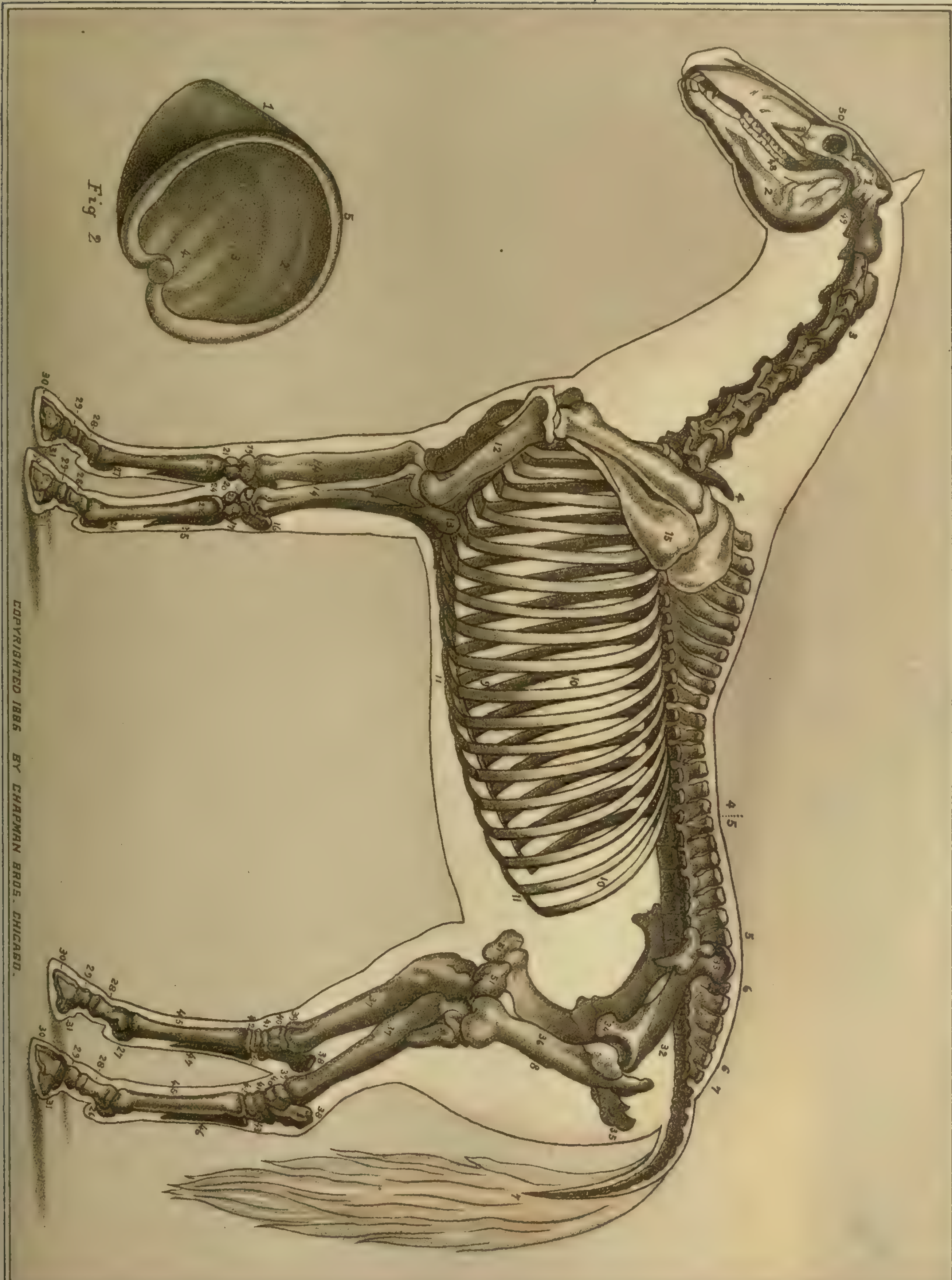


Fig 2

23. Large metacarpal bones.
24. Outer metacarpal.
25. Small metacarpal.
26, 27. Sesamoid bones.
28, 28. Os suffraginis.
29, 29. Os coronæ.
30, 30. Os pedis.
31, 31. Wing of pedal bone.
32, 33, 34, 35. Os innominatum.
36. Femur.
37, 37. Tibia.
38, 38. Os calcis.
39, 39. Astragalus.
40. Hock joint.
41, 42, 43, 44. Tarsal bones.
45. Large metatarsal bone
46. Small metatarsal.
47. Inner metatarsal.
48. Inferior maxillary.
49. Atlas.
50. Orbit.
51, 51. Patella.

THE FOOT.

There is no part of the horse that requires greater care, both in health and disease, than the foot. This subject is elaborately treated in the articles on the horse and shoeing, but these plates will be of value in studying this important section of this animal.

On Plates VII, VIII and IX are represented sections of the foot. Figure 2, on the first-named plate, shows a section of the parts entering into the composition of the foot and the fetlock and pastern joints. No. 1 shows the os suffraginis; No. 2 shows os coronæ; No. 3, os pedis; No. 4, os naviculare; Nos. 5 and 6, the perforans and perforatus tendon; No. 7, inferior sesamoidæl ligament; No. 8, cleft of frog; No 9, sole; No. 10, side of frog cleft.

Figure 2, in Plate IX, represents the hoof. No. 1 showing outer surface of the crust; No. 2, the inner surface of the crust; No. 3, the upper surface of the sole; No. 4, part corresponding with the cleft of the frog, and No. 5, coronary band.

Figure 2, on Plate VIII, represents a sound forefoot prepared for the shoe. No. 1 shows the heel of the crust; No. 2, the toe; Nos. 3, 3, the corners of the crust; Nos. 4, 4, the bars as they should be left with frogs between them; Nos. 5, 5, the angles between the heels and bars where corns appear; Nos. 6, 6, the concave surface; Nos. 7, 7, the bulbous heels, and No. 8, the cleft.

Points of a Horse. The best relative proportions of the various points of a horse will, of necessity, differ widely in animals destined to work of very dissimilar character. The points which would be highly prized in a race-horse would materially lessen the value of a cart-horse. But, notwithstanding this, there are certain points which should be found well developed in good horses of every breed, class and variety. Such are: width of forehead, indicative of large volume of brain, and denoting courage, tractability, cleverness, etc.; width of nostril, as well as of jaw, for the full and easy play of the breathing apparatus; fullness and clearness of the eye, together with a soft, gentle expression, pointing to soundness and good temper; medium-sized ear, etc.

The neck should be neither too long nor too short. It should be sinewy and full, with a sweep between the withers and breast, and gradually slope off until it joins behind the ear.

In the fore-quarters the most important point is the shoulder, if the horse is intended for the saddle. In the draft or farm horse, on the contrary, an upright shoulder, well equipped with muscle, is desirable, and in a measure, also, in the trotter and carriage horse, the pressure of the collar demanding a steady and comparatively motionless surface to sustain it. The point of the shoulder should be fully developed, but there should be no projections in it. When the true-arm is short and the elbow is under, or only slightly behind it, the action of the horse will seldom be good. When the elbow turns inward the horse is liable to turn his toes out; in the contrary case, to turn them in. A muscular and long forearm is the surest indication of grand, strong action, and is a most important point. The knee should be considerably broader than the adjacent parts of the leg above and below, when looked at from the front, tapering off to a thin edge behind, with marked development of the pisiform bone, which projects backward at its upper part. Below the knee the leg should be as large as in any other part, and not bent inward, which is a sign of weakness. A slight bending forward of the knee is far preferable, unless it rise from overwork. Large, flat cannon bones are important, with a full-sized suspensory ligament. The fetlock should be large and clean, and the pasterns form an angle somewhat over forty-five degrees with the ground. The foot should be round and moderately broad, but not flat.

In the middle piece the withers first claim our attention. They should be moderately high and thin; not too prominent and not devoid of muscle. The volume of the chest shows the size of the lungs, as well as the development of the larger digestive organs. Too great breadth of chest is not a point to be commended in the case of the racer or trotter, inasmuch as it interferes with the free action of the arms and shoulders as they move on the ribs. In them depth of chest must supply the want of width. The size of the chest at the girth indicates the capacity of the lungs; bottom, or staying power, depends upon the depth of the back ribs. To this last point especial attention should be paid. The back should be short and spacious. From the shoulder point to the back of the quarters the distance should be greater than the height at the withers. The perfection of shape in this point is embodied in the saying, "Short above; long below."

The hind-quarters will have to present characteristics dependent upon both the breed and the purposes for which the animal is to be used. In the draft-horse, the main requirement is strength, solidity of build and stamina. In his case the lower thigh is much shorter than that of the Thoroughbred, the hind-leg much straighter, and the angle formed by the hocks very small; whilst the upper thigh is nearly or quite as long as that of the Thoroughbred. In the latter, when intended for high speed, the two bones which unite at the stifle-joint should be amply long. In a flat outline, the length from the

hip-joint to the stifle-joint will measure 24 inches in a horse of 15 hands, three inches, and proportionately as the height be greater or less; measured around the surface it will be about 26 inches. The gaskin, or lower thigh, should be of nearly the same length; but, in a high-bred, well-proportioned horse, it will measure quite 28 inches from the stifle-joint to the point of the hock. Great muscular power in quarters and gaskins is a desideratum in any breed of horse, for these furnish the main propelling power. In selecting a horse it is an excellent plan to survey the quarters from behind, see that they are large in volume, well-knit, close together, and leave no hollow below the arms. Should these conditions not exist, there is reason to fear some constitutional weakness in the animal. The hock, which has to bear all the strain exercised by the muscles, ought to be clean and flat, but of good size, without any gumminess or thorough-pins, and with a clearly defined point standing out from the rest of the joint. The place of the spavin, and the "curby place" should not be enlarged, the hocks be well let down and the cannon-bone short. The pasterns and feet should be proportioned to those of the fore extremity. Horses in which even all the points above enumerated seem to exist when in the stable or at rest, should never be purchased without being tried in action; because there are many cases in which the most finely formed and proportioned horse will fall short of what ought to be expected from him, and other cases in which a horse apparently faulty in one or more points will, in action, greatly surpass the opinion formed of him.

The various parts of the horse, when in perfect proportion to each other, ought, according to the best authorities, to give the following measurements. The horse is supposed, as above, to be 15 hands 3 inches in height:

	INCHES.
Height at withers and croup	63
Length from shoulder-point to quarter	66
From the lowest part of the chest to the ground	36
From the elbow-point to the ground	39
From the withers to the pole, just behind the ears, in a straight line	30
The same, measured along the crest	32
Length of head	22
Width across the forehead	9½
From the withers to the hip	22
From the stifle-joint to the point of the hock	28
From root of tail to stifle-joint	26
From the point of the hock to the ground	22½
Length of arm from the elbow to the pisiform bone	19½
From pisiform bone to the ground	19½
Girth	76-79
Circumference of fore cannon-bone, about	8

Such are the various external points or characteristics which should be found in a really good, well-bred horse. As previously stated, the heavier and more solid draught-horse will, in many points, deviate from this standard, but there are good and sufficient reasons for this, which have already been dwelt upon.

Bone Structure. It is not intended to overload this article with more technicalities than are absolutely essential to the thorough understanding of the subject by the reader. Of these the greater number will occur in describing the bone structure or skeleton of the horse, without a sufficient knowledge of which those interested in horses, whether as breeders, trainers, buyers or otherwise, can never hope fully to master this most important subject.

The number of bones composing the skeleton of the horse is two hundred and forty-seven, which are united by joints to form the spine, thorax, pelvis, tail and fore and hind quarters.

The spine consists of 7 cervical (neck), 18 dorsal (back) and 6 lumbar (loin) vertebræ or joints	31
The thorax is formed of the dorsal vertebræ, with 18 ribs on either side, and the sternum in the middle	37
The pelvis is made up of two ossa innominata (unnamed bones) and 1 sacrum	3
The tail usually contains 17 bones	17
The fore extremity is composed of 20 bones on each side	40
The hind extremity has 38 bones	38
Cranium (skull)	10
Face and lower jaw	18
Teeth	40
Internal ear bones, 4 in each	8
Bones of the tongue, five sections	5
	247

The Spinal Column. In the horse this is the first portion of the skeleton developed in the embryo. It is the frame to which all the other parts are joined. At first it is a cylinder of cartilage, but in course of time bone points form corresponding to each vertebra or joint, the whole being finally divided into separate pieces called vertebræ. The vertebræ may be divided into true and false, the former extending from the head to the pelvis, the latter from the pelvis to the hind extremity of the animal, comprising the sacrum and coccyx. The true vertebræ embrace the 7 cervical, 18 dorsal and 6 lumbar vertebræ. From each of these, two plates, called *laminæ*, project upwards, terminating in a spinous process. Besides this there are two lateral or side projections, called transverse processes, which perform the office of binding firmly together the vertebræ themselves, and these to the ribs and extremities below, by means of the muscles attached to them. Further, each vertebra has two small projections before and behind (articular surfaces) which form distinct joints between them. The spinal cord and its clothing lies in a somewhat triangular opening between the body, the laminæ and the spinous process. The edges of this aperture are attached to those before and behind it by light yellow (subflava) ligamentous tissues. Opposite these openings the bone is indented below and above, and opposite each space between the vertebræ the ligamentous tissues are pierced by holes on each side allowing a passage to the vertebral nerves which stretch thence to the exterior as well as to the extremities of the body. The spinal column is thus a flexible tube serving to enclose the spinal cord and afford a passage for the nerves, while it is firmly secured and infinitely better adapted to the necessary end than if formed of one piece of bone, which would be no aid to locomotion, be devoid of flexibility and very liable to break under a heavy weight.

Head, Face and Hyoid Arch. The bones of the skull serve the same purpose in the case of the brain as those of the spine do in that of the spinal cord or marrow. They form a series of imperfect arches pro-

Fig 10.—ALMOT.

tecting the brain. The thirteen bones of the cranium are named as follows:

1. Occiput.	7. Malar bone.
2. Parietal bone.	8. Posterior maxillary bone.
3. Frontal bone.	9, 11. Nasal bone.
4. Petrous portion of temp'ral bone.	10. Anterior maxillary bone.
5. Zygomatic arch.	11. Temporal fossa.
6. Lachrymal bone.	12, 13. Lower jaw.

It may be here stated that the skeleton of the horse, like that of most of the superior class of vertebrate mammalia, is divided into three arches, connected one with the other by the spine, but interrupted below at certain distances so as to allow of the arching or bending of the frame which takes place in rapid locomotion. The first of these arches, called neural (from neuron, a nerve), forms the jaws and bone of the tongue; the second or hæmal (hæma, blood), comprises the ribs and sternum, and constitutes the thorax and its appendages; the third or pelvic, which protects the organs of generation, and, through its prolongation, the posterior extremities, assists in locomotion.

The facial bones, the os hyoides and the lower jaw are suspended from the neural arch just in the same manner as the ribs and the pelvic bones behind them are attached to the vertebræ. In the horse, as distinguished from many of the higher vertebrates, there is no collar-bone, the fore extremity, in his case, being joined to the thorax by two broad bands of muscle. Its liability to fracture and dislocation is thus lessened, but he is thereby made more subject to strains and rheumatic affections of the muscular sling. The fore-quarters, being nearer the center of gravity, support more weight than the hind-quarters. The latter are the chief propelling force, the former acting somewhat after the manner of springs.

TEETH. The teeth are the only true index by which the age of the horse may be known. To do this with any degree of accuracy, a very thorough knowledge of the changes which take place in them from time to time must be had. We therefore give very full and careful explanations, with illustrations, of these changes. This will enable one of ordinary acuteness and powers of observation to tell the age of this noble animal. The incisors furnish the chief indications; to them, therefore, must the attention be chiefly directed. The back and hook teeth should be observed to some extent, as their condition often serves to correct and corroborate the indications of the incisors. The form of the incisors should be studied by carefully examining those taken from dead horses of different ages.

When the horse has a full mouth, he has 40 teeth, which are as follows: 1. The incisors or nippers—six in the upper jaw and six in the lower jaw. 2. The canine or tusks—two in the upper jaw and two in the lower jaw. 3. The molars or grinders—twelve in the upper jaw and twelve in the lower jaw. The mare has but 36 teeth, her mouth being deficient of the four canine teeth. The rudiments of these teeth sometimes make their appearance in the mare, but they never become developed as in the horse. Each tooth is made up of three substances—cement, enamel and dentine. These three constituents of the horses' tooth, being of different degrees of hardness, the enamel leading in this quality, wear away with varying degrees of rapidity. The result is the rough surface of the equine tooth, which is peculiarly well adapted to the crushing of grain, upon which the animal is largely fed. The milk incisors differ considerably in shape from the permanent teeth. The milk teeth are much smaller, especially at the roots, while in the permanent set the thickness is nearly uniform throughout the tooth. The milk teeth, too, are indented on the outside, are whiter, and on their table the marks are much less perceptible than in the permanent teeth. As the teeth wear away they present an appearance which varies according to the amount of wear they have undergone. A means of determining approximately the age of any horse has thus been secured. In the parlance of horse-breeders and dealers, etc., the incisors are called nippers, the canine teeth tushes, and the molars grinders.

At the end of the first year the colt has generally cut his 16 grinders and 12 nippers. The eight forward grinders are usually visible at birth; the two central nippers a week afterward. At the end of the first month another grinder shows itself all around, and in the middle of the second month the next nipper shows itself. At the end of the second month the central nippers are full-grown, and the second about half-grown. The corner nippers are cut between the sixth and ninth month, and are full-grown by the end of the first year. The first set of nippers, as before stated, are much smaller than the permanent teeth, are more hollow towards the mouth, the outer edge being at first higher than the inner, and are more rounded in front. As they wear away, these two edges soon get level, but the corner nippers preserve this characteristic for a long time. At the end of six months the central nippers are almost level; the black mark in their middle is broad and ill-defined. At the end of the ninth month the next upper and under nipper are worn down to almost even surface.

FIG. 5.—*Three-year-old Mouth.*

B. Anterior maxillary bone. 1. 1. Central permanent nippers, nearly full-grown. 2. 2. Milk teeth worn down. 3. 3. Corner milk teeth, still showing central mark. 4. 4. Tushes concealed within the jaw.

In the first month of the second year, at latest, a fourth grinder makes its appearance all around. These are the firstlings of the permanent set. The three first molars are also shed. At 18 months, the mark in the central nipper is very faint; the corner nippers are flat, but mark is very clear. As a matter of course there will be a perceptible difference in these conditions between colts fed on soft, fresh food, and those on corn, dry hay, etc.

The second tooth-cutting begins during the third year, and takes place in the same order as the milk teeth appeared. Both are present in the jaw in a more or less rudimentary form at birth, the permanent being more deeply set than the milk-teeth. As the mouth grows, it becomes too large for its first set of teeth, and the roots of these being pressed upon by the growth of the permanent set, their fangs are absorbed and allow the new teeth to show themselves, either in the places of the former or by their sides. When the permanent teeth, instead of forcing the milk-teeth out, show themselves by the side of the latter, they are called wolf's teeth. The sixth grinder shows itself towards the end of this year, but is slow of growth, the upper and lower central nippers fall out and their place is supplied by the permanent ones.

FIG. 6.—*Mouth of the Colt at Four and a Half Years.*

A. Anterior maxillary bone. 1. 1. Central nippers considerably worn down. 2. 2. The next pair, fully developed, with their edges slightly worn. 3. 3. Corner permanent nippers in a state of growth, with the edges of the cavity sharp, and the mark very plain. 4. 4 The tushes showing themselves through the gum, but not full-grown.

At three years and four or six months, the next nipper is shed all around and replaced by the permanent tooth. The corner nippers are much worn and the mark in them barely perceptible. At four years, the edges of the central nippers become blunted and the teeth themselves have grown considerably. The next nipper all around has attained nearly its full size, the edges being still quite sharp, and the mark deep and well defined. The corner nippers ought still to be in their place, but a wish to misrepresent the age of the animal sometimes induces the horse-dealer to knock them out. Between four and a half and five years, the corner nippers fall out and the tusk is visible.

FIG. 7.—*Lower Nippers and Tushes at Five Years Old.*

1. 1. Central nippers, with their marks almost entirely worn out. 2. 2. Next nippers, showing marks partially worn. 3. 3. Corner nippers, with the mark plainly seen, but the edges partially worn. 4. 4. Tushes with the grooves inside almost obliterated.

At five years the mouth is furnished with its full complement of teeth, as shown in Fig. 7. At this age the central cavities of the lower teeth, as compared with the upper, are much more worn, the middle nipper having only a small black spot in the midst of a smooth surface; the next is much worn, and though the corner teeth show the mark distinctly, they also indicate considerable wear. The tush is prominent; the outer surface convex, the inner concave, the edges clear and sharp. The sixth molar is full-grown, and the third has made way for the permanent tooth. These are the teeth which furnish the best evidence as to age, in case of doubt. The mouth of the six-year-old is the last which affords any reliable ground of judgment as to exact age. The nippers of the lower jaw are known to wear out two years sooner than those of the upper jaw, so that up to the eight years, the horses' age may be determined with tolerable accuracy by examining them later, in the general run of cases, up to the age of eight years.

FIG. 8.—*The Lower Nippers and Tushes of a Six-Year-Old Horse.*

The lower jaw. 1. 1. The central nippers, with the marks worn out. 2. 2. The next nippers with the marks disappearing. 3. 3. The corner nippers, showing the mark plainly enough, but with the edges of the cavity considerably worn. 4. 4. The tushes, standing up three-quarters of an inch, with their points only slightly blunted.

Up to the age of six, the nippers of each jaw are nearly vertical to one another; after this age they begin to stand outwards from the straight line, and, in the very old horse, form a sharp angle. At the age of eight (Fig. 9), the upper nippers present much the same marks as the lower nippers do at six. Both tushes are much worn away at the points—the upper ones more than the lower.

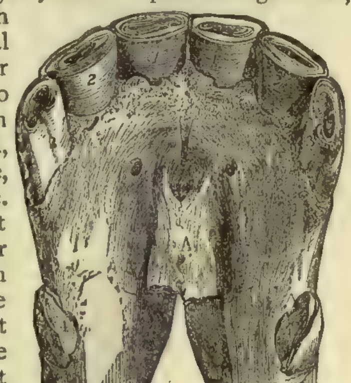


FIG. 9.—*Upper Nippers in the Eight-Year-Old Horse.*

A. Anterior maxillary bone. 1. 1. Central nippers, worn to a plane surface. 2. 2. Next pair, still showing a slight remnant of the cavity. 3. 3. Corner nippers, showing the mark plainly enough. 4. 4. Tushes, more worn down than in the lower jaw of the six-year-old mouth.

At nine years, the upper middle nippers are thoroughly worn down; the second pair have still a faint mark left and the corner nippers nothing but a dark stain without any central depression. After the ninth year the age of the horse is a matter of conjecture. The teeth increase in length and are more in a line with the jaw. The visible section of each nipper, instead of being oval, becomes more and more triangular, and the tooth becomes almost round. The teeth assume a dirty yellow tint, with brown and black streaks. The tushes wear down to a very diminutive size, and frequently one or both drop out.

In addition to what has been already said touching the punching out of the milk nippers, it may be well to state here that dealers not unfrequently saw all the nippers of an old horse off to the length which they have in the six-year old. The teeth, too, are occasionally burned to a properly regulated depth. As

in most of these cases only the experienced eye can detect the deception, it would be next to impossible to give rules for the uncloaking of the fraud.

After the horse passes his ninth year his age cannot be told with absolute certainty, yet by studying the changes after that time a good judge will not miss it far. The following are the changes as indicated after the animal passes his ninth year:

At nine years, the middle nippers are rounded on the inner side, the oval of the second pair and of the corner teeth becomes broader, the central enamel is nearer to the inner side, and the marks have disappeared from the teeth of the upper jaw.

At ten years, the second pair are rounded on the inner side, and the central enamel is very near to the inner side.

At eleven years, the corner teeth are rounded, and the central enamel becomes very narrow.

At twelve years, the nippers are all rounded, and the central enamel has entirely disappeared from the lower jaw, but it may still be seen in the upper jaw.

At thirteen years, the middle nippers commence to assume a triangular form in the lower jaw, and the central enamel has entirely disappeared from the corner teeth of the upper jaw.

At fourteen years, the middle nippers have become triangular, and the second pair are assuming that form. The central enamel has diminished in the middle nippers of the upper jaw.

At fifteen years, the second pair have become triangular; the central enamel is still visible in the upper jaw.

At sixteen years, all of the teeth in the lower jaw have become triangular, and the central enamel is entirely removed from the second pair in the upper jaw.

At seventeen years, the sides of the triangle of the middle nippers are all of the same length; the central enamel has entirely disappeared from the upper teeth.

At eighteen years, the sides of the triangle of the middle nippers are longer at the sides of the teeth than in front.

At nineteen years, the middle nippers become flattened from side to side, and long from front to rear.

At twenty years, the second pair assume the same form.

At twenty-one years, all of the teeth of the lower jaw have become flattened from side to side, their greatest diameter being exactly the reverse of what it it was in youth.

THE THORAX. As, in subsequent portions of this article, much will have to be said touching the treatment of the horse in disease, especially when either distance from a city or a sudden emergency renders it impossible or very difficult to procure the services of a qualified veterinarian, the chief parts of the horse's trunk will here be briefly explained, so as to render the treatment of the animal under such circumstances more intelligent and consequently more humane.

The thorax, which has already been mentioned and explained in connection with the bone-structure surrounding it, is what is usually termed the chest, and contains the breathing and blood-circulating apparatus of the horse. The œsophagus, connecting the pharynx with the stomach, passes through it. These organs of circulation and respiration are covered with smooth serous membranes, the *pleura* and *pericardium*. The former of these two covers the lungs, except at their roots, where the blood-vessels and air-tubes enter them. It is then called the *pleura pulmonalis* (lung pleura). It also covers the ribs, enabling them to contract and expand with ease, by the gliding of one surface against the other. The name then given it is the *pleura costalis* (costal or rib pleura). These two together form a bag, which holds, in health, only sufficient serum to lubricate its walls; in disease this amount increases indefinitely, frequently leading to dropsy or a great mass of pus, where severe inflammation of the membrane exists.

Of the heart and its action it is unnecessary to treat here, the subject being familiar to every one, as well as the action of the lungs. It is more important to describe briefly the abdominal and pelvic viscera (intestines). The digestive organs lie immediately behind the thorax, from which they are separated by a thin wall of membrane called the diaphragm. The space in which these organs are contained is called the abdomen. It is capable of very great distension. The movement of the diaphragm in the act of breathing causes the flanks of the animal to rise and fall, and thus indicates either the distress of exhaustion or any peculiarity of breathing, such as "broken wind" or the various inflammatory conditions of the lungs. In their natural condition the abdominal muscles slope gently from their costal (rib) to their pelvic attachments or ligaments. Consequently the width and depth of the pelvis and back ribs indicate the normal capacity of the abdomen. Narrow, shallow back ribs usually indicate weakness of the digestive organs in the horse. The abdomen contains the stomach, liver, spleen, pancreas, the mesenteric (middle intestine) and chyle-bearing ducts, the kidneys, with their vessels and nerves. Of these organs, some, such as the kidneys and pancreas, are attached close to the spinal column; others glide upon each other, this motion being facilitated by a serous coat, similar to the pleura, called the *peritoneum* (Greek, to stretch around). The barbarity of those who, kicking the horse under the belly, as is not unfrequently done, injure these important organs, is at once manifest.

The stomach is situated on the *left* side of the abdominal cavity, just behind the diaphragm. It is pear-shaped, has two openings, two surfaces and two bags, usually divided by a narrow neck. Generally in the horse of medium size it will hold about three gallons. The intestines are divided into large and small, and measure, in an average-sized horse, from eighty to ninety feet in length. They extend from the stomach to the arms. The small intestines range between an inch and an inch and a half in diameter, except at

their forward orifice, where they are much enlarged, forming, as it were, a kind of smaller stomach. They are tied to the upper walls of the abdomen by the mesentery, and thus become folded. The mucous coat of the stomach presents innumerable little projections, like the pile of a velvet carpet; through these the chyle is taken up. The large intestines are shorter than the small ones by two-thirds. They are gathered up in pouches or cells by a peculiar arrangement of the longitudinal muscular fibers. The mucous membrane is sparely furnished with these projections, called *villi*, and they become rarer towards the rectum. The liver is close to the right side of the diaphragm. It is unnecessary to describe it. It is enveloped by the peritoneum, except at the entrance and exit of the large veins. The bile seems designed to dissolve the fatty matter contained in the food, and to stimulate the intestines in their functions. The function of the spleen is involved in doubt; that of the pancreas is believed to be similar to the action of the saliva. The right kidney is completely within the ribs; the left barely advances beyond the eighteenth rib. The average kidney of the horse weighs about two pounds eight ounces. The pelvis contains, in both sexes, the bladder, rectum and organs of generation. The bladder occupies the middle space of the pelvis, and, according as it is full or empty, occupies more or less of the space of the abdomen.

THE NERVOUS SYSTEM is to the horse, indeed, to all animated beings, the fountain of motive power. It is composed of two different colored substances, the one grey and granular, the other white and fibrous. The former is the reservoir of all nervous power; the latter simply forms the line of its communication from the brain to any part of the body.

The nose of the horse is endowed with marvelous sensibility, which he exercises in the selection of his food.

The eye is a most important organ in the horse, and deserves some detail, inasmuch as ignorance of its construction and needs has been the cause of untold suffering to the horse, and has added considerably to the chapter of dreadful but unavoidable accidents. In the eye of the horse there are three humors, which perform the office of lenses, and concentrate the rays of light on the back part of the eye, called the retina. These humors are: The aqueous (watery), the crystalline lens, and the vitreous humor (glassy). The first is a perfectly clear fluid, which is rapidly renewed when it is let out by puncturing; the second is as hard as a stiff jelly, and is arranged in layers having a common center like an onion. It is a double convex lens. Behind it is the vitreous humor, confined in a series of transparent cells. Upon the absolute transparency of these humors and the proper shape of the parts containing them depends the sight of the horse. The same causes which affect the sight in man will affect it in the horse. Too great convexity of the anterior coat produces what is called the "buckeye," and leads to shying, which, when it proceeds from this cause, is always incurable. The outer membrane of the eye is called the sclerotic tunic; the second the "choroid;" the third the "retina," which is an expansion of the optic nerve. The membrane which protects the exposed surface of the eye is called the "conjunctiva." The eyelids need not be described. The haw is a cartilage lying within the inner corner of the eye, and is termed the *membrana nictitans*. It can be thrust outwards so as to partially cover the eye. This happens when any irritating substance strikes the surface of the eye. The lachrymal or weeping apparatus consists of the lachrymal gland, situated beneath the outer wall of the eye-ball, and secretes a fluid which is intended to relieve the eye of any foreign bodies which may be present in it.

The ear is divided into the external and internal ear. The former collects sounds; the latter conveys it inwards. The sense of touch would seem, in the horse, to reside chiefly in the lips, and to some extent in the feet.

The anatomy of the foot is very important for every man to understand. Observe, in the cut, that there is very little space between the main bone and the hoof, and that therefore, in case of inflammation, there is no room for swelling, and the pain must be intense. The three parts of the hoof are the external wall, or crust, the sole, and the frog; the latter is the triangular central portion. The crust reaches from the hairy edge of the skin to the ground, averaging 3½ inches in this extent. The front is the toe, the hinder part the heel, and the sides are termed the "quarter-hoofs." The front of the crust is rather more than a half an inch in thickness, diminishing, in the fore feet, to one-fourth inch toward the rear portion. The hinder hoofs are about the same thickness all around. The sole is slightly concave downwards, and is fixed to the inner side and not the lower edge, of the external hoof. Its usual thickness is about one-sixth of an inch, and consists of plates which are easily separated. In the middle of the frog is a cleft, the sides of which should form an angle of about 45°. In front of this cleft is a solid wedge of the substance of the frog, and is called the "cushion." The hoof grows by elongation simply, and not by spreading out.

FIG. 10.—*Lower Part of Leg and Foot.*

VARIOUS BREEDS OF HORSES.

The horse, no doubt, existed originally in a wild state, as it does now in South America and Tartary,

but at what period it was subjected to the dominion of man cannot be determined. All the civilized nations of the ancient world of whom we have any historical records not only possessed this animal in a domesticated state, but set a high value upon it, bestowing great pains in training and improving its various breeds or races. The origin of those breeds is likewise unknown, but they were most probably produced by the circumstances of variety in climate, food, and shelter during a long succession of ages, assisted afterward by the effects of domestication in different countries. Climate has great influence upon the forms of animals, and, in general, a species is found indigenous to each country whose form best fits it for supporting its existence there. Thus, in the arid plains of the East, where herbage is scarce, the horse is found to possess a form which enables it to transport itself with great rapidity from one spot to another, without permitting his weight to cause it to sink in the sandy deserts. In cold countries, on the contrary, his size is diminutive, but his compactness and strength, as well as his coarse, shaggy coat, enable him to resist the severity of the weather. In temperate climes, where these causes do not operate, and where vegetation affords, by its luxuriance, more nutriment, we no longer see him equally small or slender, but, with great capacity still for progression, possessed of more beautiful proportions, with superior muscular power, varying considerably in his qualities, which are adapted to the purpose of war, hunting, parade, the saddle, and draught.

The indigenous horse of every country has been modified by cultivation, and the native breeds have at one time or other been more or less mixed with other varieties with a view to improvement. What is meant by purity of blood is the result of limiting the propagation of particular races, and preventing other races from mixing with them. The native races of some countries are distinguished and esteemed above others for their peculiar qualities.

AMERICAN THOROUGH-BREDS. The Thorough-breds are cultivated in great perfection in the United States. Recent experiments have shown that they are able to carry their colors to the front in competition with the most formidable horse kingdoms of Europe. The English race-horses have been the acknowledged champions of the world for two centuries. They have met and defeated the far-famed Arabian courser on the scorching sands of Bengal, conquered those fabled kings of the wind on their native soil. They have ranged through the frozen regions of Russia, and defeated all the best horses in those vast dominions of absolute monarchy. France, that great nation of horsemen, has been compelled to strike her racing colors to the stout English courser, that has trampled them in the dust for unnumbered generations. All Europe, Asia, and Africa, have been compelled to acknowledge the superiority of the Thorough-bred English courser. Yet notwithstanding its remarkable fleetness, and its long and universal reign, it is compelled, in the humility of many a defeat, to acknowledge the superiority of the American Thorough-bred.

Iroquois, an American three-year-old, sent over the Atlantic in 1881, to test the speed and bottom of the English race-horse, has won the Derby, the most popular race, and the largest three-year-old stakes in England, that calls out the flower of the three-year-old flyers of Britain. Iroquois, to clinch his superior three-year-old form over English-bred colts, won the Prince of Wales stakes at Ascot, under a penalty of nine pounds for winning the Derby. He won seven out of nine starts, with all their penalties. Iroquois comes out of his three-year-old form with his flag flying at the top-mast. He has not only the credit of beating the best three-year-olds in the great racing metropolis of the world, but has the good fortune to bring to his owner material aid of over $78,000 in stakes.

Foxhall, another American-bred colt sent over from this side of the ocean to try conclusions with the best blood of Europe in 1881, won the grand prize of Paris, the most popular race of France, the great sporting event of Europe, with stakes of $30,000 hung up to the winner, open to the world. It brings together the best horses of the continent, buckled up with their armor, to compete for this grand prize and the honors of victory. The omens of victory are more stimulating than the rewards. They stand as an enduring monument to the victor. They immortalize the winner by presaging their descent to posterity as the great champions of the age. Foxhall had no "splinters" to contest with. He was confronted with the most powerful racers of Europe, who congregate together in the beautiful climate of France to develop their speed. Foxhall vanquished the whole with remarkable ease, and had run in him left over to beat the English three-year-olds on their own soil. He won nearly all his engagements in England after being penalized by extra weights for beating their faint-hearted colts, according to English rules of bringing down the speed of a good colt to the capacity of their light-waisted three-year-olds. It shows Foxhall to be far better than English colts of the present year by taking up nine pounds and beating them with extra weight on their own soil.

Parole, a few years ago, when he won the Newmarket stakes and captured, in another race, the City and Suburban stakes, etc., finally won three out of his six first starts in England, gave notice to Englishmen that their horses must run from end to end to beat the American horses on the turf.

The first authentic account of Thorough-breds imported into this country was Spark, presented by Lord Baltimore to Gov. Ogle, of Maryland. The date of his landing is not known. It must have been previous to 1750, because the Prince of Wales, who presented Spark to Lord Baltimore, died in 1751, and these transactions took place long before his death. Gov. Ogle also imported Queen Mab, by Musgrave's gray Arabian, into Maryland. About 1750, Col. Tasker, of Maryland, imported from England the celebrated mare Selima, by the Godolphin Arabian. Her de-

scendants were among the most distinguished racers in the early annals of America.

Gov. Ogle set a worthy example to his successors by introducing to the breeding community these famous thorough-breds that have perpetuated a race of worthy descendants, and stand as a living monument to mark the public spirit of their early patron and founder. The immediate successors of Gov. Ogle followed his example, and encouraged an enterprising public spirit by keeping a breeding stud to improve the breed of horses.

These importations were followed by several stallions and a few mares. Fearnaught, son of Regulus, was landed in Virginia in 1764, and also Morton's Traveler by Partner, grandson of the Byrley Turk, and grandsire of King Herod.

These, together with Jolly Rogers and a few others, bred to those imported mares Selima, Kitty Fisher, Jenny Cameron, and Miss Colville, may be said to have laid the foundation of the American race-horse.

At the breaking out of the Revolution, this foreign traffic in equine celebrities was suspended. Every able-bodied man had to buckle on the armor of war, to defend his hearthstone and drive the invader from our soil. At the conclusion of peace, the importation of horses was revived, and such distinguished stallions as Medley and Shark were introduced into Virginia; the latter was got by Marske, the sire of Eclipse. Diomed was brought over to Virginia in 1798. He was by Florizel, a son of King Herod. He was one of the best, if not at the head, of all the stallions bred in England. Also, imp. Bedford by Dunganon, was brought into Virginia. Dunganon, the sire of Bedford, was by Eclipse, out of Aspasia by Herod (a fashionable pedigree), and he was one of the most popular sires in Great Britain. He had a roach-back, called in racing parlance the Bedford hump, which he transmitted to his posterity. It has been carried to the front in triumph over some of the best horses on the American turf.

Diomed was unquestionably the greatest sire of getters of winners that ever stepped his foot on American soil. Had he gotten no other celebrity than Sir Archy he would have established a reputation that would last as long as the horse finds admirers. There was not a winner of any repute for half a century that did not carry in his veins the blood of Diomed. Those great champions that won their laurels upon the turf, and made the course memorable by their wonderful achievements, were nearly all of this blood. They include Eclipse, Henry, Sir Archy, Boston, Lexington, Lecomte, and a host of others, whose indomitable energy and iron will, inherited from Diomed, carried them in triumph over their most formidable competitors to victory and renown. It was unexampled speed and the courage to continue it to the finish that Diomed transmitted to his posterity. His vital powers were so strong that he entailed his speed to the fifth and sixth generation of his descendants. Nearly all the horses up to the middle of the present century, that became distinguished on the turf, or celebrated in the stud, came down from this grand old hero of stallions.

Eclipse was by Duroc, son of Diomed. Eclipse was never beaten, and never paid forfeit. He was retired from the turf to the stud when in the palm of his glory, with the champion's wreath girded upon his saddle, where he became as successful as he had been distinguished on the turf.

Sir Archy, the best son of Diomed, was never beaten nor did he ever meet a horse that could make him extend himself, or put him to his full speed towards the close of a race. He went into the stud in the prime of life—when there was none that dared to compete with him on the turf—where he sired more winners than any other horse, living or dead.

Boston was probably the best race-horse of his day, and the equal of any horse of any age. He was long on the turf, and never fairly beaten but once, and that when out of condition, by the fast mare Fashion. The owners of Boston offered to match Fashion a second time for $20,000, but the proposition was refused. This showed the confidence on both sides. The owners of the mare were satisfied with a single victory over such a formidable competitor, without sacrificing the reputation of their noble animal by the doubtful issue of a second attempt. The confiding public were always on the side of this great son of Timelion, the hero of so many battles, and would defy Fashion or any other race-horse to beat Boston when at himself. Boston was on the course six years, starting thirty-eight times, and winning thirty-five races—twenty-six of these at four-mile heats, and seven at three-mile heats. His winnings amounted to the large sum of $49,500.

For further history and characteristics of the American thorough-bred, see Thorough-breds in this article.

AMERICAN TROTTER. The true modern trotting horse is a most remarkable instance of what may be done by keeping an animal to one kind of work for generations, and selecting the specimens best fitted for it to breed from. He cannot be called a distinct breed, and will almost invariably be found to be a cross between the thorough-bred and some more robust and hardier native horse. Some have come from Canada; some from the country horse of the Middle States; some from the Vermont family; some from the Indian pony, and lastly, some mainly if not entirely from the thorough-bred. To no one of these families can any superiority be attributed as producing trotters of great speed. All have shown their specimens by means of which to claim their share in the production. Only it may be affirmed, generally, that while some very famous trotting horses have been nearly, if not entirely, thorough-bred, they are not generally compatible with good trotting action or speed. Still, it is true the best time trotters have not the round, high-stepped action which is prized in carriage horses, or parade horses for show, and that they have in a great measure the long reaching stride, the quick gather, and the comparatively low step of the thorough-bred. The first time ever a horse trotted in

public, in America, for a stake, was in 1818, and that was a match against time for $1,000. The match was proposed at a jockey-club dinner, where trotting had come under discussion, and the bet was that no horse could be produced that could trot a mile in three minutes. The horse named at the post was "Boston Blue," who won by a close shave and gained great renown. He was a rat-tailed, iron-gray gelding, 16 hands high, and nothing is known of his pedigree. Since that date the performances of trotting, as well as running and pacing horses, in America, may be found under the head of Speed.

The essential quality of speed, at any gait, is a certain organization of the nervous system, and this is the one thing needful in every case. This is what we breed for when we breed for speed; this is the quality that has been transmitted through so many generations from the progenitors of American trotters. We can not detect this peculiarity of organization by any outward sign; we can know of it only by its manifestations in action. We know that it is hereditary, and we also know that it may be associated with any form. We, therefore, must respect the pedigrees of the horses and mares we breed from, and the more of the trotting quality we find in their pedigrees the more reason we will have for expecting a fast colt. The speed should be in both families, to make its inheritance certain; but if it is strongly inherited by one side, we may reasonably expect all of the progeny to go faster than the parent that is not speedy. Thus a slow mare bred to a good trotting-foal getter will always produce faster colts than she would if bred to a slow stallion like herself. No trotter attains his greatest speed before maturity, and the best of them continue to improve up to 15 and 18 years of age. To do this a horse must have a good constitution, one that will carry him to a great age without disease, and will stand the hard work necessary to develop his powers. Breeding from such horses will therefore improve the stock of the country, not only in speed but also in stamina. The cultivation of Thorough-breds for running races has been of immense benefit to the road stock of the country by improving its speed and stamina, and by giving it better form and style. The American trotter gets more of his peculiar excellence from the Thoroughbreds than all other sources. Since the first trotting-match in America, in 1818, when the trotting of a mile in three minutes was considered a most wonderful performance, the time has been decreased, by the improvement of the stock, to such an extent that in the year 1881 Maud S trotted her mile in the unprecedented time of 2 m. 10¼ s., and with like improvement in the future, none can tell the time that may be recorded. For record of fastest trotting-time, see Speed.

Arabian Horse. There is no evidence that there were horses in Arabia 900 years before the time of Christ; for then, while Solomon brought silver and gold and spices from Arabia, he brought his horses from Egypt. So late as the seventh century after Christ, there were but few horses in Arabia, for when Mahomet attacked the Koreish near Mecca, he had but two horses in his army, and although vast numbers of camels and sheep were carried away, and immense plunder in silver, not a single horse is mentioned as a part of the spoils, in fact, the most credible testimony would seem to show that the horse was gradually introduced into Arabia at a comparatively late period from Egypt, from whence, also from the same stock, sprung the stock of horses in the whole south-eastern portion of Europe. What the Arabians have excelled in is in keeping their race of horses pure by the most careful breeding and attention to keeping the blood pure and without stain of intermixure.

Travelers differ as to the number and names of the distinct breeds of horses which are found in Arabia; but Ali Bey, an accurate and apparently disinterested Oriental writer, describes six distinct breeds of Arabds. The first, "Dgelfe," is found in Arabia Felix. They are lofty in stature, with long ears, narrow in the chest, but are deep in the girth, swift, high-strung animals, and capable of supporting hunger and thirst for a long time. The second breed, named "Seclaoni," is reared in the eastern part of the desert and resembles the "Dgelfe," but is not considered so valuable. The third breed, "Mefki," is handsome, resembling the Andalusian horse in figure, but not remarkable for speed. The fourth, called "Sabi," resembles the "Mefki." The fifth, named "Fridi," are quite common, but apt to be vicious. The sixth breed, named "Nejdi," is from the neighborhood of Bussorah, is considered equal to the first named breed. Other writers make mention of but three distinct breeds, to which they attribute names different from those above given.

The general characteristics of the pure bred Arabian may be stated as follows:

He stands from 14 to 15 hands in height, the difference depending mainly on the country in which he is bred, and the amount of good food he is given as a colt. In shape he is like the English Thoroughbred, but with certain differences. The principal of these is, as might be expected, in the head, for when there is a mixture of blood, the head almost always follows the least beautiful type of the ancestors.

The head of the Arabian is larger in proportion than that of the English Thoroughbred, and is extraordinary for its beauty. The ears are fine and beautifully shaped, but not small. The eye is large and mild; the forehead prominent; the neck is light; the shoulder is good; the fore-arm in the best specimens is of great strength, the muscle standing out with great prominence. He is well ribbed and stands higher at the croup than at the wither. The tail is set on high, but not on a level with the croup. The tail is carried high, both walking and galloping, and this point is much looked to as a sign of breeding. The hind-quarter in the Arabian is much narrower than in our horses, another point in breeding which indicates speed rather than strength. The line of the hind-quarter is finer, the action freer, and the upper limb longer in proportion than the American race

horse. The hocks are larger, better let down, and not so straight. The cannon-bone is shorter. The legs are strong, but with less bone in proportion than back sinew. The hoofs are round and large, and very hard. In disposition the Arabians are gentle and affectionate; they have no fear of man, and will allow any one to come up and take them by the head when grazing. They are never vicious, shy or show signs of fear. The colors mostly prevalent among them are bay, gray and chestnut. Occasionally a black is found.

THE BARB. This is an African horse, and derives its name from Barbary, the country where it is found. Barbary embraces the States of Tunis, Tripoli, Algiers, Fez and Morocco, all lying on the northern coast of Africa, to the west of Egypt.

In height, he is from fourteen to fifteen hands; his chest is round; his shoulders are broad but light, and somewhat obliquely sloping; his withers are thin and rather high; his loins are straight and short; his flanks and ribs are round and well developed; his haunches are strong; his croup is somewhat too long for nice correspondence with the rest of the body; his quarters are muscular and full; his legs are clean and the tendons are clearly marked; his pasterns, like his croup, are somewhat too long and slanting, but not so much so as to amount to real defect; and his feet are sound and of good shape. But his head is especially beautiful. It is small and lean, while the ears are of medium size and admirably placed. The mane is rather meager; but the neck rises boldly from the withers, and gives an impression of ease and grace in carriage.

In spirit and fleetness he is not regarded as the equal of the Arab, much less of the real Thoroughbred; but in a certain native vigor and in form he is superior.

CANADIAN HORSE. French horses were brought over into Lower Canada in the early settlement of that colony, and formed the principal horse stock of Canada. The rigor of climate and scanty fare have somewhat reduced their size from that of their French ancestors; still they retain the same strong make-up and general characteristics, so that they can be distinguished from any other breed as readily as daylight can be distinguished from darkness. They constitute a hardy race of easy keepers, with a remarkably sound constitution, and live to a great age. From their strong, compact form, they can command their strength to the best advantage. There is nothing but the mule that will stand the wear and tear of hard work equal to the Canadian French pony. They have done more to establish the trotting horse of the United States than they have ever had credit for. The cross of that breed with those upon this side of the line, on account of their sound constitution, has proved the salvation of several other breeds.

Alexander's Pilot, Jr., the founder of a family of trotters, was got by the French pacer Pilot, that was converted into a trotter. Pilot, Jr., was the sire of the dam of Maud S and many other distinguished trotters. The original Pilot was imported from Canada into Kentucky, and numbers among his descendants Bonesetter, Pilot Temple, Tatler and Tackey, who owed their great speed and value to the French pacer Pilot. Alexander's Norman was got by a half-breed French horse—the Morse horse. He was the sire of Lulu, record 2:15. Red Jim, the fastest three-year-old of his time, inherits the blood of Norman; Blackwood, the fastest three-year-old of his day, was a son of Norman. Davy Crockett, a French pacer, was the progenitor of Legal Tender, Red Cloud, Red Cross, and some of the best horses of his day and generation. Copper Bottom, a French pacer, did much to improve the trotting stock of Kentucky. Blue Bull, it has been claimed, was sired by a French pacing stallion. There are a large number of Blue Bulls in the 2:30 class. Columbus was a French pacer, brought from Canada into the States, and converted into a trotter; he was the sire of Young Columbus, that has filled the Northern States with trotters. There are hosts of the decendants of old Columbus to be found in the 2:30 class.

The black mare Kate, bred in Canada, sired by a French stallion, has dropped five colts to Hambletonian that have trotted better than 2:30. Three of them are on record—Bruno, 2:29½; Breese, 2:24; Young Bruno, 2:22¾; the other two, Brunette and Daniel Boone, are quite as fast, and have trotted in public better than 2:30. From the strict technicalities of racing rules they have never been put on the record for what they have performed. Susy, the dam of Henry Clay, was a French mare, from whose lineage sprang Geo. M. Patchen, Lucy and American Girl. Gift, one of the most promising colts of Mambrino Pilot, was out of a French pacing mare. The dam and grandam of Mambrino Gift, had a French cross, as well as his grandsire and his dam's grandsire. This stallion had the gift of trotting in 2:20. Crobeau, St. Laurence, Grey Eagle, Andrew Jackson, Canada Chief, Whirlwind, Snow Storm and Cœur de Lion, were French trotting or pacing stallions, brought over from Canada into the United States, and they perpetuated the trotting or pacing element to a large number of their representatives.

The claims of the French Canadian to public favor rest upon their capacity for all work, as the general purpose horse. Their sound body, wind and limb is a constitutional inheritance that is propagated from generation to generation. This gives them an advantage for hard service over other breeds of less constitutional vigor. They are so formed that they can use their strength to the best advantage. They will perform more labor, at less expense for keeping, than any other breed of horses of equal weight. Their legs are more perfect than any other breed. They will be found hard and dry to the touch under a shaggy coat of hair. These levers are composed of solid bone and firm, matted sinews, that seldom spring at the knee, cock at the ankle, or throw out curbs or spavins. Their feet are unexceptionable. Soft feet have proved the ruin of many highly pampered breeds.

They are short-coupled from the knees and hocks down, which gives good purchase power. The strong, muscular thighs and fore-arms complete the limbs and make them strong enough to support the body under heavy loads, over hills and hollows, without tiring out or breaking down. The first-class Canadian French pony will weigh about 1,200 pounds, which is large enough, with their powerful form, to draw a dray or any other heavy draft; and small enough to be active for the plow, the reaper, mower, light buggy, or family carriage.

The prevailing color is black, but browns and chestnuts are frequently found, sometimes sorrels and duns and occasionally a dark iron-gray, with black legs.

Canadians are long-lived, easily kept and capable of the greatest endurance. They are heavy enough for the purposes of the farmer and as roadsters. While they are not regarded as rapid travelers, they maintain a reasonable rate of speed, say six miles an hour for long journeys, and continuously, and this while carying a heavy weight. It is nothing for them to go fifty miles a day for many days in succession.

Few horses are entitled to more consideration at the hands of those who would obtain the best medium-sized and easily kept animals for the farm, and for medium heavy and moderately rapid draft. The breed, chiefly in a mixed state, is widely spread in the Northern and Eastern States.

CLEVELAND BAYS have long been celebrated as one of the best breeds for draft. They were originally bred in Yorkshire, England. The Cleveland Bay horse was capable of carrying a great weight and of maintaining under it a rapid rate of speed. A lighter horse and one better adapted to the carriage was produced by crossing the Cleveland mare with a large thorough-bred stallion. The Cleveland Bays, in their pure state, are nearly extinct, yet from them a very superior animal has descended, which, after several steps and gradations, has settled down into a family common throughout many portions of England.

Writing of their origin, Prof. Low says: "It is the progressive mixture of the blood of horses of higher breeding with those of the common race that has produced the variety of coach horse usually termed Cleveland Bay. About the middle of the last century Cleveland became known for the breeding of a superior class of powerful horses, which, with the gradual disuse of the heavy old coach horse, became in request for coaches, chariots, and similar carriages. The district of Cleveland owes its superiority in the production of this beautiful race of horses to the possession of a definite breed, formed not by accidental mixture, but by continued cultivation."

As to the purity of the blood of the present stock of Cleveland Bays, or the distinctiveness of the breed, some doubt. As above remarked in their pure state they are quite if not altogether extinct. On this subject the editor of the *Breeder's Gazette*, under date of Feb 16, 1882, makes the following remarks. The first article was in answer to an inquiry as to the peculiar characteristics of the Cleveland Bays, the use to which he is adapted, and "Is there such a thing as a breed of Cleveland Bays?"

"'Many years ago there was a class of horses bred in portions of England, notably in the vale of Cleveland, in Yorkshire, known as Cleveland Bays, and generally recognized as a distinct breed. They were especially adapted to use on the coach. All modern writers, so far as we are aware, agree in stating that no such breed is now recognized in England, and that the Cleveland Bay, if it ever existed as a breed, has become extinct. The so-called Cleveland Bays of the present day are what would be called in this country, grades,—that is, they are produced by breeding large, stylish, high-stepping, well-bred mares to Thorough-bred stallions. We can breed just as good and just as pure Cleveland Bays in this country, and of substantially the same blood as any that are bred in England. We have the same material from which to make the cross, or rather the grade. We have just as good and as stout Thorough-bred sires, and certainly we can find mares equally as well adapted, with which to make the cross that produces the so-called Cleveland Bay in England.'

"We based our opinion as given above largely upon information obtained through personal interviews with many intelligent English and Scotch breeders, but more especially upon the fact that, nowhere in all our reading of British agricultural papers within the past ten years, have we seen an editorial allusion to the Cleveland Bays as a distinct breed; neither have we seen them mentioned in any of the reports of horse shows in that country. Clydesdales, Cart-horses, Suffolks, and Thorough-breds are often mentioned; and hunters and coach horses are also alluded to, but in no reports do we find a reference to the Cleveland Bay. The nearest approach that we have been able to find to a recognition of the Cleveland Bay as a breed in any English agricultural paper within ten years past, is the following from the London *Live-Stock Journal* of November 18th, 1881:"

"'The Cleveland that some people write about is not a Cleveland; it is only the nearest approach to what the Cleveland was like. If there is such a thing as a pure Cleveland the owner should stick to him; the breed, it is possible, may be resuscitated.'

"And the *Mark Lane Express* of about the same date qualified a reference of the same sort by the query 'if there be such a breed?'

"In comfirmation of this, Youatt & Burn, Youatt & Spooner, Prof. Low and 'Frank Forrester,' all treat of the Cleveland Bay as an extinct breed. 'Frank Forrester' (Henry William Herbert), the most recent of these writers, in Vol. II, page 20, of his great work, speaks at length of the course of breeding which have rendered the Cleveland Bay extinct as follows:

"'The first gradation, when pace became a desideratum with hounds, was the stinting of the best Cleveland Bay mares to good Thorough-bred horses, with a view to the progeny turning out hunters, troop-horses, or, in the last resort, stage-coach horses, or, as they were termed, machiners. The most promising of these

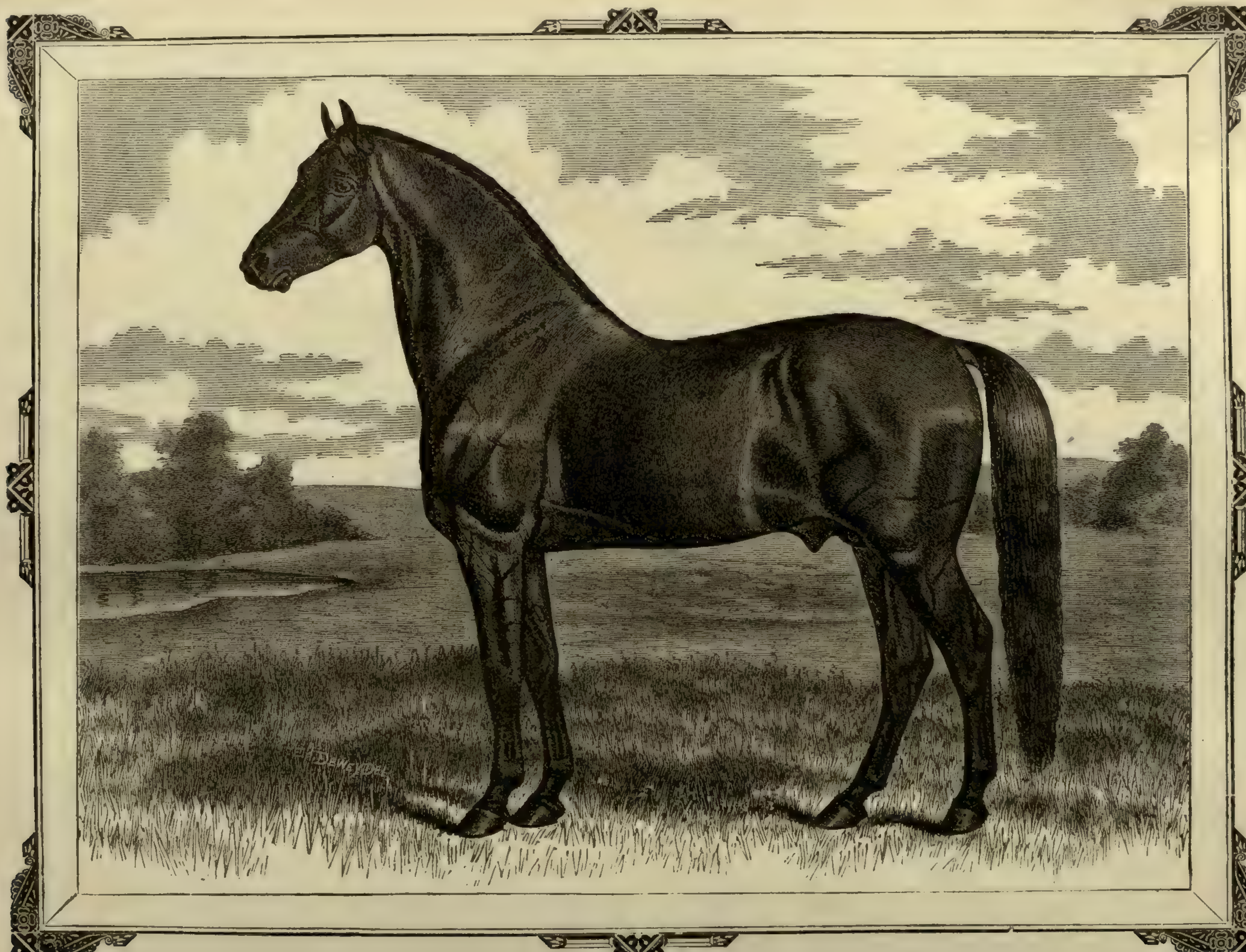


Fig. —CLEVELAND BAY.

half-bred colts were kept as stallions; and mares, of the same type with their dams, stinted to them, produced the improved English carriage horse of fifty years ago.

"'The next step was the putting the half-bred fillies, by Thorough-breds out of Cleveland Bay mares, a second time to Thorough-bred stallions, their progeny to become the hunters, while themselves and their brothers were lowered into the carriage horses; and the half-breed stallions, which had been the getters of carriage horses, were degraded into the sires of the new, improved cart-horse.

"'From this, one step more brings us to the ordinary hunter of the present day, of provincial hunting countries, for light weights, and persons not willing, or able, to pay the price of Thorough-breds. These are the produce of the third and fourth crosses of thorough blood on the improved mares, descended in the third or fourth degree from the Cleveland Bay stock, and are in every way superior, able and beautiful animals, possessing speed and endurance sufficient to live with the best hounds in any country, except the very fastest, such as the Melton Mowbray, the Northamptonshire, and perhaps the Vale of Belvoir, where the fields are so large, and the land all in grass, and the scent so fine that the fox-hunting in them is in fact steeple-chasing; so that no fox can live before the hounds on a fine scenting day above half an hour, nor any horse, except a Thorough-bred, live even that time with the hounds, having fourteen stone or upward on his back.

"'No sort of breeding in England is so profitable as this. The breeder is comparatively secured against anything like ultimate loss, while he has a fair chance of drawing a capital prize, in the shape of a first-rate hunter or a carriage horse of superior quality; and it is to the breeding of such a class of animals that the attention of the farmers, in horse-breeding countries, is wholly directed at this date.

"'For this reason one has no more pure Cleveland Bays, the use of the stallion of that breed being entirely discontinued; large, bony, slow Thorough-breds of good form and great power, which have not succeeded on the turf, having been substituted for them, even for the getting of cart and farming-team horses; and the farmers finding it decidedly to their advantage to work large, roomy, bony, half or two-thirds bred mares, out of which, when they grow old, or if by chance they meet with an accident, they may raise hunters, coach horses, or, at the worst, charges, or machiners, rather than to plough with garrons and weeds, the stock of which would be valueless and worthless, except for the merest drudgery.

"'Since the authorities above referred to all substantially agree with Mr. Herbert that there are now "no more pure Cleveland Bays, the use of the stallion of that breed having been discontinued," we recommend that our critics turn their batteries upon them a while, and "give us a rest."'

"We do not deny that many most excellent and well-bred animals have been imported and sold as Cleveland Bays—animals that are well calculated to improve the stock of farm horses in almost any neighborhood."

In a very thorough encyclopedia on domestic economy published in England half a century ago, we find in a reference to the Cleveland Bay breed, which it denominates Cleveland or Yorkshire Bays, that "they have long been celebrated as one of the best breeds in the island for draft; but they are said to have degenerated flat." This work also says, in speaking of the coach horse, "it cannot be called a particular breed; but the origin of the superior kind is the Cleveland Bay, confined principally to Yorkshire and Durham, and now difficult to meet with in either country."

A very intelligent gentleman, well known as a writer upon live-stock matters in Great Britain, writing from that country in response to a personal inquiry concerning the present status of the Cleveland Bays, says, in substance, that of late a demand for the old sort of Cleveland Bays has sprung up, and the breed is in a fair way to be resuscitated. He thinks there is material enough left to operate on, and says that "the Cleveland is undoubtedly the produce of the Thorough-bred horse (race-horse or hunting stallion) on the North country cart mares; this was the origin of the breed, and it was created for coaching purposes. The coaches, toward the last, required faster horses, and these were superseded by the railway. So the Cleveland fell into desuetude. Now they are wanted again for fast, heavy town work."

Whatever may be said of the origin of this horse or the various gradations through which it has passed, it is certain that the Cleveland Bays of the present day are a most excellent and superior stock, worthy the attention of the best breeders. As roadsters they occupy the front rank, are of uniform color, build and disposition.

We present a fine specimen (Prince Minister) of the Cleveland Bay on the next page. He is owned by W. M. Field & Bro., Cedar Falls, Iowa.

CLYDESDALE HORSE. Though, no doubt, as the Stud Book indicates, Clydesdale horses are bred all over Scotland, the area to which the true Clydesdale is confined is very limited. The Clyde Valley on either side, as high as Biggar, Renfrewshire, the northern district of Ayrshire, Kintyre, in Argyleshire, part of Dumbartonshire, a small piece of Surlingshire, parts of Wigtonshire, and Kircudbrightshire, the border part of Dumfriesshire and Cumberland comprise most of the farms where the tenants have any pretensions to Clydesdale, or rather draft-horse breeding.

The Clydesdale is the product of certain Scottish mares with Flanders stallions. In color bays and browns predominate, with usually some white in the face or on the feet. In height he ranges from 15:3 to 17:1, with an occasional one at nearly 18 hands, and in weight from 1,500 to 2,100 pounds, with an occasional horse 2,400 or 2,500 pounds. He is heavier-boned than any other breed, according to his weight,

particularly in his limbs, which are of great width, flat, cordy and hard. Ringbones, bone-spavins, splints, and such diseases of the bony structure, are, with him, in his native country, entirely unknown. The hoofs are good size, deep, well-shaped, fine-grained, firm and tough. He has a prominent eye, fine head, well-shaped neck, which is well set upon magnificent shoulders. His barrel is round and straight, with none of the paunchy appearance; body generally long, and the quarters immense. The whole muscular structure is of prodigious development, and with none of the stall-fed and flabby appearance so common in some families of the draft horse; his mane and tail heavy and usually inclined to curl. The back of the legs, from the knee and hocks to the fetlock is covered with quite long hair, a characteristic very highly prized by the Scotchman, being evidence of the purity of the blood. He is kind and gentle in disposition, but spirited, and with great nerve, vim and energy.

It is said that one of the ancient kings required the bishops to see that good stallions were kept in each diocese to propagate a good race of horses for agriculture and other work purposes. Later, the Duke of Hamilton sent to Flanders for a Flemish stallion, which, crossed upon the mares sprung from the horses kept as above referred to, became the fountain head of the Clydesdale. The estate of the Duke of Hamilton is in the valley of the Clyde, from which came the name "Clydesdale."

From the valley of the Clyde, the breeding of this horse gradually spread over a large part of Scotland, and has found its way to American shores.

We give an illustration of a Clydesdale stallion, Rhoderick Dhu, owned by Powell Bros., Springboro, Pa. He is a good representative of the Clydesdale breed. See page 701.

Conestoga Horse. This horse was bred in the valley of Conestoga, Pa., many years ago. They are supposed to be descended from Flemish and Danish cart-horses, brought by the early German settlers to that district. It is a very large, muscular animal, often reaching 17 hands and upwards, and closely resembles the heaviest breeds of German and Flemish cart-horses. They are used in Pennsylvania chiefly to the wagon, and are good, honest workers, much quicker and lighter in their action than might be expected from their weight.

English Draft Horse. The improvement in the breed of heavy horses in England was principally effected by the importation of a race of black horses from Belgium and Holland. They are hardly known in this country as a distinct breed, although they have undoubtedly exercised more or less influence on the work horses of this country. In England they are divided into three sub-families: First, the heavy, massive horse, reared in the rich marshes and plains of the midland counties expressly for the London brewers; second, the smaller-sized, but still tolerably heavy horse, generally employed for agricultural purposes; a strong, compact animal, but slow in action; and third, a lighter and more active animal. The modern English Draft horse, however, is as much different from those of one hundred years ago as the modern Thorough-bred is superior to his ancestors of two hundred years ago. The last fifty years has marked an era in the breeding of draft animals, as has the last one hundred years in the breeding of Thorough-breds. So that in the Draft horse good feet and legs are of the utmost importance; the shoulders should be oblique, in order that the animal may have free and safe action. The stallion should have a well-arched chest, long, lean head, and clear, prominent eye; added to this, there must be great bone, supported by strong sinews, with plenty of muscle, and the animal should be so good a feeder that it will carry plenty of weight to assist all this.

In speaking of the English Cart-horse of 60 years ago, of which the modern English Draft-horse (in America as well as in England) is an improvement, the English Cart-Horse Stud Book says:

"With very few exceptions (and those exceptions chestnut), black, dark brown and gray are the only colors met with in descriptions of Draft stallions living in the first quarter of the present century. Gray horses seem to have been more common in countries south of Derbyshire and Staffordshire, but it is probable that the coats of many of the so-called black horses had interspersed therein a considerable sprinkling of white hairs, and they were occasionally described as grays; there is one instance, about 40 years ago, of an Oxfordshire horse being sometimes described as a black and at another period as a gray. The head was large in all its dimensions, well placed on the neck by strong, broad and deep attachment; the forehead and face wide, expressive and intelligent; a side view of the jaws and muzzle represented those parts to be remarkable for depth; the ears were small and carried slightly outwards; the eyes somewhat small, not prominent, but generally mild and moderately intelligent in expression; the nostrils and mouth large, firm, and well closed; the neck was long, arched, and remarkable for its depth, and for the strength of its insertion between the shoulder blades. The shoulders were massive, muscular, upright, low and thick at the withers, thrown well outwards beyond the insertion of the neck by the front ribs being properly arched. The fore-arm was long, strong and muscular, the knee broad and flat on all its aspects; the fore and hind cannons short and thick, frequently measuring upward of 12 inches in circumference, covered with coarse skin and having a beefy appearance and touch, more marked in advanced age than in youth. The hocks were of rather defective formation, but showing little predisposition to disease, generally too short and round and not sharply defined. The breast wide and full of muscle, indicative of great strength rather than quick movement; the back longer, narrower, and dipping rather too much behind the withers. The dock strong and thick, with powerful, broad attachment to the trunk. The growth of hair upon these old stallions was remarkably luxuriant, that of the mane and tail

being abundant, strong in texture, glossy, and very often several feet in length. The cannons, fetlocks, and coronets, both fore and hind, were garnished with a profusion of coarse, long hair, distinctive of the Cart-horse breed. The silky growth in corresponding situations of the present day has probably become thus modified from the admixture of extrinsic blood, from local influences, from altered methods in the system of rearing and managing young stock, or from a combination of two or all of those causes.

As an illustration of the English Draft-horse we give a picture (Fig. 14) of Grand Duke, a noble specimen of the breed. He is owned by W. M. Field & Bro., Cedar Falls, Iowa.

MORGAN HORSE. While many deny that this is really a distinct breed, yet so marked are their characteristics and so different are they in some particulars from other racers, that they seem fully entitled to be considered as a distinct breed. He was kept pure in its own district for more than half a century, and descended from a single horse, in the possession of Mr. Justin Morgan, a schoolmaster, in Vermont. The founder of the family, or strain, was got by a horse called "True Britain," which was said to have been stolen from a British officer during the Revolution, and whose pedigree was therefore lost. From him were descended, more or less remotely, "Black Hawk," "Ethan Allen," "American Eagle" and a host of horses celebrated for gameness and many of them for fast-trotting powers. He is generally, though not universally, admitted to be very stout and enduring, with good action, especially in the trot, and great hardiness of constitution. He shows very little evidence of pure blood; indeed, it may be said that the reverse is the case, as he invariably possesses a thick and long mane and tail, with a considerable curl in both, signs which may be truly said to be fatal to his claims.

FIG. 13.—*Norman Mares.*

In height he seldom exceeds 15 hands. His frame is corky, but not remarkably well put together, there being generally a deficiency in the coupling of the back and loins. The head is not extremely small,

but there is no superfluous muscle or fatty matter about it; the face is straight, the forehead broad, the ears are small, fine, and set far apart, the nostrils are wide, the lips are close and firm, the muzzle is small, the eyes are not large, but very dark, prominent, set wide apart, and full of animation. The back is short; the shoulder-blades and hip-bones are large and oblique, the loins broad and muscular; the body is long, round, deep and closely ribbed up; the chest-bone is prominent, the chest wide and deep, the legs seem rather short for the height, but they are close-jointed, and though thin, they are very wide, hard, clean and very powerful; the feet are small and round; the hair is short and flossy at almost all seasons; the fetlocks are moderately long and there is some long hair up the backs of the legs.

Their peculiar adaptability to all the ordinary purposes of the farmer is such that they enjoy a high degree of favor. As a breed, they are usually long-lived, and this constitutes one of their great points of excellence.

Norman Horses. No breed of horses has attracted more attention in this country during the last 50 years than the Norman horses from France. There has been much discussion regarding the use of the different names applied to these French horses. We quote the words, in describing this magnificent breed, and giving an account of its origin, etc., of Mr. E. Dillon, of Bloomington, Ill., one of the largest importers and breeders of French horses in this country. He says, in speaking of the Norman horses, that they are "so called from the fact that they were bred in Normandy, and existed there a distinct breed for many years before they became scattered throughout the other districts in France. They are now known by various names peculiar to the departments in which they are found. In Boulogne they are known as Boulonnais; in Normandy, as Augerons; in Picardy, as Vimeux; and in Artois and French Flanders, as Hammonds. They are all descendants of the Norman race, to which they are indebted for all their good qualities as draft horses. There are various other names by which Norman horses are known in France, but the families we have named are the most renowned in commerce.

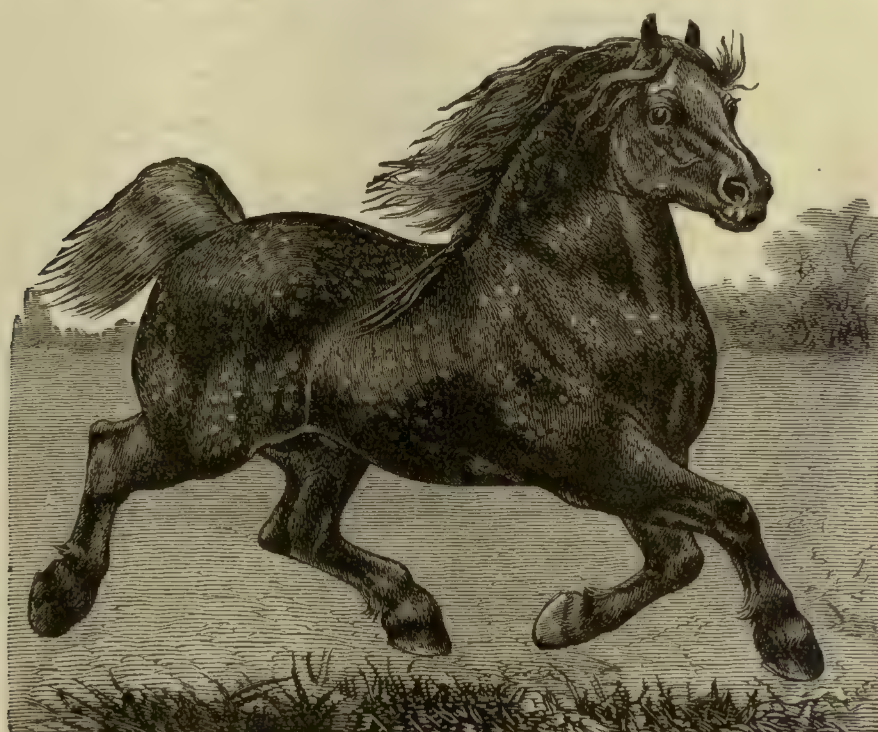


Fig. 14.—*Norman Stallion.*

"Brittany (a division in France, situated on the Western coast) furnishes the Perche farmers with the greatest number of colts suitable for omnibus horses. This Percherizing business has been carried on extensively in Perche; and the large number of Percherized animals which the Perche farmers have thrown upon the market under the name of Percherons, has established that name for all omnibus horses in France, regardless of where they are bred or raised. Brittany furnishes the Paris market with as good omnibus horses as Perche does, and, although they are bred, raised and sold by the Breton farmers, when they go in the Paris market they are called Percherons.

"French draft horses are generally known throughout the world as Norman horses. It is the name that was given to the renowned heavy horses in Normandy many centuries ago, and has been handed down from generation to generation. The name Percheron-Norman is an American invention; there are no horses in France known as Percheron-Normans. There is no difference between the draft horses now found in Perche and those found in other localities in France.

"The ancient race of heavy horses, known for ages throughou the world as Norman horses, originated in Normandy during the days when chivalry flourished and the iron-clad Norman knights wielded the heavy javelin and the ponderous battle-ax. The heavy Norman war-horse originated in a cross of the heavy gray horses of Lombardy, of Persian descent, and the black Vandal, the native stock of the north of France and the Netherlands. This cross, under a favorable system of breeding and the influence of the fine climate and rich productive soils of Normandy, originated a race of gigantic horses that has ever been the glory of France and the envy of other nations.

"For many years, during the reign of the Norman kings, these mighty horses were used exclusively as war horses; in the course of time, however, the invention of gunpowder brought fire-arms into use, and they gradually took the place of the heavy spear and battle-ax in warfare. There was no longer a demand for those giant horses for war purposes; but the demands of war had created in the Norman war horse those qualities that pre-eminently fitted him for agricultural purposes; and in the fourteenth century he became an agricultural horse, a position he has honorably held from that time to the present.

"Agriculture in France advanced with civilization; and, as the inhabitants began to turn their attention to the cultivation of the soil, they very naturally looked to Normandy for their supply of horses. Thus the old Norman race became scattered throughout the different departments in France, and laid the foundation for all the families of draft horses, not only in France, but throughout the world.

"The description of these horses are as follows: Average height, full 16 hands; head short, thick, wide and hollow between the eyes; jaws heavy; ears short and pointed well forward; neck short and thick; heavy mane and tail; rump steep, and divided by a deep furrow; quarters very broad; chest deep and wide; tendons large; muscles excessively developed; heavy, flat, bony legs, very short, particularly from the knee and hock to the fetlock, and thence to the top of the hoof, which is partly covered with long hair. A horse is a Norman just in proportion as he fills the above description, no difference by what name he may be known in France."

We give an illustration in Fig. 13 of two Norman mares, imported from France in 1877, by E. Dillon & Co., Bloomington, Ill. They weigh 1,940 and 1,950 pounds, and are certainly magnificent specimens of the Norman French breed.

Fig. 14 represents a Norman stallion, imported in 1880 by same parties as the Norman mares. He is a dark dapple gray in color, and is certainly a splendid specimen of the Norman breed.

PERCHERON HORSES. We cannot go into a lengthy discussion upon the name or names which properly belong to the two varieties of French horses now in this country. In the previous section we give Mr. Dillon's views upon this point, but others differ with him. Indeed, much has been written and said upon this subject pro and con by the best informed men of the country. In fact, so difficult did it seem to draw dividing lines that the editor of the "Percheron Norman Stud-Book" was at a loss to know what should constitute fitness for entry. The plan finally adopted was to give a full account of the course of breeding and crossing practiced in France, and admit to registry all horses imported from France as Percheron, Norman, Percheron-Norman, and Norman-Percheron. The two are so mingled inFrance; and as the French utterly ignore pedigrees, the question cannot be satisfactorily settled there. It is claimed that the Percheron is a stock peculiar to La Perche, a district in France. He is claimed by some to be a descendant of the pure-blood Arabian, crossed with a stock of heavy draft horses existing in that part of France prior to the Crusades. Others think the native race referred to was the old war horse of the Normans. It was heavy, bony and slow, good for cavalry use during the days of chivalry, when the carrying of a knight and his heavy mailed armor required an animal of great strength and power of endurance. One author asserts that the Percheron is descended from a remote cross between the Andalusians (after their commixture with the Morocco Barbs) and the Normans; and this somewhat fanciful reason is given for the active agency of man in bringing it about; that the Norman, though powerful, was too slow for a fully caparisoned knight, the Andalusian or Spanish Barb was too light, and a cross was effected for the purpose of securing a horse that combined speed with power.

The old Norman stock is said to have transmitted to this race their extraordinary bone and muscle, while the Arab or Andalusian, or whatever may have been the cross, give the spirit and action. The Norman has been described as being capable of carrying great burdens at a reasonable rate of speed; to have been large, compact, muscular, and possessing the greatest endurance.

We understand of the two varieties of French horses, that they are but different strains of one breed, and scarcely differ more than different specimens of other breeds of either horses or cattle. Those of the Percheron type are smaller, more active, exceedingly muscular and powerful, having good trotting action, fast walkers, weighing 1,250 to 1,600 pounds. The Normans will weigh 1,700 to 2,000 pounds, have similar characteristics of a lower degree—that is, walk well, trot finely, are docile, powerful and well formed.

Indeed, whatever may have been the origin of the

Percheron, or the distinct features between it and the Norman, or the proper naming of the two, it is evidently a pure race, one capable of producing and reproducing itself unchanged through a long succession of years, and without deterioration of qualities when like sires are bred to like dams.

For hard work on ordinary fare the Percheron is unequaled, and his energy and endurance are wonderful. He will keep his condition where another horse would die of hard work and neglect. Though full of spirit, unflinching under even painful effort, he is yet docile.

Ponies. Of the numerous breeds of ponies the only ones worthy of mention here are the Indian pony, the Mexican Mustang and the Shetland. In whatever manner the pony was originally produced, in its primary form, or subsequently established in all, or any one, of its self-producing varieties, is impossible to decide, and it is useless to speculate.

Indian Pony, which seldom or never exceeds thirteen hands in height, is remarkable for activity and strength, as compared with its size, appearing to be almost overwhelmed with its rider, whose feet nearly touch the ground, yet moving under its load with freedom. It has a high crest, and a flowing mane and tail, with a proud carriage of the head of a very pleasing character. The body is strongly built, and the legs and feet are made of the most lasting materials. Large numbers of them run wild in the prairies of the Northwest. They are thought to be a degenerated Norman, having sprung from horses of that stock brought to Canada by the first French immigrants, and allowed by some means to escape into the forests. Wandering, from generation to generation, in those cold regions, and under circumstances altogether unfavorable to the production of generous growth, they have become dwarfed and in other particulars modified as to form. They seem in their present state to be a perfectly distinct animal, and they possess many points of excellence. They are found in the Upper Mississippi country, on the borders of Canada, and west of the great lakes, and are used chiefly by the different tribes of northern Indians. Great herds of them are found in a wild state on the northwestern prairies.

They are a larger animal than the Mustang, and in most respects far superior to him. Though he is to be considered a true pony, he is often thirteen, sometimes even fourteen, hands high. The body is very strongly built, being round-ribbed, short-barreled, and with powerful limbs. The neck is thick and short; the legs are covered with thick hair, and seem somewhat heavy and clumsy, but they are as firm, muscular, iron-like and sound as those of the Shetlands. The mane is very heavy, often falling on both sides of the neck, while the forelocks cover the eyes, and give a sort of shaggy appearance about the upper portion of the the head; the tail is also heavy and generally inclined to be wavy. They have a high crest and quite a proud carriage of the head. They are docile, intelligent, sure-footed, capable of enduring all the rigors of a northern winter, and able to perform long-continued journeys, at a moderate pace, while carrying or drawing disproportionate burdens.

Their courage is so high that they do not readily succumb to any hardship, however trying its nature, and though coupled with poorness and scantiness of fare.

Mexican Mustang, one of the most widely known and distinct of American ponies, is found chiefly on the prairies of Texas and Mexico. His origin is doubtful, though it is affirmed that notwithstanding his diminutive size, and some striking points of degeneracy, there is clear indication of Spanish origin. It is difficult, however, to account for the difference between him and other wild horses left or lost upon the American continent by the early Spanish discoverers and conquerers. They are the smaller of our ponies, of very slight limbs, often ugly and disproportionately made, with long back, slender and weak posteriors. Their hoofs are often badly formed, tending to flatness and irregularity. Their heads, however, though long, are lean and well shaped, and their nostrils are wide. Their manes and tail are fine.

Shetland and Scot Ponies are the most remarkable of all the European pony races, and best adapted for one of the principal uses to which ponies are applicable. They are natives of all the northern Scottish isles, but are found of the smallest size and of the most perfect form in the extreme northern isle of Yell and Unst. None of the Shetlanders exceed, in the average, nine or ten hands, that is, from three feet to three feet four inches in height, and none are considered truly bred which exceed eleven hands or three feet eight inches. Many are found which do not exceed 30 or 32 inches, and which are consequently inferior in size to some of the largest Newfoundland dogs. Their characteristic form is a round, closely ribbed-up barrel, a well-laid, sloping shoulder, but thick rather than fine, and with little elevation of the withers; a short, thick neck, covered with redundant masses of coarse mane, scarcely inferior to that of the lion, a well-shaped, lean and bony head. The ears are unusually small, erect and well placed; the eyes large, clear and intelligent. Their loins are superb, so that their breadth bears no small proportion to the entire height of the animal. Sway-backs and flat sides are unknown to the race. Splints, curbs, spavins, windgalls, thorough-pins, ringbones and navicular diseases seem to be things utterly foreign to the Shetlander. Their hardihood and spirit are wonderful. In their native isles they run wild on the hills, never herded, sheltered nor fed, but picking up a hardy livelihood from the tender shoots of the heather, and the coarse, innutritious grass which grows among it. In winter he is often obliged to scrape off the snow to get at this. Even when domesticated their fare is but little improved. Oats are a luxury unknown, and a few bundles of wild meadow hay or barley straw furnish a dainty bouquet to the wee Shetlander. His speed, of course, is not great, but he will go along at a sort of a waddling run under a weight which it

would bother some horses to carry, that is to say, from 150 to 200 pounds, at the rate of four or five miles an hour, and will accomplish his 50 miles between sunrise and sunset with a heavy weight on his back. For little boys and girls learning to ride the Shetlander is perfection, for he is very docile, intelligent, affectionate and gentle. The colors are generally black, dark brown and a sort of rust-colored sorrel. Whites and grays are exceedingly rare, and blacks are considered the best of the race. Shetland ponies of the true breed are not often imported into America, although of late years a good many of the larger or Scottish or Welsh ponies are being introduced, and if black, are often erroneously called Shetlands.

Thorough-bred Horse. The following is extracted from an excellent article on the Thorough-bred horse read before the convention of stock breeders at Washington, D. C., Jan. 20, 1882, by Gen. W. H. Jackson, of Tennessee. The subject was so fully and fairly treated that we can do no better than take liberal extracts from it:

"Among all the numerous varieties of domestic animals which a benevolent Providence has created for the use of man, the blood horse stands pre-eminent —without a compeer in the animal kingdom.

"The uninitiated may ask what you mean by a Thorough-bred or blood horse? I mean the horse which traces back with certainty, through a long line of distinguished ancestry, to the beautiful and game little creatures which were imported into England from the deserts of Arabia about the middle of the sixteenth century. How they came to Arabia, or by what means they had been brought to the degree of perfection they possessed at that early period, I am not able to answer.

"In beauty the Thorough-bred is without a rival in the equine family; a coat as fine as satin; his eye in repose as mild and gentle as the lamb; under excitement as bright as the eagle and as bold as the lion, denoting the energy of his nature; his skin as thin and elastic as the fawn; his form as perfect and well-placed as beautifully defined muscles can make it. This is his exterior, or that which is visible to the naked eye; but there is an interior or invisible structure that contributes more, perhaps, to his powers than even his perfect exterior formation. His large heart and capacious lungs give him the wind of the high-bred hound; his large blood-vessels and soft, thin skin enable him to throw off the excess of heat that must be generated by great and rapid exertion, especially in a heated atmosphere; his muscles firm and beautifully defined, with bone of ivory texture, all combine to give him strength, endurance, action and beauty, far exceeding all of his race.

"The uninstructed in this particular branch of animal industry may inquire, 'How do you know of this internal and invisible structure?' The veterinary surgeon will answer: 'By dissection of blood horses we find universally large hearts, capacious blood-vessels, thin skin and ivory-like bone, possessing solidity and consequently strength far superior to coarse breeds.' Therefore, when we know that the pedigree is pure, we also know that this perfect internal structure exists. From the time of the introduction of this horse into England to the present, the best talent of intelligent breeders has been zealously and energetically employed throughout the world, aided too, by all the leading Governments (except our own), to develop and improve this noble animal. They have not failed. By attention to his comfort, with a liberal supply of proper food from infancy to maturity, his size has been enlarged; consequently his speed and strength increased; though beautiful when brought from his native desert, he has attained such perfection in symmetry and strength that breeders of the present period are puzzled to know what further improvements can be anticipated.

"The many admirable qualities I claim for this magnificent animal do not constitute his chief, nay, nor his greatest value; his high mission is to improve all the equine race. The pure and unadulterated blood that flows in his veins, improves and gives additional value to all the horse family. To the child's pony it imparts more action, sprightliness and beauty; to the saddle-horse more action, durability and style; to the trotter—a class of animals at present so highly prized, and for which such fabulous prices are paid—this blood is indispensable, for without it, with all his strength, when pressed, his muscles will tire, and he will grow weak for want of breath, the natural result, not of his exterior formation, but of his defective internal organization.

"I quote from Col. John P. Reynolds, then editor of the *National Live-Stock Journal*, published at Chicago, on this subject, as follows: 'So far as we are advised and believe, there is no individual fast trotter, nor admitted family of trotters, whose blood, if known, is not traceable in part to the Thorough-bred. In other words, Thorough-bred blood, if not the foundation, the *sine qua non* of speed at trot, and we may add, at any other gait, is always present where speed is found. There is no speed without blood, and we think the inference fair that none is expected.'"

"The question is frequently asked, With all the perfection you claim for the blood horse, do you esteem him the horse of all work? I answer, No. The horse of all work is a misnomer: no such horse or breed exists. The horse is now an inhabitant of all countries, of nearly every clime, from the torrid to the frigid zone, used by all people (civilized), under varied and totally different circumstances and for different purposes. Of course no single animal or breed can be best adapted to all these various circumstances and conditions; but I affirm that he is better adapted to a greater variety of uses than any of his race.

"The veteran breeder, Gen. Harding, after an experience of forty years, says: 'The best and most durable plow horse I ever owned was a thorough-bred. On a hot day and in high corn (the most severe test for farm stock) he could kill all the horses and mules that could keep up with him, without any injury to himself. The best, most active and durable saddle

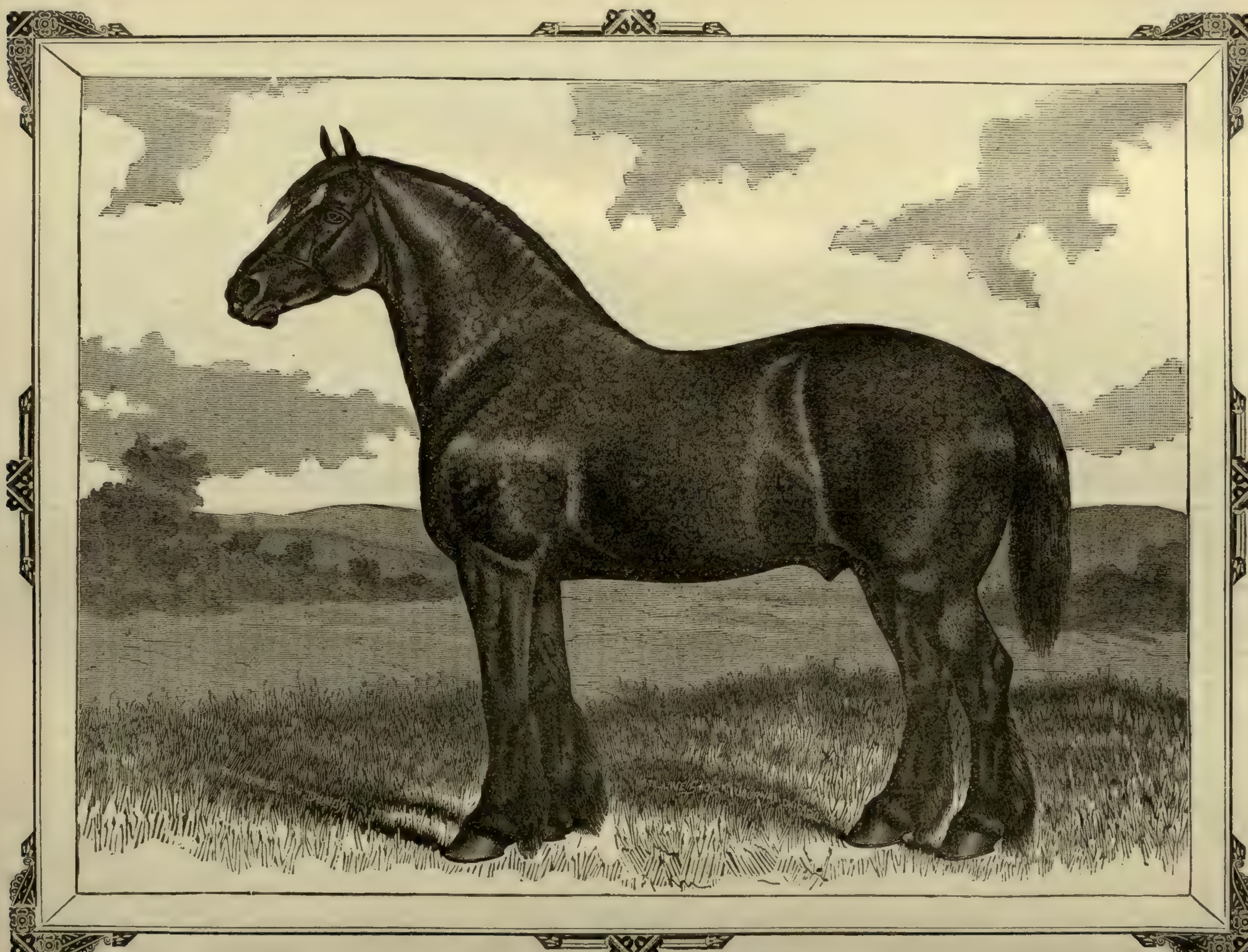


Fig. 6.—CLYDESDALE STALLION

horse I ever owned was a blood horse. I rode this horse until he was twenty-four years of age before he ever fell with me, or made a bad blunder. I then set him free and had the pleasure of providing for his comfort for several years after.'

"The best harness horses I have used were well-bred. I find them more sensible and more bold, consequently more safe and reliable. The best mules I ever worked were from Thorough-bred mares; indeed, no animal is more improved by a dash of blood than the mule. It imparts to him the action and spirit which he so greatly needs. To form an idea of the wonderful powers of the blood horse we will suppose his weight nine hundred and fifty pounds, this being about the weight of the average race-horse. By the strength of his muscle he carries this weight, together with his rider (one hundred and ten pounds), making ten hundred and sixty pounds,—not on a down grade, but on a horizontal line, a mile in 1:39¾, almost equaling the power of steam. Of all animated nature, the feathered tribe alone can equal his speed. If we imagine a feathered monster of equal weight I doubt much whether he could surpass him in his flight. Persons not versed in the art of breeding this animal have but an imperfect idea of his history, or of all the care and labor bestowed in its preparation, from the Arabs down to the present time.

"The English Thorough-bred is descended from the Darley Arabian, imported into England in 1703, being then four years old, and the foundation of the present improved stock of English race-horses is to be attributed to the Darley and Godolphin Arabian, though previous to the importation of the Darley into England, several Barbs, Turks, and Arabians—mares as well as horses—had been brought into the country and crossed on each other; but none of them had been able to establish any imposing reputation by imparting to their stock that size, bone, strength, and substance, those extraordinary and unequaled powers of speed and continuance which were afterwards attained through the agency of this noble animal.

"For the benefit, and I hope for the pleasure of my hearers, I will append here the description of the two stallions—the Darley and Godolphin.

"The Darley Arabian was a bay horse, fifteen hands high, strongly and elegantly formed, with a blaze in his face, and his near fore-foot and both hind feet white.

"The Godolphin Arabian followed the Darley twenty-five years later, and though he enjoyed greater reputation than the Darley—many writers of that day attribute his success to the advantage of the labors and improvements of stock accomplished by the Darley. Flying Childress and Eclipse, the swiftest beyond a doubt of all quadrupeds at that time, were the son and grandson of the Darley Arabian. The Godolphin was an entire brown bay in color, fifteen hands in height, of great substance, of the truest conformation for strength and action, bearing every indication of a real courser, a horse of the desert. He had mottles on the buttocks and crest, with a small streak of white upon the hinder heels. He was imported into France from some capital or royal stud in Barbary. He is said to have been foaled in 1724. Mr. Coke brought him over from France and gave him to William, master of St. James Coffee House, who presented him to the Earl of Godolphin. He is said by French writers to have been bought for eighteen louis, about $75. He died in 1753—the most successful as a stallion of any foreign horse before or since imported into England. To sum up from my reading I think the English race-horse derives much of his beauty and speed from the Arabian; his strength and stride from the Barb; and his size and height from the Turk.

"The first Thorough-bred horses imported to this country were Bulle Rock, imported in 1730, foaled 1718, and tracing back to 1689, 1686, and 1584; and Dabster, imported in 1741. Both of these horses were imported to Virginia. Since that date millions have been expended in the importation of stallions and mares from England and France.

"I present here a list of those horses imported to this country which have left the most lasting impress upon the blood stock of America, named in the order of merit, viz: Diomed, Glencoe, Priam, Leamington, and Bonnie Scotland. The most noted of our native stallions are Sir Archy, Medoc, Lexington, Vandal, Longfellow, Virgil, Enquirer.

"The most noted of the brood mares of England have been Pocahontas by Glencoe, Queen Mary by Gladiator, and Alice Hawthorne by Melbourne or Windhound.

"The most noted mares imported to this country are Gallopade, Britannia and Weatherwitch.

"The most noted of native mares are Reel by Glencoe, Magnolia by Glencoe, Picayune by Medoc, Madeline by Boston, Sally Lewis by Glencoe, Maggie B. B. by imp. Australian, Madeira by Lexington, Nevada by Lexington, Nantura by Brawner's Eclipse, Susan Ann by Lexington, Vesper Light by Childe Harold, Forfaletta by Australian, and Florine by Lexington."

The color of the Thorough-bred horse is now generally bay, brown or chestnut, one or other of which will occur in ninety-nine cases out of a hundred. Gray is not common, but sometimes appears. Black also occasionally makes its appearance, but not more frequently than gray. Roans, duns, sorrels, etc., are now quite exploded, and the above five colors may be said to complete the list of those seen on the race course. Sometimes these colors are mixed with a good deal of white, in the shape of blazes on the face, or white legs and feet; or even all these marks may occur. Gray hairs mixed in the coat, are rather approved of than otherwise, but they do not amount to a roan.

The texture of the coat and skin is a great proof of high breeding, and in the absence of the pedigree would be highly regarded; but when that is satisfactory it is no use descending to the examination of an inferior proof, and therefore, except as a sign of health, the skin is seldom considered. In all Thorough-bred horses, however, it is thinner, and the hair more silky than in common breeds; and the veins are more appar-

ent under the skin, partly from its thinness, but also from their extra size and number of branches.

The mane and tail should be silky and not curly, though a slight wave is often seen. A decided curl is almost universally a mark of degradation, and shows a stain in the pedigree as clearly as any sign can do.

VERMONT DRAFT HORSE. This is a celebrated family of draft horses long existing in Vermont, and less marked in their distinctive features than they were before the introduction of railroads. The peculiar characteristic of these horses is the shortness of their backs, the roundness of their barrels and the closeness of their ribbing-up. So striking is this that they much resemble ponies, yet, when approached, they are found to be 16 hands high, and often over. Of their origin but little is known, but it is very likely that the old Suffolk Cart-horse, imported into Massachusetts in 1821, the Cleveland Bay brought there in 1825, and the Thorough-breds introduced three years later, and with the best stock of the district produced this breed. These noble horses filled an important sphere before the days of railroads. The lighter ones were driven to stage coaches, so common then. The attention given to the Morgan horse seems to have been to the detriment of this stock, as they are now seldom met with in anything like their original excellence.

BREEDING. No question is of more vital importance to the majority of farmers in the United States than that connected with the rearing and use of stocks, especially the horse. We have very fully treated of the principles of breeding under that head, to which we refer the reader, and to attempt to discuss the importance of rearing the best animals possible under the circumstances, would be to discuss a question universally accepted. A few observations, however, may be in place upon horses intended for different uses.

The most profitable horses to raise are those that will do the most service and keep on the least amount of food. Good draft horses have good constitutions and will perform a vast amount of heavy work without tiring out or breaking down. They have a full developed chest to hold and digest their food, and will keep fat at hard work on a reasonable amount of food. They require weight and large muscular development to give strength to move heavy loads. They do not require speed, and it need not be cultivated in this class, except the fast walk. They are always in demand, and find a ready sale at good prices. Take a drove of draft horses to any large market and they will sell for about $250 per head as an average, which will pay a profit on the cost of production. Other breeds would eat their heads off before they would find a purchaser in the same market at a lower price.

The vast imports and exports of heavy goods in commercial dealings require strong, powerful horses to distribute them to the consignee, or to start them off from the consignor, and the draft horse has become the favorite medium to facilitate the interchange of these commodities.

The road horse is an indispensable agent in all active business pursuits. They will always be in demand for commercial traffic and domestic intercourse in every civilized community devoted to commerce and manufactures, and in all enlightened nations whose enterprising people have increased the national wealth by encouraging commercial industry and facilitating the mutual exchange of manufactured commodities. The first-class roadster is valuable for fine style and rapid movement. Their splendid form and superlative action gives them an exchangeable value that will pay a profit on the cost of production.

In breeding first-class road horses, many of them will turn out to be fast trotters. The breeder will realize a fortune on those that strike the key-note to the tune of 2:20 on the race-course. Flora Temple, with a record of 2:19¾, sold for $8,000 when an old mare. Dexter, record 2:17¼, brought $33,000 when in the prime of life, and in the palm of his triumphs as champion of the turf. Young Pocahontas, record 2:26¾, sold for $25,000, on the reputation of her celebrated mother. Jay Gould, record 2:21¼, brought $30,000 on his own reputation. The breeder only wants to produce a few of the famous champions to become as rich as Crœsus, who built the great temple of Diana at Ephesus.

The carriage horse has come into general use in most families that can afford the luxury. They have usually been bred from a cross between the Thorough-bred and Draft horse. The object of the grade is to retain the strength of the Draft horse, and to quicken the movement by the superior action of the race-horse. When they are brought up to the standard of great weight carriers at a good rate of speed they are called carriage or coach horses. Their high-stepping action, good size and commanding form are ornaments to the gentleman's carriage. So long as the public prefer this class of stout travelers for domestic use there will be a demand, and it will require a large number to supply the demand of an increasing market.

There is another class of useful horses that may be called the farmer's horse for all work. They are a cross between a draft and a road horse. The cross lightens the carcass and improves the action. They are strong enough for heavy work, and quick enough for active road service. They are adapted to all kinds of farming, and suited to carry the products of agriculture to market. They are raised at light expense, keep easy, perform a vast amount of labor, and live to an advanced age. There is no class so well adapted to a broken, hilly country as the horse of all work. They may become the staple production, in the horse kind, of the rural economist of the Northern States.

Breeding is the art of so coupling animals and of so rearing them as best to fit them for the purposes for which they are intended. The fact early became known that characteristics of the parents were transmitted to the offspring; hence the saying is true enough among wild animals, that like produces like. A criti-

cal study of the form and proportions of an animal with a view to their adaption to the desired end is necessary to any one who seeks to excel in the art of breeding animals. The object of breeding being to improve the animals bred in such qualities as have a definite value in the market, the breeder must work strongly to obtain high developments in some particular quality. The time has long since passed when mediocrity in several essentials and excellence in none will be accepted by the buyer.

The standard of excellence of the true breeder must be high and well defined; in other words he must have a clear idea of the various points of the perfect animal, and strive to attain, slowly it may be, but surely, to that perfection. This will require in him a keen eye, quick to detect faults, and also to recognize all good qualities as they present themselves. Beyond and back of eye-sight, he should have good judgment, by which he comprehends the causes that are at work to produce good or ill effects, and if possible he should be able to control the forces with which he has to deal. Any exterior points of beauty, as to outline or color, should not lead him to sacrifice the deep fundamental qualities upon which the great value of well-bred animals always rest. Lastly, he should not hope to produce an animal that is the best for everything.

The first thing to be done in breeding horses is to select the best animals, and the first indispensable quality in such animals is a good constitution. Without this as a foundation, all attempts to perfect a race of horses will be a failure. The animal that is selected for a breeder should have a deep chest, strong loins, good limbs and feet. The nervous temperament of the animal should by no means be overlooked. The eyes should be wide apart, full and clear. The ears should set apart, not lopped like those of a mule, nor pricked forward like the rabbit's. To these points of a good constitution and a fine nervous temperament, add all the symmetry you can. Make sure of good size; never take a mare weighing less than 1,000 to 1,200 pounds, and not below 15½ to 16 hands high. The fault with most of the horses bred in the past, is that they have been too small.

The next requisite is blood. Having selected your mare, never take any but a fixed blooded stallion. When you have the qualities already described, breed early so that your colt may get a good growth before flies bother it and its mother.

In regard to breeding, breed near enough to secure the desired qualities, and when once secured, to retain them; but do not breed nearer than first cousins if you can avoid it. If "in-and-in-breeding" is followed more closely than this, and persisted in, the colt will be either stillborn, or if living will be a cripple.

Never sell the best animals. When a man has disposed of his best breeding mare, he will advance in his work on the same principle that the "frog jumped out of the well" one step ahead and two backward.

It is poor policy to go to the city and buy a broken-down mare, thinking to make a breeder of her. In a great majority of cases you will only breed defective animals.

Blind mares are almost sure to have colts which go blind at an early age. Select good sound mares and breed to good stallions, if they do cost 10 or 15 dollars more than a common scrub, and you will have a colt to be proud of. If you want light carriage horses breed mares of about 1,000 or 1,100 of good style, to Thorough-bred stallions, which weigh from 1,100 to 1,200. If breeding for any other purpose, breed good heavy mares to some full-blood stallion; the best are among the Normans, Clydesdales, English Draft and Cleveland Bay horses. Take which you fancy most. Never breed to a vicious brute of a stallion, or a mare; if you do the colt will be dangerous. In selecting a stallion select one of proud bearing, with a lean head, open nostrils, full, lustrous eyes, wide between eyes, light neck, well arched; short back, but long under, broad hips, flat lean leg, well muscled, good round hoofs (the harder the better), soft skin, fine hair, not too long, and you have the ideal horse.

Perhaps not half the farmers who take their mares to a stallion give fair consideration to the gait of the horse, especially to his walk. A careful calculation of the time spent on a walk by the farm horse, as compared to the time used at other gaits, would show that the walk is nearly the constant gait—constant at the plow, also at the harrow, the corn planter, and the seeder. In hauling the hay, grain, or any other commodity to market the walk is always the gait. It is not used only when returning with the empty wagon, or when, occasionally, a team is hitched to the family carryall. A very fast walker, under the saddle, will make very nearly or quite five miles an hour. Such a horse at his work would make, say three and a half miles, while a slow walker would not come within one mile of this speed taking the day through. When a horse is offered in the market, his rapid walking stride commends him to buyers, partly because all men like a horse that walks fast and partly because a good walker is clever at all gaits.

To breed a rapid walker, look well to the shoulder, that it is not too upright; neither must the breast be too broad. The rapid walker is not likely to be a lazy horse, but, on the contrary, he usually shows spirit; sometimes he shows high mettle. These qualities all tell in judging his value in the market, because they add to his show qualities, if he has any, and to his tendency to progression when hooked up; and there is no class of buyers that object to a horse because he is not slow enough. It is easy to get slow horses, and horses that go slow at all gaits; but now that nearly everything goes by steam except the horse, the nearer this useful animal comes to doing this the more attention he will attract, and, all other things being equal, the more money he will bring. Especially do express companies, omnibus companies, wholesale dealers who deliver to trains, men who haul by the load, and all men except sporting characters, prize a horse largely for the speed he makes at that very useful gait, "the walk."

One or other of the parents should be of mature age, and if a very young mare is chosen, the horse should not be less than eight, ten or twelve years old. If both are very young or very old the product is generally small and weakly. A great many of our best performers on the turf have been got by old stallions; but their mothers, with few exceptions, were young. The rule generally adopted, is to wait till the mare is three years old before breeding from her, and then to put her to a horse of at least full maturity,—that is to say, seven or eight years old. The necessity for health in each parent should be considered, and it will be found, the preponderance of either over the form and temper of the progeny, will fall to that one which has the superior purity of blood; and therefore, if the breeder wishes to altar in any important particular the qualities possessed by his mare, he must select a horse which is better bred. Neither a large nor a small sire or dam will perpetuate the likeness of himself or herself, unless descended from a breed which is either the one or the other.

Management of Brood Mares. All mares are the better for slow work up to within two months of foaling, but they should not be ridden or driven so fast as to cause exhaustion.

Farm mares are generally used to within a few days of their time, care being taken to keep them at light work.

The time of sending the mare to the horse will vary with the purpose for which her produce is intended. If for racing, it is desired that she should foal as soon as possible after the first of January, and as she carries her foal about eleven months, the first time of her being "in use" after the first of February is the period chosen for her. All other horses take their age from the first of May; and as this is the time when the young grass begins to be forward enough for the use of the mare, the breeder is not anxious to get his foals dropped much before that time. As, however, mares are very uncertain animals, he will do well to take advantage of the first opportunity after the first of March; as by putting off the visit to the horse, he may be disappointed altogether, or the foal may be dropped so late that winter sets in before it has strength to bear it. (See table, page 144.) The foregoing remarks apply to maiden mares only; those who have dropped a foal are generally put to the horse nine or ten days afterwards, when almost every mare is in season. For this reason valuable Thorough-bred mares are often sent to foal at the place where the sire stands who is intended to be used next time. The traveling to him so soon after foaling would be injurious to both the dam and her foal, and hence the precaution named is adopted. The mare then remains to be tried at intervals of nine days, and when she is stinted, the foal is strong enough to bear any length of journey with impunity. Mares and their foals sometimes travel by road twenty miles, or even more, for this purpose, but they do not often exceed that distance. About fifteen miles a day is quite as much as a nine-days-old colt can compass without injury, and that done very quietly, the mare being led at a slow pace all the way.

After having been served by a horse, the mare should be allowed to stand idle awhile, as conception will be far more apt to take place if she is left alone. If put to brisk motion, or to any strain immediately after copulation, she is very apt to fail of conception. She should also be kept away from string-proud or badly castrated geldings, not only at this period but during her entire pregnancy, as they are apt to worry her to the casting of the conception, or at a later period, to slinking the foal.

After she has been allowed a reasonable season of quiet, moderate work will be rather beneficial than injurious; and this may be kept up until about the time of foaling. Special care should always be exercised to guard her against being kicked, heavily thrown, or inordinately strained in any way.

It sometimes occurs that at the time of foaling, a false presentation is made, producing difficulty of delivery; but no reliable instructions can be here given as to what course to pursue in these cases; and it is best to seek the aid of some skillful veterinary surgeon.

The mare which has had a colt will be found in season some time within the next thirty days, and she ought to go to the horse at this time if she is to be bred at all. The ninth day after foaling will generally be found to be the right time. Whenever indications of heat are discovered, the matter should not be delayed, as the season may pass off and not return. After-putting, the days of trial are the ninth, then, if she refuses, the seventh after this, and upon a second refusal, the fifth after this, which is sufficient to prove her.

When about the time of pregnancy is passed, more than ordinary pains should be taken with the mare, for it is at this time, if ever, that she is most likely to slink. Excitement of every kind is a fertile source of "slippin'" the foal, and anything which is at all likely to have that effect should be avoided. The smell of blood is said to have a prejudicial influence in this way, and there is no doubt that one mare miscarrying will in some mode affect others in proximity to her. Possibly the same cause may act on all; but it seems to be generally concluded that the act is generally contagious, either from what is called sympathy, or some other inexplicable way. If a mare has "slipped" a foal in a previous pregnancy, double care should be taken, as she will be far more likely to do so again than another which has hitherto escaped the accident. It occurs most frequently about the fourth or fifth month; therefore extra care should be taken at that time. The suspected individual should be kept quiet by herself; but it is better to allow her the run of a small retired pasture than to confine her to the barn, where, for want of exercise, she will become restless and anxious. Purging physic should not be given unless it is absolutely necessary; and if the bowels are so confined as to require some stimulus of this kind, and bran mashes and other changes in the

food fail to produce any effect, choice should be made of the mildest aperient which is likely to answer the purpose.

Treatment after Foaling. In a healthy state the mare very soon recovers the efforts which she has made in bringing forth the foal, and in fine weather she may be allowed to enter the meadow on the second day afterward, which is generally soon enough to suit the strength of the foal, though occasionally the young animal is very active within six hours after it comes into the world. For a month or six weeks the mare and foal are better kept in a meadow by themselves.

During the remainder of the time of suckling, no special treatment is required except to see that the mare is well fed and well protected from the weather. At weaning-time she sometimes requires a dose or two of cooling medicine; but generally she is so nearly dry that no interference is required.

For further knowledge as to the care of the colt while young, see Animals, page 12.

If the colt is healthy and thriving, he should be weaned when from five to six months old. If he continues with the dam after this period he is an unnecessary burden to her. If at this time the mother is inclined to furnish milk so copiously as to render the udder painful to her, care should be taken that it does not result in inflammation. If necessary to prevent this, draw away the milk by hand once a day for a few days. Keep her on dryer food than usual, and at more than ordinarily steady work. This will have a tendency of preventing the secretion of the usual quantity of milk, and the udder will soon dry.

CARE OF THE COLT. It matters little what the breed, or how well born, if the colt does not have the proper care he can never amount to much. Starve a colt in his first year, and he is spoilt forever. No subsequent treatment, however judicious, can redeem the neglect of his early youth; the sinking loin, the worn look, the spindle shanks too surely attest the treatment he received in infancy, whatever his original caliber may have been.

Very much of the future value and size depends on the condition in which they are kept the first winter. They should always be provided with comfortable quarters; that is, a dry, warm stable, with a window having a southern exposure, if possible. They should not be kept tied up continually, but allowed the range of a yard during the day time, and especially during the pleasant weather, that they may exercise as much as they please; observing that there is no projecting rail, stake, or bit of board against which they may injure themselves by running, as, when at play, they perform with a recklessness scarcely equaled by any other domestic animal.

Treat them kindly, occasionally feeding a little from the hand, and thus gain their confidence. Break them to the use of the halter; lead them about by it; tie them up for a few hours when you are busy about the barn, and until they will stand quietly do not leave them unwatched but a short time at once, for it is difficult imagining what position they may not get into.

There is but little or no use breaking them to the use of the bit until at least one year old, and at the age of two is a better time to commence the operation of bitting and checking up. By exercising a little patience and kindness, a colt may just as easily be brought up as a pet, and, in one sense of the word, be broken ere it is hitched to a vehicle, as to be necessitated to call into requisition the services of a horse-tamer.

CASTRATION. This operation should be performed at a rather early age, yet not before they are one year old. They will then retain more of the natural vigor and style of the entire horse. The latest and one of the best methods of castrating colts or horses of any age, is with the castrating ecrasseur (Fig. 17). Directions accompany each ecrasseur.

In the case of colts and old horses the structures are tough and the cords strong; consequently clamps (Fig. 18) are necessary, so that the circulation may be entirely stopped.

The clamps should have a small portion of red precipitate and corrosive sublimate sprinkled on the inside, first wetting the clamps. The operation should be performed as follows: Cast the horse or colt and fasten him securely, having everything ready, a keen, round-pointed knife, clamps and cords. Seize the scrotum, and make a clean cut through the integuments and well into the testicle, and in a line so the cut shall be parallel to the median line or line dividing the scrotum. Clean the envelope of the testicle, leaving it as near intact as possible, as the envelope must remain with the animal. Draw the testicle out, put a clamp on the cord and seizing the other end of the clamp with a pair of pincers (Fig. 16), press it strongly together, and tie securely with a wax thread.

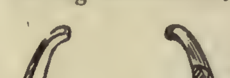


FIG. 16.—*Castrating Pincers.*

Proceed the same with the other. The horse may then be allowed to get up. In thirty-six to forty-eight hours the sticks or clamps are to be removed.

In castrating do not be afraid to make an extensive cut, and do not leave the cord too long, else it may be strangulated, and fever and inflammation ensue. If this should unhappily occur, enlarge the opening and push up the cord. If there is formation of matter, hasten it by fomentation with warm water. When a free exudation of cream-like matter is established, the animal will go on to recovery as granulation progresses. If, how-

ARISTIDES.

ever, the work has been properly done, the animal will suffer little inconvenience, and nothing more need be done.

The best time for castrating colts and horses is from the middle of May to the first of June, in the North, and in the South, about the time the young grass is a free bite.

BREAKING. If a colt is never allowed to get an advantage, it will never know that it possesses a power that man can control; and if made familiar with strange objects, it will not be skittish and nervous. If a horse is made accustomed from his early days to have objects hit him on the heels, back and hips, he will pay no attention to the giving out of harness, or wagons running against him at an unexpected moment. A gun can be fired from in front of a horse, an umbrella held over his head, a buffalo robe thrown over his neck, a railroad engine pass close by, his heels be thumped with sticks, and the animal take it all as a natural condition of things, if only taught by careful management that he will not be injured thereby.

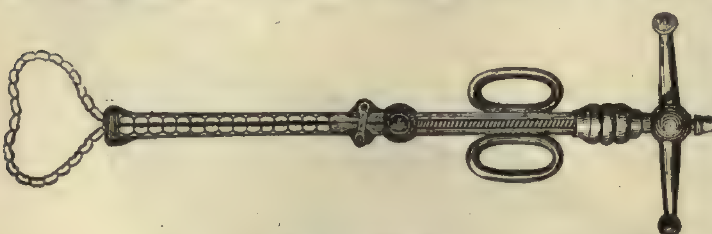


FIG. 17.—*Ecrasseur.*

FIG. 18.—*Clamps.*

Commence handling the young foals from their very birth. They are much more easily gentled and halter-broken during the first few months than at any subsequent period, and, as a rule, the longer it is deferred the more difficult the work becomes. The easiest way in the world to break a colt to the halter is to tie him in the stall by the side of his dam, and to lead him by her side occasionally when she is taken out for work or exercise. The time thus employed is never missed, and many a young thing that might otherwise grow up wild, vicious, and unruly, is made gentle, kind and tractable.

Many a fine horse is ruined before it becomes a horse at all, and the owner can charge his loss upon the mismanagement of the colt at the time of breaking. We have seen colts, after remarkable patience with the stupidity or viciousness of those breaking them, at last resort to kicking or balking, through fear or in self-defense; and in many cases the defect is lasting.

A verv great mistake is to let the colt run wild from the time it is foaled until it reaches the proper age for breaking. It is not uncommon to find colts that are as wild as hawks because they have never been even fondled, much less familiarized with the touch of any part of harness. Very naturally such a colt is handled with difficulty and danger when the attempt to break it is made. Such a result is utterly inexcusable, for it is rather a pleasure than otherwise to familiarize the colt with being handled, and the accomplishing of that object should be begun at once, and the breaking of the colt, in the proper sense, should be commenced as soon as it is weaned,—that is to say, it should be accustomed to the halter, to being led about, and even tied up for short periods. The surcingle can be applied and anything that can be done without injury to the colt to accustom it to the touch of harness, should be done, gradually of course; for not only would nothing be gained by doing everything at once, but the irritation that would be caused might be injurious to the young animal. After the first year the breaking should be more in earnest. The colt can then be bitted. Select a much smaller bit than is generally used and one that will not hurt the animal's mouth. A wooden bit is a good thing to commence with. When he has become accustomed to the bit, which he will in a few days, it is advisable to fasten ropes to it, and extend them to a loose girth over the back, attaching them thereto. Thus harnessed he may be driven, as it were, over a field, the trainer pulling the ropes occasionally. Portions of the harness can be very soon placed upon him, and by the time the colt is really old enough for use he will be pretty thoroughly "taught," if such a course is followed. In handling a colt, or for that matter a horse, we never want to forget our first duty is to gain the animal's confidence, and that in the next place the animal cannot do anything if it does not understand what is wanted of it. An incompetent trainer attempts to induce the animal to do a certain thing, and because it does not understand what is required of it, and consequently cannot do it, the trainer flies into a passion, the animal becomes excited, loses confidence both in itself and in the trainer, and great injury is done. No man is fit to handle a horse, much less a colt, who has not just as much patience as a competent teacher has with a child. He should proceed just as a teacher proceeds. The teacher explains and explains until the child grasps the idea, knowing that the child can do nothing until the idea is grasped, and if the child is very stupid so much more patience is necessary and given.

Frequently we hear men swearing at a horse and lashing him, because he does not do what he does not understand. A man that will whip a horse under such circumstances, is foolish enough to swear at a tree because it does not fall when he tells it to. If we cannot be gentle and patient we have no business to touch a colt, whatever else we may think ourselves competent to train. A trainer needs but three moral

requisites, namely, firmness, steadiness and patience.

The regular training of a colt or filly should begin at the age of two years past. There are many urgent reasons for this; first, the animal has neither the full strength nor the disposition to resist that it will have at a more mature age; second, it is more tractable, and will acquire its lessons more easily; third, it will not have contracted habits of self-will difficult to be broken off; and fourth, lessons in flexions of the body may be taught that will naturally increase its usefulness in whatever direction it may be wanted.

The first lesson for any use is implicit and perfect obedience to the will of the master. This thoroughly accomplished, the rest of the task will be comparatively easy, as it is only a question of time. It is supposed the animal is entirely free from acquired vice that it has been halter broken, and taught to stand quietly at the end of the halter, to follow quietly, to lead by the side of the master, and to stand quietly in the stable.

The next step is to procure a bitting bridle, also a strong bridle with a heavy, smooth snaffle bit, with a tongue piece and keys depending from the center of the bit; it must also have a check rein that may be lengthened or shortened, and two side straps, one on each side. The harness is simply a very wide, strong surcingle, with padded back-piece, having at the top a strap and buckle to form a loop for the check rein, and also a buckle on each side of the surcingle in which to buckle to side straps. To the rear of the pad of the surcingle is attached a back strap and round crupper strap, the latter to buckle and unbuckle.

Take the harness, and approaching the colt in the stall, let him smell it until satisfied, then put it on without undue haste or fuss. If the colt is nervous or skittish, talk to him and take time. The harness on, put on the bridle, giving plenty of length to the check rein and side straps, so the colt will not be unduly hampered, and let it out in a smooth, tight yard, following it about with the whip under the arm. Sometimes a strong colt will struggle and sweat violently, but if he has been properly handled heretofore, he will take the subjection as a matter of course. Let him exercise an hour a day for a few days, tightening the check rein and side straps gradually, until his head is brought into a proper position, but not a constrained position. When he ceases to fret at the harness, pass the snap of a leading rope through the near ring of the bit and snap it into the off one. This rope should be about fifteen feet long. Taking the end in hand, exercise the colt in a circle, allowing him to walk if he will. When somewhat tired let him stop and stand in front of him, say Come, tapping him lightly on the fore-legs with a whip. If he pulls, hold him firmly, but without undue violence while he resists, tapping him on the fore-legs at intervals, using the word Come. He will soon find the way to escape the whip will be to get near you. Then fondle him and give him a trifle of sugar or salt, and let him follow to the stable. So proceed from day to day, exercising him in a circle both to right and left (lunging it is called), gradually increasing his pace to a fair trot, until he will work as you want him, turning at the word to the right or left circle, or to stand and come to his master at the word of command.

Rarey System of Breaking. If the colt is properly educated during its early life, the right course pursued, as previously directed, there will be no occasion for a violent process of training. When this is not the case, however, and the colt is wild and vicious, there is no mode to break him equal to the one invented by John S. Rarey, of Ohio. Novel and extraordinary to a degree bordering on the marvelous were the exhibitions which he gave, both in America and Europe, in the management of this noble animal. Wondering and delighted crowds attended these exhibitions in all the principal cities in this country and abroad. Crowned heads and titled dignitaries were among the gifted champion's most enthusiastic auditors. As this system is so remarkable and so effective, we shall give both a sketch of it and describe the method.

The apparatus that is required is, first of all, an ordinary snaffle or straight bit in the mouth, without which nothing can be done with a vicious horse.

The manner of getting this bit in the mouth is different and great difficulty is ofttimes experienced. Rarey sometimes used guide ropes fastened to the head of the animal and held by grooms on each side.

The second part of the apparatus is the leg-strap for the near fore leg. This is very similar to a stirrup-leather, which, with the addition of a strong loop, can be made to answer the same purpose very well. Before applying this strap, which at once makes the horse harmless for offense, he must be rendered approachable, which in ordinary animals is effected merely with the aid of the bridle. As soon as this is done the horse is innocent of all mischief, except with the teeth, for he cannot kick on three legs, and even his mouth may be kept away from the operator by drawing on the off rein.

To bring him to speedy submission the other leg should also be confined, which is effected by first buckling on a surcingle, as represented in the following engraving, and then catching the off fetlock in the running noose of another leg-strap, composed of a long strap with a loop at one end

Provided with this second strap in his pocket, and having already applied the first strap and surcingle, the subject under manipulation is either induced to drop his off foot into the noose or it is slipped around his ankle, while the off rein is held by the other hand to keep the teeth off the operator. As soon as this loop is firmly drawn around the leg, the other end is slipped through the surcingle under the belly, and entire control of the horse is only a work of time.

With a violent horse, it is always best to let him feel his want of power for doing mischief with the near fore leg strapped up and the slight degree of fatigue which a few minutes hopping will produce, before the second strap is called into play. When this is done

and the second strap applied and slipped through the surcingle, the rein is taken in the left hand and gently jerked, to make the horse move, which he can do only by raising the off fore leg off the ground in the action known as hopping. The moment this begins the right hand firmly draws the off leg up to the surcingle, and keeps it there, when the horse must either bound into the air on his hind legs or he must go down on the ground. See Fig. 21.

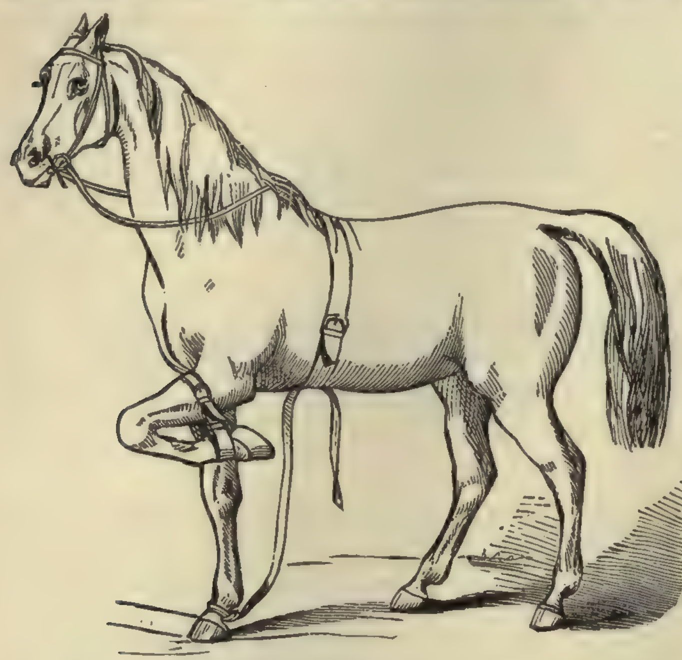


FIG. 20.—*Horse in the Power of his Master.*

To avoid mischief, therefore, the yard where the operation is carried on should be thickly bedded with straw, for no knee-caps are stout enough to protect the joints from injury on hard ground, nor, if they escape being bruised, will the shock to the body on falling be at all safe. Even straw can hardly be relied on, if the floor beneath is of brick, stone, pebbles, or hard natural soil, for it is apt to give way during the struggles of the horse, and allow the knees to reach it without the intended protection. A good, solid bed of manure, which is always to be had where horses are, spread at least a foot thick all over the yard, and over this clean straw, is the most desirable place. When the horse bounds into the air, plunges and falls on his knees, the chief art of managing him, or this part of the process of breaking him, is to keep a firm hold of the strap attached to the off leg close to the surcingle; the hand, being protected by the glove, can easily prevent it from slipping through during the struggles of the horse, and at the same time serves as a starting point for the operator, so that he can follow the movements of the bounding animal in whatever direction he may progress. The operator must on no account attempt to stand away from his patient, nor must he advance before the girth-place, but keeping close to this he is in no danger, provided he has the sense and the ability to give way if the horse should throw himself down toward his side. The rein, being still held in the left hand, prevents the horse falling away from the operator and is also used by him as a means of guiding the animal, if he happens to progress in a direction which is not desired. Nothing else is to be attempted till the horse has quite exhausted all his energies, which those possessed of high courage will soon do; but low-bred animals are very apt to turn sulky, and, refusing to plunge, remain on their knees, in spite of every kind of stimulus which can be given them short of severe punishment with the whip, which must be avoided as opposed to the principles on which the whole process is founded. By taking time with these low-bred animals they may always be made to tire themselves, for the kneeling position is very irksome to them, and the most stubborn will give a plunge now and then to relieve themselves. Sooner or later, varying from ten minutes to two or three hours, the tail begins to tremble, the flanks heave, and a profuse perspiration breaks out, which are signs that the horse himself desires the incumbent position; and if he does not lie down of his own accord, he may be pulled over by the hand of the operator.

A second or two after the horse has gone down, let him raise his head, and then drag it down again to the ground by the mane. On repeating this once, twice, or thrice, the animal will give in as far as that

FIG. 21.—*The Horse Bounding on his Hind Legs.*

part is concerned; and being rewarded with a pat of the hand, the head remaining on the ground, that part is gentled. Now remove the leg straps, lift the

FIG. 22.—*The Horse on his Knees ready to Fall on his Side.*

fore legs, separately, and let them fall to the ground, gently patting them, and they are gentled. Then go round to the back, proceed to gentle the hind limbs in the same manner, when you may perform all the usual "clap-traps" of putting your head between the legs, knocking the hind and fore shoes together, standing on the body, etc. While in this state, the horse lies in the attitude and with the expression which is very well represented in the accompanying sketch, and there he will gladly lie as he is permitted to do so. But he is not to be allowed to recruit his powers, and as soon as you have gone through the tricks above mentioned, make him rise; call for a saddle; in every case show it to the horse, put first on his head, then on his neck, and then in its proper place; then mount and the horse will move off as tamely as an old horse for years accustomed to the saddle.

By this plan it is indisputable that any active man of good temper but possessed of firmness and courage, and accustomed to deal with horses, may gain such a control over even the most vicious. This manner of breaking acts by producing in the horse a compound feeling of fear and gratitude, the former being the result of the animal's fruitless efforts to get rid of the controlling hand of man, and, the latter being established, from finding that same hand relieve him of his straps and then caress and gentle him.

BREAKING WITH A HALTER. For the breaking of ordinary colts other methods are much better than that of Rarey's. His, however, is much quicker, and for breaking cavalry or circus horses his method is not excelled. We give another method of breaking a colt. This with the halter only. This operation is often accompanied with danger, unless proper steps are taken to avoid it. Our experience has taught us that it is well to be governed by these rules. First, provide against accident yourself. Second, secure your horse against possibility of injury. Third, accomplish your desire with the animal in the quickest time possible, to render the lesson a permanent one. Having these rules in view, we proceed as follows: Take a round stick, one inch or one inch and a half in diameter, the length of which is to be governed by prospect of danger from the viciousness or nervousness of the colt. Commence by driving a shingle nail three inches from the end, drive another about seven or eight inches from and in a straight line with the first, leaving the nails far enough out, so that you can hang upon your halter. Then take a common halter, made of rope, which has a running noose, made as follows: Tie a hard knot on the end of your rope; about eight inches from the first make another, and about twenty inches from the second, make another; put the end knot through the third, drawing the third tight, then draw the other end of the rope which is intended for the stale of the halter, through the second knot; this will form the

FIG. 23.—*The Horse Tamed.*

noose. Place the head-piece of the halter on the nails, turning them upwards for security in holding it on. You are now ready to commence operations with the colt, in doing which it is necessary to understand the fact that curiosity is a very strong trait in the horse, and when not overcome by fear or some other powerful influence is sure to prevail. You can test this, if you choose, by placing your hat or handkerchief on the end of your stick, and holding it toward the colt. He may at first show symptoms of alarm, but, by holding it towards him and moving it gently, the colt will naturally use his own way of examining it, by reaching out his nose and probably touching it. He will soon become accustomed to the stick, and manifest the same curiosity in regard to the halter. You will now take the halter with the noose well loosened, holding the end of the stick and the halter strap in both hands. The halter hanging on the nails as before suggested, move it gently toward the colt, giving it a small swinging motion; and holding the stick pretty well up over the head, the colt will now extend his nose to examine the halter, and while his attention is attracted by its swinging motion, pass the head-piece gently over the ears, and turning the stick half around, drop it on his neck, then with a quick motion drop the stick and pull up on the strap, and your colt is haltered. You may now lay the stick aside.

Having your colt haltered, your next object is to teach him its use. Take a position about opposite his shoulder, still keeping at a distance in order to secure your own safety, as well as not to alarm the colt too much. Give him a short, quick pull toward you, sufficient to move him, immediately slackening your pull. The object in doing this is to teach him that you have the power to move him; and by slacking immediately you do not give him time to resist; which, if the pull were steady, he will do, even to the extent of throwing himself. Repeat the side pulls a few times, till his disposition to resist grows weaker. You will repeat the operation on the other side, alternating from side to side at every pull, but always avoiding a straight-forward pull. As you operate, gradually but slowly keep shortening your hold on the halter strap, until at last you can place your hand on his nose, with which he will examine it, that organ being the one made use of by all horses to test the danger or harmlessness of substances, which alarm them. As he becomes accustomed to your presence, which he will soon do, if you are gentle, you will then proceed to caress him over the face, gradually extending your hand down over his neck, being cautious not to touch his ears. As soon as he begins to be restive or cringe under your hand, remove it, and gently place it again on his face, repeating the former operation, extending the hand farther and farther at each repetition, until he becomes calm. You will now slacken the halter a little on his nose, and by tying a knot through the noose, you will avoid hurting him, as the halter will not tighten on his nose.

Remember that up to this point you have not hurt the colt, and have therefore not called out any undue resistance on his part. The main objection to a rope halter is, that it is sometimes used in such a manner as to hurt the colt. We obviate this objection,—first, by the short pull and slackening up before resistance is excited; second, by tying the knot as soon as practicable, so that the noose cannot tighten around the nose. At any time after this, when you can safely do so, you may, if you please, change for a leather halter.

You will now step back and repeat the pulling operation, being careful to get a side pull, and to change sides at each alternate pull. The reason for working on both sides is, that in this as well as in other lessons in which you attempt to instruct the horse, there are two sides to teach. What he learns to do on one side, must by the same process be learned on the other, in order to have the same understanding of what is required of him. The reason in avoiding a forward pull is that you cannot easily move him in that direction, and he only learns your weakness by your unsuccessful attempts. As you move from side to side, if the colt be inclined to move before you pull up on the halter, instead of pulling, step forward and caress him gently over the face or withers, always encouraging the animal to do what is required of him. By the side pulls he is compelled to come, and by rewarding him for coming towards you, the animal learns your meaning and knows that by obeying he gains your approval, and he willingly obeys. Should the colt prove of a stubborn disposition, and refuse to move as you desire, take hold of the halter strap with your left hand, about a foot from the head, and with your right hand seize him by the tail, and give him a few sharp turns around, pulling the head towards you, at the same time giving him an occasional kick with the side of your foot across the buttock. This lesson will teach the colt that he can move, and that you have the power to move him whenever you choose. Now repeat the side pulling as before, and if he remains stubborn, repeat the operation of turning twice or or three times. By this time he will probably appear to brighten up, and show signs of being willing to step. If he should not, you will take a bow-top whip in your right hand, and holding the halter strap in your left hand, stand opposite his left shoulder, reach the whip across and tap him gently on the right hip, at the same time giving a slight pull on the halter. If he starts with this movement, caress him and repeat as before. If he does not start, use a little more force with the whip. If he is still stubborn, and does not show signs of moving, talk kindly to him and step back for a few moments, allowing him to get quiet, if he be angered, as the reason for this conduct is that the colt is frightened, and he can only be assured that you do not mean to injure him, by your kind and patient usage. As soon as he becomes calm, you having taught him that he is not to be hurt, he will likely move in whatever direction you ask him. When he steps readily, you may tie up your halter strap and let him go. This will do for the first lesson.

The colt should now be left alone for half an hour,

until he recovers from his excitement, when you can repeat the lesson. As soon as he obeys the side pull readily, you may then, and not before, commence to teach him to obey the forward pull. If he leads, no matter how little, caress him, and repeat, being careful to not pull too hard.

If he does not move with a reasonable pull, give him two or three short side pulls, and try the straight forward pull again. In a short time, by this usage, he will lead willingly. It is necessary to avoid giving a determined pull forward, as it is likely to not succeed, and by an unsuccessful attempt to move the colt, he is only taught your weakness, and by inflicting pain upon him, he will naturally pull in the opposite direction from whatever causes the pain. By teaching him to refuse in this way, you are apt to learn the colt the habit of halter-pulling. You are now ready for hitching the colt in the stall.

The stall should be a common one-horse stall, about four feet wide; should be prepared by having two staples driven in the rear end of the stall, one on each side, so that a pole or rope can be stretched across, about the height that the breeching would be on the colt if harnessed. You will now lead the colt into the stall, and some assistant can be called to put up the rope or pole. Should no one be at hand, you can do it yourself by putting the halter strap through the ring or tying place, and hold the end in your hand, being careful to not tie the halter until after the pole or rope is up. The object for not tying the halter before putting up the pole is that by holding the end of the strap in the hand, should the colt attempt to pull back, you can step forward, and the strap slipping through the ring, you will avoid hurting the colt's head with the halter. You can at the same time pat and caress him, thus assuring him that he is not to be hurt. The reason for putting up the obstruction behind before tying is because you thereby avoid the risk of the colt through fear, or pain, where the halter presses on the head of halter pulling. When once tied, should he attempt to back out of the stall, he will come against the rope or pole, and step forward, instead of hurting his head with the halter and pulling harder to get free from what hurts him. In removing the colt from the stall, be sure and untie the halter before removing the obstruction in the rear, and for the first few days be careful to not tie him where he can have a chance to pull. By observing these rules for a few days there is no danger that the colt will ever become a halter-puller. Bear in mind that during the entire process of handling the colt, it is proper and necessary to speak to him in a mild and gentle manner, for the purpose of familiarizing him with your voice, and as a partial guard over your own temper. Never speak sharp or over loud, but gently and firmly, always connecting the command with whatever motion you make, to cause the colt to obey. For instance, in your side pulls you combine the words "come here;" this kept up will learn the colt to come at that command.

To Accustom the Colt to the Bit. Place on the colt an ordinary head-stall with a joint bit, without check-strap or reins; allow it to remain on a few minutes, then remove it; put it on again, allowing it to stay on a short while; then remove it again, thus putting it on and off at short intervals for a couple of days; the colt becomes used to the bit, and is not likely to become alarmed on being drawn up by the bitting bridle. As soon as the colt shows no signs of alarm at the bit being placed in his mouth, he is ready for

The Bitting Attachment. Take a leather girth with crupper and check hook, and a ring in each side, ten inches from check hook. Use a common head-stall with two small loops on the head-piece, so that the check can run up between the ears. Use a joint bit. Take a small cotton rope, 16 feet in length, place the middle of the rope on the check hook, then pass the ends through the loops on head-piece, then through the rings of the bit, and bring one end back on each side and tie it slackly to the side rings. Put a small sliding loop on the checks upon the forehead, to keep them together, leaving it slack enough, so the checks will work easily back and forward when the colt moves his head. The advantage that this bitting attachment has over all others is that when on the colt, and drawn up tight, he has the power of holding his head in almost any position; he can raise or lower it, or turn to either side, the check not being fastened at the girth, runs around to suit whatever position the colt chooses to hold his head in. This change of position rests the muscles of the colt's neck, and instead of overtaxing those muscles, as done by the ordinary bitting rig, they are developed, and the colt learns to carry a graceful head with a well-curved neck, and always gives him a good mouth. We have never known a colt, which was bitted with this bitting attachment, to become a bit-lugger; and by being able to move his head from one position to another, all danger of the colt throwing himself backwards is avoided. It is necessary to caution the reader against the use of the common old-fashioned bitting rig, as we have never known any good results from its use, and have known of serious damage to be done by it. The bitting rig referred to is made and used as follows: The old-time horse-breaker would take a rope surcingle and crupper, with rope bridle, and straight side reins; having this rig placed upon the colt, he will, in order to teach him to hold up his head, check him up tight, drawing his head up in the desired position at once. With this torturing contrivance he turns the colt loose in a yard, and will allow him to run for several hours at a time, without even unchecking him. When he returns to take up his colt, quite probably he will find him in a corner of the yard, with his mouth open, standing in a sleepy posture, with the whole weight of his head resting upon the bit. The colt does this in order to rest the overtaxed muscles of his neck, and to relieve the pain caused by the head being drawn up and held in one position. The old-fashioned breaker will wonder at the sleepy attitude assumed by the animal, and resolves next day to compel him to hold up his head

Fig. 24.—PREAKNESS.

by still tightening the rein, and will persist in so doing until the colt, whenever bridled, will push his head almost to the ground, in order to rest its weight upon the bit. How can a man expect that an animal so timid and sensitive as a horse can be brought into voluntary obedience with a harsh rope encircling the body, and burying itself in the tender flesh of the back and tail, so that at every move the torture to which he is exposed is increased; and in many cases that have come under our notice, the colt, in order to free himself from such misery, would rear up, throw himself violently backward, and bringing his high-checked head in contact with the ground, he would either kill himself instantly or by violence of the blow bring on an attack of phrenitis, or an abscess on the brain. In order to teach the colt what is required of him we must use great gentleness, and not allow anything to touch him that will cause pain or alarm.

How to Bit the Colt. In placing the bitting attachment upon the colt, care should be taken that no part of it be tightened enough to alarm or hurt the animal. The bridle should be carefully put on, buckling the throat-latch loosely, so that when the head is drawn in by the check, it will not choke him. In checking him for the first time, all that is necessary is to tie the side-reins to the rings of the surcingle, leaving them long enough that the colt's head will not be drawn any out of his natural way of holding it. In this way you can leave the attachment on about half an hour, then remove, allowing the colt to go free a short time, when you may put it on again. The second time put it on, drawing the reins a little tighter, but only allowing it to remain on, say five minutes, when you will uncheck; in a few minutes check him up again, making the side-reins a little tighter, being careful to uncheck him as soon as the colt shows signs of yielding to the pressure of the rein, and not until then. The reason for not unchecking him while he refuses to rein is that we desire to teach him that, while he remains stubborn, he cannot be released from the restraint of the bridle. After using him, as above described, for a few times, the side lines may then be taken from the side rings of the surcingle, and the right side rein drawn around the check-hook and fastened by a knot to the left side rein; thus by placing the side reins upon the check hook, the colt is enabled to move his head into any position he chooses, and the rope not being fastened stationary at any place, will slip around to suit his convenience.

On this account this attachment can be left on longer than any other in general use, without tiring the colt's neck. It should not, however, be allowed to remain on for more than half an hour at the most, without unchecking, and the tightness of the check to be governed by length and form of the neck and shoulder.

It must be remembered that in bitting colts, all that can be done is to teach them to rein as far as their form will allow. We cannot take a colt with a straight shoulder and a short, chubby neck, and teach him to rein as gracefully as one with a well-slanted shoulder and a long, curved neck; and should his head be drawn up and held in such a position by the check, the result would be that the muscles of the neck would be strained and the colt would carry his head more awkward than before. After using the colt as described for several days, you may proceed

To Harness the Colt. You will, by having the colt well bitted, overcome a great part of the difficulty attending in harnessing him. In the first place, you have taught him by your gentle treatment that by handling him he is not to be hurt; next, by having the bridle, surcingle and crupper on you have him partly harnessed, and he becomes partly aware of what the harness is for. Use a neck collar, place your harness on gently, being careful that no part be allowed to hurt or scare him. Let the colt stand in the stall, say half an hour, then remove the harness. When convenient put on the harness again, letting him stand as before, then remove. The next time place on the harness, drawing the breeching straps through the side buckles of the tugs and buckle them moderately tight, so that both the breeching and collar will press against the body; after doing this a few times you may commence to drive him with lines. The lines should be put through the side loops of the harness, instead of the terrets, and buckled to the bit-rings. By having a line on each side, and kept down by the side loops of the harness, you can prevent the colt from turning around toward you. You will then move him gently forward, occasionally turning him from side to side by the use of the lines. When he gets so that you can start and stop him at will, you may start and stop him often, being sure that you can combine the word "whoa" with the pull which you give to stop him. By using him in this way about three days, he will likely obey the rein.

To Hitch up the Colt. If you want to hitch him single, it would be necessary to accustom him to drawing before hitching him to a wagon; this may be done by tying a piece of rope about six feet long to each tug and getting a boy to hold each one; you can drive the colt forward, allowing the boys to pull gently back on the tugs, gradually pulling harder, until he will pull the boys around easily. The object of this is, that should the colt become alarmed and try to kick and free himself, the boys can let go and he is the same as if never hitched up; you therefore avoid the danger of your colt becoming a kicker or of breaking your wagon. When he draws the boys around easily, you may then take a piece of scantling, about seven or eight feet long, and tie a trace to each end and allow him to drag that around for awhile. As soon as he does this willingly, which will take two or three lessons, you may then hitch him to a wagon. Before hitching him, lead him up to the wagon and allow him to examine it. Rattle the thills and shake the wagon, thus making him accustomed to the rattle and noise. Lead him into the thills and allow him to examine it, until he is assured that the object which he so much dreaded is not calculated to hurt him. When all symptoms of fear have subsided, you may then, and not until then,

proceed to hitch him to the wagon. In driving him for the first few times, a level piece of ground should be selected, and backing or turning carefully avoided, if possible. One mile is sufficient distance to drive the first time, after which you can by degrees increase the distance, gradually toughening the colt to his work. When it is convenient to hitch the colt double, and we consider that the safest way of hitching him for the first time, hitch him along with a well-broke horse, putting the colt on the off-side. Having your colt harnessed, you will then buckle a strap around the left front footlock of the colt, in which there is an inch ring; to this ring you will attach a line, pass the line through the belly-band, fetching it up outside the trace, and holding it with the lines in your right hand. You will then drive them around, and should the colt struggle to get away, or act in any way unruly, pull up on the foot-strap and hold his foot up until he remains quiet on three legs. After he becomes quiet you will then start him up, always stopping him by pulling up his foot—bringing him to a standstill on three legs. A couple of lessons of this kind will suffice. You then have him ready to hitch to the wagon. After driving around a little as before, hitch and get into the wagon, holding the foot-strap in your hand. You now start up the team, walking them along slowly, and stopping occasionally, always using the word "whoa" distinctly. You will now find that the colt is under perfect control, and that by those proceedings there is no danger of injuring him. It may seem strange to the reader that the colt, when on a walk or run, can be safely drawn to a halt on three feet, but it has never occurred in the experience of the author that a colt, or horse either, stumbled or fell when stopped in that manner. When the colt moves along quietly, it will then be well to hitch him up twice every day for about a week, giving him short and lively drives, until he learns to obey the reins and the word "whoa." You may then change sides with him, in order to teach him to go on both sides,—always, when changing, removing the strap to the inside foot. When the colt becomes accustomed to being handled and driven freely, you may hitch him either double or single, as he is then fit to drive.

Learning to Back. This should not be attempted until the colt is thoroughly tought to drive, obey the pull of the lines, and stop readily at the word "whoa." The reason for not attempting to learn him to back sooner is, that it is necessary to first confirm the habit of going and turning to either side at the pull of the rein, so that he will not confound backing with those other movements. By so doing, you will avoid the risk of learning the colt to run back, throw himself down, or balk. When he has been driven enough to warrant you in learning him to back safely, you will then put on a common bridle, and commence by standing in front of him, taking hold of the side reins and pulling back gently, and firmly using the word "back," just as he is in the act of stepping back. When he will step back readily by pushing steadily backward on the reins, you may then put on lines and take your position behind him, having the reins through the shaft loops, of the harness, and held well down on the sides, to prevent him from turning around towards you. Have him loosely checked. As you step behind him, pull gently on the lines, saying "back," slackening up immediately, when he obeys. A half an hour's exercise is usually enough at a time, repeating the lesson, until he backs readily. Always select a favorable piece of ground on which to back him, such as down hill, so that the wagon will back easily. Always preserve your temper in handling the colt, for in losing your temper you lose control of the animal, which by kind, patient usage is only too willing to become your servant. When he will drive quietly, you may proceed.

How to Train to the Saddle. This should not be done until the colt has been thoroughly bitted and taught the use of the reins. Begin the lesson in the barn-yard or some other enclosure. Place on him a common riding bridle. Draw the reins tight over the top of the neck, and tie a knot, so that he will be checked up slightly. Stand on the left side opposite his shoulder. Throw a webbing line over his shoulder, letting it hang down by the side of his off fore leg. Then gently caress the leg until he becomes calm, and quietly tie the webbing around the right fore fetlock. Should he be restive, and prevent you from tying the line upon his fetlock, or attempt to strike or kick at you, take him by the head and tail and give him a few lively turns around. While he is disconcerted by this movement, stoop down quickly, but gently, and tie the line. Having the foot-strap tied, you will then take hold of the near rein, about six inches from the head, and pull the colt toward you, causing him to wheel in that direction; and when he moves readily, pull up on the foot-strap, so as to fetch him to a stand-still on three legs; repeat this until he will stop readily by pulling up his foot.

The lesson taught here is that the colt cannot get away while one foot is off the ground, and he learns that by being brought to a halt in that way, he is not to be hurt; so the danger of plunging, when you afterwards attempt to ride him, is avoided.

By pulling the foot-strap across his back, the colt gets accustomed to bearing up the weight. By pulling his foot up and back, he has not got the ability to throw himself backwards, and combining kind usage with this mode of controlling, your desire is accomplished more readily than in any other way known. Now draw up the foot, taking a short hold upon the foot-strap with your right arm well extended across the colt's back, and your left hand holding the rein upon his neck. You will now make a motion as if going to get on. First, get up so that you can lie across his back. As soon as he becomes quiet with you in this position, get off; second, get up far enough, so that you can lay your right leg along his hip. While in this position, caress until he becomes calm, and slip off again. The third time, by the aid of an assistant, catching with his right hand your left foot, and with his left your knee, and lifting up, you can light

easily in the desired position upon the colt's back. Being seated upon his back, you will caress him until he becomes used to your position; you will then let his foot down, and move him to the right and left by pulling first on one rein, then on the other. Always be careful, while turning a colt around, to pull only one rein at a time; for by pulling on both reins he may acquire the habit of running back and sulking. When you move him a few times from right to left, you may then urge him forward. If he should remain stubborn or refuse to move, take a bow-topped whip, hold it in your right hand along with the foot-strap and tap him gently across the right hind thigh. By using him in this way, he will soon comprehend what you require of him, and you will easily accomplish your desire. Only ride him a short distance for the first few times, and always repeat the lesson with the foot-strap until you can ride with perfect safety. There are several other ways adapted for riding the colt, but we give this as the only way whereby a wild colt can be ridden, insuring safety to both colt and operator.

Bad Habits or Vices. Horses, notwithstanding their many excellent qualities, are likewise subject, more or less, to defects and disagreeable habits, termed vices. Of these, restiveness is one the most dangerous, and is generally the consequence of bad temper or bad training. It appears in the form of kicking, rearing, plunging, or bolting, and but rarely admits of a cure. A good and determined rider may, for a time, conquer a horse, but he generally returns to his old tricks the first opportunity; and the best thing that can be done with a very restive horse, in most cases, is to turn him over to some other work. Biting is a fault that is not easily corrected, and which requires certain precautions to guard against. Kicking is another fault for which there is rarely any cure, particularly if not taken in time; it is very bad in the stable, but kicking in harness is much worse. Irritability in cleaning is most generally the consequence of a tender skin and bad management. Viciousness to shoe is likewise usually owing to want of skill in managing, but should be corrected, since owing to it lameness is often occasioned, and not by any fault of the smith. Crib-biting is a troublesome fault, and difficult to prevent; the horse will not only bite and destroy his wooden manger, but, if it is lined with iron, he will bite it and injure his teeth, as well as disperse and lose his feed. The best remedy appears to be muzzle sufficient to enable him to pick up his food, but not to allow him to lay hold of the manger. Some horses will not readily lie down at night, and stand still till their legs swell; sometimes a fresh, well-made bed, and casting him loose, will tempt him. Pawing is a bad habit which some horses have in the stable, by which they destroy their litter, and also the floor; shackles are the best remedy. Rolling in the stable is another bad habit, which must be prevented by not allowing him sufficient length of collar-rein. Shying is a vice which may be cured by a good horseman, except it be owing to a defect of sight. Slipping the collar in the night is a trick that some horses are very clever at; by this they sometimes get at food and gorge themselves, or do some mischief. Tripping is a dangerous fault, sometimes owing to lameness; a known stumbler is never safe to ride.

Shying generally arises from timidity, but sometimes it is united with cunning, which induces the animal to assume a fear of some object for the sole purpose of finding an excuse for turning round. The best plan to adopt with such an animal is to take as little notice as possible of the shying, and when the horse begins to show alarm, speak encouragingly to him, and if necessary, use the whip or spurs. Never chastise him after he has passed the object, but use every means to induce him to go up to it.

A horseman should never "shy" himself when the horse shies, or show the least nervousness, or notice it in the horse, and far less punish him for it. Whenever he notices his horse directing his ears to any point whatever, or indicating the slightest disposition to become afraid, let him, instead of pulling the rein to bring the horse towards the object causing its nervousness, pull it on the other side. This will instantly divert the attention of the horse from the object exciting his suspicion, and in ninety-nine cases out of a hundred the horse will pay no more attention to the object, from which he will fly away if forcibly driven to it by pulling the wrong rein. With some young horses this fault is the result of nervousness, and when that is the case the remedy is in strengthening the nervous system. A young horse given to this fault must be handled gently but firmly. When it has an opportunity, for instance when under the saddle, and has plenty of room, it will, if allowed to get off at a distance and do so, turn round and look at the object. This action indicates that if it could be brought up to the object and shown that it was harmless, all would be right; and that is true. Perhaps no better direction can be given for remedying this fault than to lead or drive the horse up to the object when it is practicable. Judgment must always be used. Sometimes it is advisable to whip the animal up to the object, but the way nine-tenths of drivers do, is to whip the horse after he has passed the object, a most reprehensible thing to do. If the horse is frightened the fright cannot be whipped out of him, and the whipping is rather associated in his mind with the danger he thinks he has incurred, and not being able to separate the two, he becomes confirmed in the belief that he was right in suspecting that he would be harmed. If the horse is permitted to pass the object without being driven up to it, that should be the end of it. No amount of whipping, or swearing, or jerking the mouth will do any good.

The driver of such a horse needs to keep himself well in hand, and if one-half the drivers would devote two minutes of attention to themselves and one to their horses, there would not be so many horses addicted to tricks and faults. Keep a steady rein, speak kindly to the horse, and use such means as judgment

will suggest to show the horse that its fears are groundless, is the best advice that can be given.

Stumbling arises from a variety of causes, and the nature of any particular case should be thoroughly investigated before any remedy is attempted. Sometimes it is merely dependent upon a law or "daisy-cutting" action, and then it is possible that it may not be attended with danger. We have known many horses which would stumble at least every half-mile, but yet they would travel for years with sound knees, the other legs always being ready to catch the weight. In other cases a stumble would only occur at rare intervals, but if the trip was made it was rarely recovered, and a fall was almost sure to follow. Again, it happens with some horses that when they are fresh out of the stable their action is high and safe, but after a few miles the extensors of the leg tire and they are constantly making a mistake. Inexperienced judges are very apt to examine the action of the fore legs alone, while that of the hind quarter is of quite as much importance to safety, and is more so as regards the ease of the rider. Lameness is a frequent source of a fall, from the tendency to put the foot too soon to the ground in order to take the weight off the other. And lastly, upright pasterns will produce stumbling, when the shoulders are so formed that the foot is put down too near the center of gravity.

The best plans for remedying these several conditions are as follows: If the cause is weakness of the extensors, no care can be of much service; all that can be done is to be on the look-out for a trip, and then take the weight off the fore quarter as much as possible by sitting well back, at the same time using such an amount of sudden pressure on the bit as to cause the horse to exert himself, without any attempt to keep up the head by mechanical force, which is an impossibility. When laziness is the cause, the stimulus of the spur or the whip will suffice; and it often happens that a horse is safe enough at his top pace, while a slower one is full of danger. In lameness, of course, the only remedy is to wait till the foot or feet are sound again.

Rearing is seldom met with excepting among raw colts. When existing in an aggravated form it is a most dangerous vice. An effectual remedy is to deal the horse a very severe blow between the ears as he rises. Another plan is to wait until the horse is just on the balance, then slip off the left side and pull him over, learning him a lesson he will not soon forget. The ordinary running martingale is used with success to keep down the rearer.

Kicking. Severity is the only remedy, and a strong application of the whip down the shoulder the best means of using it. At the same time the snaffle reins ought to be firmly held and by their means the head kept up.

Bucking and Plunging. Simply saw the mouth with a twisted snaffle and the bucking and plunging may be stopped at once.

Balking. There are a thousand remedies to break a balky horse. We will give a number of them. Nine cases out of ten the whip is not a successful remedy.

If, perchance, you have an apple or potato, give it to the horse: at the same time gently caress him for a few moments and start him again.

Pat the horse upon the neck, examine the harness carefully, first on one side and then on the other, speaking encouragingly while doing so; then jump into the wagon and give the word Go; generally he will obey.

Another way is by taking him out of the shafts and making him go around in a circle until he is giddy. If the first dance of this sort does not cure him, the second will.

To cure a balky horse, simply place your hand over the horse's nose and shut off his wind till he wants to go, and then let him go.

The brains of a horse seem to entertain but one idea at a time; therefore, continued whipping only confirms his stubborn resolve. If you can by any means give him a new subject to think of, you will generally have no trouble in starting him. A simple remedy is to take a couple of turns of stout twine around the fore-leg, just below the knee, tight enough for the horse to feel, and tie in a bow-knot. At the first check he will go dancing off, and after going a short distance you can get out and remove the string to prevent injury to the tendon in your further drive.

Take the tail of the horse between the hind legs, and tie it by a cord to the saddle-girth.

Tie a string around the horse's ear close to his head.

Getting Cast in the Stall. This is a habit attended with great danger, as we have known many valuable horses to be injured by it. To prevent it, tie your halter strap just long enough, so that the colt can just touch its nose to the floor; tie a rope to the headstall of the halter, just back of the ears, and attach it to a staple directly above the colt's shoulder in the upper joists. Have this rope long enough to allow him to lie down, but not long enough to let him touch the side of his head to the floor. He cannot roll over while his head is kept off the floor. In preventing him from rolling for some time, he will forget the habit.

Crowding and Cringing. If the colt crowds or cringes upon your entering the stall, you will, as you enter, gently caress him, gradually assuring him that you do not intend to hurt him. Proceed to enter the stall, being careful to avoid loud or sharp words, and on entering feed him something out of your hand. If this means is not sufficient, take a long bow-topped whip and stand far enough behind him to be out of reach of kicking, reach up by his side and tap him gently on the shoulder. Continue tapping him until he moves over to the other side of the stall, being very careful not to strike hard enough to hurt him, and always combine the words "stand around" with the motion of the whip. When he stands around, advance and caress him, and repeat on the other side. In a few lessons he will stand around by the simple motion of the hand and allow you to enter the stall.

Halter Pulling. Put on a leather halter and a

surcingle. Then take a rope about 20 feet long, place the middle of the rope under his tail, the same as a crupper, bring the rope up along the back, crossing it over a few times, to prevent it from sliding down on his hips. Pass the ends through under the surcingle, then one along each side of the neck and through the side rings of the halter, and tie to the manger, about the same length as if tying him with the halter strap. You may then do whatever causes him to run back and pull at the halter. When he pulls, instead of the halter hurting his head, which would cause him to pull harder, the pull comes under his tail, which, to get rid of, he would spring forward. This method is perfectly safe and effectual. The author has never tried it on a horse that it did not stop from pulling at the halter in less than one day. Another: Attach a pulley to a rafter of the stable above where the horse stands; then take a long rope, attach a weight of about 50 pounds to one end, draw the other end over the pully and down through the rack, or through a hole in the floor, pass it through the ring or place of tying and tie it to the halter. When the colt pulls back, the weight will rise and allow him to go back without much of a struggle, and when he ceases struggling to free himself the weight on the other end of the rope will pull him back to his place. This will break up the habit, but is not considered as safe or effective as the first.

Pawing. This is a very disagreeable habit and gives the colt or horse a great amount of unnecessary labor, and keeping all who live in the immediate vicinity of the stable awake by the continual pounding kept up through the night. Bore a half-inch hole in each side of the stall, opposite or a little in front of where the fore legs stand, put a rawhide in each hole and wedge them in tight, allowing the top ends to reach out to the middle of the stall. When he paws, he will catch the rawhide with the foot with which he paws, and in fetching it back, the end of the rawhide will hit him on the other shin, causing him to lift up the other leg quickly and stand on the one with which he paws. He will soon learn that whenever he paws he will get whipped on the other leg, and gives up the habit.

Kicking at Night. A great many horses injure themselves by this habit. When once the habit is fully established, the proprietor is likely any morning, on entering the stable, to find the stalls kicked down, the horse's legs badly swelled, and perhaps a leg broken. He will probably consult some "horse-tamer" on the subject, and the kicking-block or the sand-bag, or some other implement of torture, will be applied, all of which will render the horse a more confirmed kicker at each application. The only remedy for this habit that has come under our notice is: Take a piece of two-inch plank six feet long and fifteen or sixteen inches wide, bore a hole through it edgeways, two feet from one end; set to upright studs directly behind the stall and the width of the stall apart; bore a hole in each of the studs, five feet from the floor; now take an iron rod and put it through the hole in one of the studs, then through the hole in the plank, and then through the hole in the next stud. Having this done, you will have the plank so that when the horse kicks and hits, the plank will swing backwards and forwards. You will then bore a hole through the plank about two or three inches from the top end; take a little tree, about the size of a fish-pole, leaving all the brush on it, put the end of it into the hole in the plank and wedge it tight. Have it so that the bushy part will be over the horse's back when he stands in the stall. When he kicks this plank he will put it into a swinging motion, and every time it swings the brush will whip him over the back. He will soon find out that to kick will be only to get whipped over the back with the brush, and in a few nights will give over the habit.

Shouldering is an attempt to crush the leg of the rider against a wall, which some ill-tempered horses are fond of doing. It is easily avoided by putting the horse's head around to the wall instead of from it.

Putting Tongue out of Mouth. To prevent this, take a thick piece of patent harness leather, about four inches long and two inches wide. Cut off the ends rounding; near the edge on each side punch two holes, through which put a leather string, and tie it on top of a joint-bit. When you put in the bit, place this on top of the tongue; take the side pieces of the head-stall up pretty well. This will prevent him from running his tongue out over the bit. If he runs it out under the bit, use a straight one, bore two holes through the bit from the under side, about an inch and three-fourths apart. To these attach a piece of large wire, bringing it under in the shape of the bowl of a spoon. When you put on the bit pull the tongue through between this wire and the bit, seeing that the space is large enough for it to sit easy. These plans will soon break up this bad-looking habit.

To Break from Pulling Back. Take a long halter, pass the strap through the hole in the post, then between the fore-legs and over the surcingle next to the belly, and tie to the fetlock of the right hind foot, as shown in Fig. 25. Hitch the horse or colt in this manner for a few times, and he will be entirely broke from the bad habit.

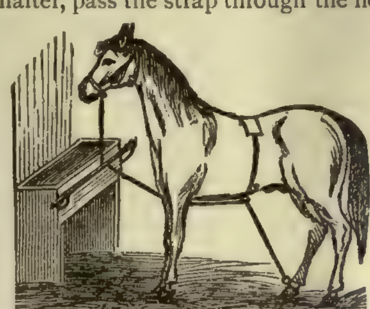


FIG. 25.—*Tied to Prevent Pulling Back.*

Running Away. When there is plenty of room apply the whip and let him run; but unfortunately runaway horses generally choose a crowded thoroughfare to indulge their fancies in. The most essential part of the treatment of a runaway is the proper selection of a bit, which should be sufficient to control him without exciting opposition from the pain it gives. Runaway horses, which could not be cured in any

way, have been easily and perfectly managed and entirely and permanently cured by placing a leather hood on the head-stall in such a manner that whenever the horse starts to run, a cord pulls the hood over his eyes. As soon as he finds that he is blinded completely, he will slacken his pace and soon come to a halt, or if he does not, run him against some object that will give him a brushing, and he will soon get tired of the trick.

FEEDING. In adapting the quantity and quality of horse feed to the wants of each horse, regard must be paid first of all to the small size of this animal's stomach; secondly, to the work for which he is designed, and thirdly, to the peculiar constitution of each individual. The horse should never be allowed to fast any long period, if it can possibly be avoided, it being found from observation, that at the end of four hours his stomach is empty, and the whole frame becomes exhausted, while the appetite is frequently so impaired if he is kept fasting for a longer period, that when food is presented to him it will not be taken.

The kind of work for which a horse is intended affects not only the quantity of food required, but also its quality. Thus very fast work, as in racing and hunting, strains the muscular system as well as the heart and lungs to the utmost, and therefore the food which is best fitted for the development of the former to the highest degree consists of those kinds which present the elements contained in the muscular tissues in the largest proportions consistent with the due performance of the digestive powers. These are found in oats and beans; but nature herself teaches every animal instinctively to keep within such limits as are safe, and hence it is found that, though every horse will greedily devour a peck or a peck and a half of corn daily, yet he will not go beyond this quantity, even though it is not sufficient for his wants, and in spite of his being deprived of every other kind of food. The demands of his muscular system are supplied by the corn; but there are certain saline matters in hay which are not found in the former, and being necessary for the performance of several important functions, the stomach receives its warning through the appetite, and no more corn is received into it. On the other hand, the hard-worked horse fed on hay alone craves for corn, and will greedily devour almost any quantity put in his manger until he upsets his digestive powers, when the appetite for it ceases. It is found by experience that a certain proportion of hay and corn is best adapted to each horse according to the work he has to do, and his own particular constitution, so that in laying down rules for feeding, it is necessary first of all to ascertain what demands will be likely to be made upon the system.

Lastly, the peculiar constitution of each horse must be studied before it can be known whether the average quantity and quality of food which will suit the majority of horses doing the same kind of work, will be enough or too much for him. Some washy animals pass their food through them so quickly that they do not absorb from it one-half of the nutritive elements contained in it. These must be fed largely if they are kept at work, and those articles of food must be selected for them which have a tendency rather to confine the bowels than to relax them. Independently of this extreme case it never can with certainty be pronounced beforehand what amount of food will keep an untried horse in condition, but in a large stable an average can easily be struck, and it is this quantity alone which can be estimated here. The blood of a horse fed on highly nitrogenized food does not differ on analysis from that of another which has been kept on the opposite kind of diet. Physiological research, however, tells us that muscle is chiefly composed of fibrine, and that every time a bundle of its fibers contracts, a certain expenditure of this material is made, calling for a corresponding supply from the blood, which cannot be afforded unless the food contains it. Hence the badly-fed horse, if worked, soon loses his flesh, and not only becomes free from fat, but also presents a contracted condition of all his muscles. And thus science is confirmed by every-day experience, and the fact is generally admitted, that to increase the muscular powers of a horse he must have a sufficient supply of nitrogenized food.

The nutrition of muscle requires fibrine, but in addition the brain and nerves must be supplied with fatty matter, phosphorus and albumen. The bones demand gelatine and earthy salts, and the maintenance of heat cannot be effected without carbon in some shape or other. But it is chiefly with nitrogenized food that we have to deal in considering the present question, there being plenty of the other substances mentioned in all the varieties of food which are not largely composed of fibrine. It may therefore be taken for granted that the hardly worked horse requires oats, together with such an amount of hay as will supply him with the starch, gum, sugar, fat, and saline matters which his system requires, while on the other hand the idle animal does not use his muscular system to any extent, and therefore does not require much if any oats.

Oats are extensively used for horse feed in almost every part of the world in connection with hay or straw. They are very nutritious, containing 743 parts out of 1,000 of nutritive matter. Oats for feeding should be old and heavy. New oats will weigh more than old, bulk for bulk, but the excess of weight consists mostly of water. New oats are not so easily masticated as the old, as they are generally soft and form a sticky pulp under the horse's teeth, and are much more difficult of digestion than the old. Indeed, new hay, new oats, and especially new corn, should never be fed to a horse except in small quantities if anything better can be obtained. The habit of some farmers of feeding soft corn to horses is extremely bad and even dangerous, as it has caused the death of many a fine animal. Old corn is very much safer and better in every respect.

In some countries barley is much used as food for horses. In Syria and Turkey nearly all the horses

Fig. 26.—TROUBLE.

are fed on it, and they are in general very hardy, and capable of enduring very severe exercise without exhibiting symptoms of fatigue. Boiled barley is sometimes found very effectual in restoring weak horses to strength and vigor. The best way it can be given to horses which are recovering from an attack of disease, is in the form of mashes, hay being also given to prevent relaxation of the bowels.

Peas are sometimes used as food for horses, but their use is not general, and they are not considered a desirable kind of provender. In 1,000 parts they contain 577 of nutritive matter They should be bruised and ground before being used, as when they are fed whole they are not easily masticated, for they slip away from under the teeth of the horses. Some horses have died after eating a heavy meal of peas. In such cases a post-mortem examination has shown that the stomach has been burst by the swelling of the peas. This fact will be sufficient to point out the necessity of caution in the use of peas as food for horses. They are nutritious and strengthening, but more than ordinary caution is required in managing them.

Carrots are much esteemed for horses, but they should be given in moderation, and in connection with other food. When given in large quantities they cause inflammation of the eyes and a sluggishness of spirit. A small quantity given in connection with the usual amount of hay and oats has an excellent effect on the health of the horse, promoting digestion, imparting a fine gloss to the coat, and improving his condition in every way. Some persons feed horses exclusively on carrots, at certain seasons, and consider them valuable provender, but the majority of intelligent observers prefer giving them in small quantities in connection with other food.

When hay is scarce and dear, chopped straw may be substituted for it without having any visible effect on the condition of the animals fed with it.

In feeding oats in the bundle cut the straw about an inch long, mix corn meal and bran in about equal quantities as to weight, so that each horse has about a bushel of cut feed and three quarters of the meal and bran twice in each day; 200 pounds per week of this mixture of corn meal and bran added to the cut feed will keep a pair of working horses in the best condition. It is less than two-thirds cost keeping them on uncut dry and whole grain. The human stomach will bear hunger far better than that of the horse, and if the rider feels his appetite keenly, he may be satisfied the animal which carries him is still more in want of food; some washy animals pass their food through them so quickly that they do not absorb from it one-half of the nutritive elements contained in it. These must be fed largely, if they are kept at work, and those articles of food must be selected for them which have a tendency rather to confine the bowels than to relax them.

In order to feed a farm horse so that he can work safely and comfortably, it will be necessary to give less hay and more grain than most farmers furnish. The hay should be cut and moistened with warm water. If meal is fed, it should be sprinkled upon and mixed with the cut hay. If oats are used instead of meal, they may be given with the hay or after it has been eaten. The feeding should be regular and no dry hay should be furnished between meals. When the horse is hard at work, the quantity of meal or oats should be increased, but no more hay should be given than usual. A few roots will be a good addition to the diet. Carrots are specially beneficial. After extreme hard work, a warm mash may be given with benefit. Still, it is not best to drive or work horses up to the point of exhaustion. It will certainly injure and may spoil them.

Hard driving after hearty eating is more injurious than hearty eating after hard driving. A farm horse assigned to the unaccustomed task of making a long journey should be allowed his own time for it; start early, drive moderately, giving him an early and long nooning, with a good rubbing down before feeding. If the end of the journey cannot be reached early in the evening, stop for supper, and after another rest he may be driven a few miles farther. A case of extreme necessity only, can justify driving a horse in the evening that has worked hard all day.

Long fasts, followed by heavy feeds, is a sure way to bring on colic and inflammation of the bowels, which may be entirely prevented by an opposite system of management. Some disapprove of giving cooked or steamed food to farm horses; but our experience has long since convinced us that it is not only a useful auxiliary to the dietary of the stable, but even an indispensable article. During summer and autumn, horses are chiefly fed on green food, and a sudden change to dry is not advisable. Not only the working horses, but the young colts, should be well cared for. It is the worst policy in the world to let farm stock get too low in flesh; for it will cost about double the money and trouble to bring them up again that it would have done to keep them so. They should be kept in a thriving state steadily from their birth. They should, besides, be housed in comfortable, well-ventilated stables. Certain it is, that many first-rate farmers keep their horses in an open yard, with sheds around. They will tell us that consequently their horses never suffer from cold. Still it is a question whether it be not cheaper in the end to have them properly housed during the winter, as there is not then the same exhaustion of animal heat, which requires an additional amount of nutrition to maintain.

This point, as well as the general principle, will be found discussed at length in the article Feeding Animals.

Watering. The water which is given to the horse will materially affect his condition if it is not suitable to him in quality and quantity, or if he is allowed to take it when heated by work. Thirst is most distressing to this animal, and if he has not his water regularly when his stomach demands it, he will not only refuse his solid food, but he will drink inordinately when he has the opportunity, causing colic or founder to supervene.

It is not desirable to have the water standing in the barns for the horses to drink at will; this luxury is so often abused by the troughs being allowed to get into a foul and dirty state that it is best to do without them altogether. Moreover, water standing in a stable readily absorbs any ammonia or other gases, and it is therefore rendered unsuitable for the horses to drink; for this reason water that has stood in a pail in a stable over night is not fit to drink. Those who contend for this constant supply have overlooked the fact that the horse when he first comes into the stable is unfit to be allowed to "take his fill," and yet he will be sure to do so if the water tank is open to him.

If, after feeding hay and then oats, we allow the horse to take a large drink of water, a considerable part of the oats will be carried by the water into the intestines, and we get little of the advantage of feeding the oats after the hay. If such a drink is taken soon after eating hay alone, the effect will not be so injurious, because hay does not need so long a time for digestion as grain. If only one or two quarts of water are allowed, it will pass the food in the stomach without changing its position to any great extent. When the stomach has got rid of a considerable part of its contents it seems a difficult matter for it to force out the remainder, and fermentation and colic sometimes result. A drink of water at such a time, by carrying on the substance which has remained long enough, relieves the condition.

The quantity of water which will be imbibed by horses varies more than that of their solid food, yet ignorant men are apt to give all alike. If salt is given, it will produce considerable thirst at first, but after a time the effect ceases and in the long run will not make much difference. Green food will also make less alteration in the desire for water than might be expected, and it is necessary to be cautious in the allowance of water to horses which have begun to eat green grass, for if given in the usual quantity, when the stomach is full of green food, it will very probably bring on an attack of colic. As a rule, no horse should go to any moderately fast work with more than half a bucket of water in him, and that should be swallowed at least half an hour.

The quality of water best suited to the horse is one moderately soft, but it should not be rain-water collected in tanks, which soon becomes full of decomposing vegetable matter. Most horses are accustomed to hard water, and a change to that which is soft must be carefully avoided when work is to be demanded of them. Thus, in sending horses used in fast work from home when they have been accustomed to either kind of water, it often happens that their health is upset, and this is quite as likely to occur when the change is from hard to soft as from soft to hard water. Trainers of valuable race-horses are so aware of this fact, that irrespective of the risk of poisoning, which they thereby avoid, they take water with them.

The proper temperature of the water given in the stable is a matter of serious importance, and the effect of a bucketful of cold water to a horse just come in from his work is very serious. Even in a state of rest cold water will often produce cramp or colic, so that careful hostlers never give it without warming it, either by the addition of a little hot water, called "taking off the chill," or by letting it stand for some hours in the stable or saddle room. If the former method is adopted, it should not be made to feel actually warm, for in that state it nauseates a delicate feeder, but it should barely have the chill taken off, so that in dipping the hand into it no sensation of cold is produced.

How to Use a Horse. On this subject we can do no better than to quote from Henry William Herbert:

"It is not, after all, every one who owns a horse," says Mr. Herbert, "that knows how to use him, whether for his own pleasure or the horse's, which is, in other words the owner's best advantage. Nor is it very easy to lay down rules how a horse should be used, considering the many different purposes for which horses are kept, the different natures and constitutions of the animals, and the different circumstances of their owners.

"Horses may, in general, be divided into two classes, —those kept for work, and those kept for pleasure. In the former class may be included farm-horses, stage, coach and omnibus horses, team-horses employed in the transportation of goods and moving heavy and bulky masses, car men's horses, and lastly, the road horses of all professional men, who, like lawyers, doctors of medicine, and the like, are compelled to drive or ride many hours per diem regularly, in the performance of their business.

"In the latter class may be included race-horses, match trotters, private gentlemen's saddle-horses, carriage-horses, or roadsters, and many other animals belonging to business men, which being employed during half the time or more in actual service, are used during spare hours on the road for purposes of amusement.

"With regard to the first class of these horses, the exigencies of the business to which they are applied are for the most part such as to supersede and override all rules. In some cases the natural hours of the day and night have to be reversed, and the animals are called upon to do their work by night, and to rest and feed by day. Under these circumstances it may be laid down as an immutable law that at whatever hour the horses are to be worked, they must have full time beforehand to digest their food and water; they must be carefully cleaned, and made comfortable; they must have sufficient intervals for halting and baiting on the road, must be cleaned and well fed during the intervals of work, and must have ample time for undisturbed repose. The distance which horses in perfect condition can go upon the road varies greatly with the powers of the animal, the degree of pains bestowed on him, the skill of his driver, and the amount of his load, as well as the state of the roads. But it may be taken as a rule that strong, able horses, of moderate speed, can travel forty miles a day, with a moderate load, without distress, for many days in succession. It may be observed that it is the better way to start at an easy pace when on a journey, to

increase it slightly in the middle of the day, and again to relax it before coming in at night, in order to allow the animals to enter their stables cool, in good order, and ready, after a short rest and cleaning, to feed with an appetite.

"It may also be observed, in this point of view, that it is a mistake to fancy that horses are benefited by being driven or ridden very slowly when they have a long distance to perform. If a horse has to get over forty miles in a day, the roads being good, the temperature of the day pleasant, and the load not excessive, he will do it with more ease and less inconvenience to himself, going at the rate of seven or eight miles an hour, and doing the whole distance in five or six hours, with a single stoppage in the middle of the day to feed and rest, than if he be kept pottering along at the rate of four or five miles, and be kept out of his stable hungry, thirsty and leg-weary for a longer time.

"Farm-horses, whose work is necessarily slow and continuous, lasting ordinarily from sunrise to sunset, with the exception of a mid-day halt for baiting, are under different circumstances. Their work being always slow, and rarely if ever severe at the moment, or toilsome except from its long duration, they need not be subject to the same conditions as fast-working horses, of being fed long before they are put to work and allowed to evacuate their bowels thoroughly before being harnessed. They may, therefore, be fed and watered at the last moment, and put to slow work immediately, and will rarely take harm from traveling on full stomachs. In the same manner, when they are loosed at noon-day, being rarely overheated, after a slight rest and a slight rubbing down—which, by the way, they rarely receive—they may take their mid-day feed without delay and without fear of evil consequences. In like manner may be treated carmen's horses, and team-horses, the labor of which is heavy and continuous rather than rapid. All horses, however, whatever the work to which they are applied, should have ample time to rest at night, and should be thoroughly rubbed down, dried, clothed and made comfortable before feeding them and closing the stables for the night, and the more so the more trying the day's work.

"With regard to pleasure horses, which are usually in the stables, more or less, 20 hours out of every 24, that are only taken out for the gratification of the owner at such times as it suits his humor or necessity, they should never be taken out and driven fast on full stomachs, which can always be avoided by letting the groom know in case they will be required at an unusual hour or for unusual work—when he can adapt his feeding hours to the circumstances of the case.

"When harnessed and ready for a start the driver should mount his seat quietly, gather his reins, and get his horses under way slowly and gradually, by speaking or chirruping to them, never starting them with a jerk or striking them with a whip, allowing them to increase their pace by degrees to the speed required, instead of forcing it on a sudden.

"It is far better for horses to drive them steadily at a regular pace, even if it be ten or twelve miles an hour, than to send them along by fits and starts—now spinning them over the road at sixteen or eighteen miles, now plodding along at six or seven; and of two pairs of horses driven the same distance, after the two different methods, that which is driven evenly will at the end of the day be comparatively fresh and comfortable while the other will be jaded and worn out.

"In regard to punishment, the less that is administered the better. A sluggish or lazy horse must, it is true, be kept up to his collar and made to do his share of the work, or the free-goer will be worn out before the day is half done, and for this the whip must be occasionally used. Even good and free-going horses will occasionally be seized with fits of indolence, at moments, induced perhaps by the weather, and it may be necessary to stimulate them in such cases; again at times when roads are bad, when time presses and certain distances must be accomplished within certain times, recourse must be had to punishment; as it must also in cases where the animals are vicious and refractory, and where the master must show himself the master. Still, as a general rule, punishment should be the last resort. It should never be attempted with a tired, a jaded, or an exhausted horse; for to apply it in such cases is utter barbarity, little or no immediate advantage is gained to the driver, while it may probably result in the loss of an excellent animal. It is common to see horses punished for stumbling, and punished for starting; and whenever a new horse which one may chance to be trying starts off into a gallop after committing either of these offenses, one may be sure he is an habitual starter or stumbler, and that he has frequently undergone chastisement for them, and undergone it in vain. It is altogether an error to punish for either starting or stumbling; the one is the effect of fear, which cannot be cured by the whip; the other, in most cases, of malformation or of tenderness in the foot, which certainly cannot be treated successfully by chastisement, which, in fact, aggravates and confirms instead of alleviating or curing.

"In speaking of driving at an equal pace we would not, of course, be understood to mean that horses should be driven at the same gait and speed over all roads, and over grounds of all natures. Far from it. A good driver will while going, always at the rate of 10 miles (we will say) an hour, never perhaps have his horses going exactly at the same rate for any two consecutive twenty minutes. Over a dead level, the hardest of all things except a long continuous ascent of miles, he will spare his horses. Over a rolling road he will hold them hard in hand as he crosses the top and descends the first steep pitch of a descent; will swing them down the remainder at a pace which will jump them across the intervening flat and carry them half way up the succeeding hill, and will catch them in hand again and hold them hard over the top, as we have shown before.

"Horses in traveling should be watered about once, with not to exceed two quarts, after every ten miles, or every hour, if one be traveling fast; and if traveling far they should be well fed once in the middle of their journey. This point, however, has been discussed already under the head of feeding.

"In closing we would say, always remember in using a horse that it cannot be done with too much coolness, too much gentleness, too much discretion, or too much kindness.

"There is no better beast in the world than a horse, nor any one which, though often most cruelly misused by man, so well deserves, and so amply by his services repays, the best usage."

For full directions for Driving, see that article.

STABLING AND GROOMING. In a climate so uncertain, changeful, and in which the extremes of cold and heat are so great as in the greater portion of the United States, the question of stabling is of greatest importance. It is a matter of much regret that so many of the farmers of America make such poor provision for their horses. The stables are often so illy ventilated, or not ventilated at all, that the ammoniacal vapors and stifling odors from the urine and excrement and decomposed vegetable matter engender the worst forms of disease. The same laws affect alike the health of the horse and his master; and that of farm horses, as well as farm laborers, would often be much worse than it is were it not for the large proportion of time spent by each in the open air. The subject of stabling and the manner of the construction of the stable is fully treated under head of Barn.

As to grooming, little need be said. When at work the farm horse needs more care and attention than they generally receive. Not only should their feeding and watering be regular, and of the proper sort and quantity, but they should be kept clean and comfortable. After working in the mud, their legs should be washed clean, wiped and rubbed until dry. On the subject of grooming Youatt says:

"Of this much need not be said to the agriculturist, since custom, and apparently without ill effect, has allotted so little of the comb and brush to the farmer's horse. The animal that is worked all day and turned out at night, requires little more to be done to him than to have the dirt brushed off his limbs. Regular grooming, by rendering his skin more sensible to the alteration of temperature and the inclemency of the weather, would be prejudicial. The horse that is altogether turned out needs no grooming. The dandruff or scurf which accumulates at the roots of the hair is a provision of nature to defend him from the wind and the cold."

This, however, which may be true, and correct as of the horse that is turned out every night during the greater part of the year, and feeds only on grass, with some slight addition of oats and mashes, certainly is not applicable to the farm-horses of the United States, which are, for the most part, if not altogether, stabled for the greater part of the year, or in winter at least; fed on artificial food: kept warm, to a certain extent; and which, of course, must be cleaned daily, especially after severe work or exposure to wet, if they are to be kept in health and working condition.

"It is to the stabled horse," Youatt continues, "highly fed, and little or irregularly worked, that grooming is of the highest consequence. Good rubbing with the brush or the currycomb opens the pores of the skin, circulates the blood to the extremities of the body, produces free and healthy perspiration, and stands in the room of exercise. No horse will carry a fine coat without either unnatural heat or dressing. They both effect the same purpose, but the first does it at the expense of health and strength; while the second, at the same time that it produces a glow on the skin, and a determination of the blood to it, rouses all the energies of the frame. It would be well for the proprietor of the horse if he were to insist, and to see that his orders are really obeyed, that the fine coat in which he and his groom so much delight is produced by honest rubbing, and not by a heated stable and thick clothing, and, most of all, not by stimulating or injurious spices. The horse should be regularly dressed every day, in addition to the grooming that is necessary after work."

In speaking of grooming, Herbert says: "It is true, in a measure, that the necessity of regular dressing, wisping, currying, brushing and hard rubbing is far greater in the case of highly pampered horses, fed in the most stimulating manner, principally on grain, kept in hot stables, always a little above their work, and ready at all times to jump out of their skins from the exuberance of their animal spirit; yet it is necessary to all housed and stabled horses; and the farmer, no less than the owner of fast trotters, will find his advantage in having his horse curried and washed before feeding in the morning in the increased play of his spirit and in the gayety and fitness of the animal for his work; and if, when he brings him in at night, reeking with sweat, drenched with rain or snow, his thighs and belly plastered with thick mud, and his legs covered, as cart-horses' legs mostly are, with thick hair, saturated with cold water and clogged with particles of mud and sand, he neglects to have him thoroughly cleaned and made dry and comfortable for the night, he not only commits an act of gross cruelty, but wholly disregards his own interest. Unless a horse be cleaned and groomed when in such a condition, he cannot be kept in health; and if he be fed freely in such a state,—although the cart-horse is less liable to such ailments, from his hardier habits and less impressive constitution,—the chances are that soon he will be attacked by inflammation of the bowels, or lungs, or with spasmodic colic—the race-horse, fast trotter, or highly bred and highly fed roadster would be so attacked, to a certainty—and the failure to dry and cleanse the legs of such a horse, especially if there be a draft of cold wind blowing upon the heels from a crevice under the stable door, as is generally the case in common farm stables, will be almost certainly succeeded by that troublesome, dangerous and foul disease known as 'grease,' or

more commonly in America as 'the scratches,' etc.

"When the weather will permit the horse," says Mr. Youatt, "to be taken out, he should never be groomed in the stable, unless he be an animal of peculiar value, or placed for a time under peculiar circumstances. Without dwelling on the want of cleanliness, when the scurf and dust that are washed from the horse lodge in his manger and mingle with his food,—experience teaches, that if the cold is not too great, the animal is braced and invigorated to a degree that cannot be attained in the stable by being dressed in the open air. There is no necessity, however, for half the punishment which many a groom inflicts upon the horse in the act of dressing, and especially on one whose skin is thin and sensitive. The currycomb should be, at all times, lightly applied. With many horses its use may be almost dispensed with; and even the brush need not be so hard, nor the bristles so irregular as they often are. A soft brush, with a little more weight of the hand, will be equally effectual and a great deal more pleasant to the horse. A hair-cloth, while it will seldom irritate or tease, will be almost sufficient with horses which have a thin skin and which have not been neglected. After all, it is no slight task to dress a horse as it ought to be done. It occupies no little time, and demands considerable patience as well as dexterity. It will be readily ascertained whether a horse has been well dressed, by rubbing him with one of the fingers. A greasy stain will detect the idleness of the groom. When, however, the horse is changing his coats, both the currycomb and the brush should be used, as lightly as possible."

In ordinary cleaning, in the morning, the head should be first dressed. The hair should be lifted and deranged lightly, not stretched or torn with the currycomb, and then rubbed well in all directions, both against and across the grain of the hair, as well as with it, until it is entirely clear from dust and dandruff. The ears should be gently pulled and stripped with the hand, from the roots to the points, and the whole head should then be washed smoothly and evenly, as the hair ought to lie. The neck, back, shoulders, loins, croup and quarters follow, the same plan being used, except that in dressing these parts, while the comb is used lightly and dextrously with one hand, the brush is employed in removing the scurf with the other. The flexures of the skin at the insertion of the limbs are parts which require especial care, as the dust is most apt to collect in these places. This done, the horse must be thoroughly wisped all over with bunches of dry straw, till his coat is quite clean and glossy, when it may be gone over for the last time with a fine, soft brush, or a light duster.

HOW TO BUY A HORSE.

This subject is certainly deserving the attention of the farmer, even though he breeds and raises more horses than he buys. The farmer should know most thoroughly the horses that he breeds. Indeed, he should be a competent judge of this noble animal. In buying a horse the first things to be considered are, the use for which he is needed, and the amount of capital to be expended for him. These points having been settled there are many other things to be observed in buying a horse. Buy only of responsible, well known men. Remember that no matter what conditions horses may be in, a certain class of horse traders always attempt to put them off for what they are not. In buying of such men you cannot rely with any degree of certainty upon what they tell you, but must risk your judgment. Even then the horse is handled with such skill that the shrewdest judges are often deceived. Another point to be observed is to never buy a horse because he is offered at a price evidently far below his real value. When a horse is offered at what seems to be a sacrifice to his owner, rest assured that he has some disagreeable vice, or is permanently unsound.

In reference to the uses for which a horse is desired a few observations may be made with profit, as the different kinds of horses have different points of excellence and distinct qualifications. The regular farm horse requires strength, quickness, activity, hardihood and courage. Light, shambling nags are not suited to turn up a good broad-shoulder furrow to the action of the winter's frost. The heavy draft-horse requires only great power and weight, with fast walking action, or a moderate trot, and with an easy moving action to himself. The carriage horse is an entirely different animal in shape, action, etc. Size, symmetrical figure, stylish action and a moderate stroke of speed must be his chief characteristics. The light harness horse is still different from the carriage or family horse. He must have more style, be capable of faster speed, greater endurance, and have a good mouth. The saddle horse is the most difficult to select. He should be handsome, have a showy, stylish action, must be sure-footed, have a fine mouth, excellent temper, abundance of courage and perfectly docile. Above all, however, he must be an easy mover, both to himself and to his rider.

For hard labor never purchase a narrow-chested animal. It indicates weakness of lungs, and those liable to inflammation. For a saddle horse, however, avoid a very broad-chested animal, though sometimes they are found to be good trotters. A medium between the narrow and broad chest will be found the most perfect.

WHAT A HORSE SHOULD BE. In summing up the physical structure of what a horse should be we quote from Henry William Herbert. On this subject he says:

"The points of the physical structure of a horse on which the most, indeed the whole of his utility depends, are his legs. Without his locomotors, all the rest, however beautiful it may be, is nothing worth. Therefore, to these we look the first. The fore shoulder should be long, obliquely set, with a considerable slope, high in the withers and thin above. The upper arm should be very long and muscular; the knee broad, flat and bony; the shank or cannon bone, as short as may be, flat, not round, with clean, firm sinews; the pastern joints moderately long and oblique, but not

too much so, as the excess produces springiness and weakness; the hoofs firm, erect, or deep, as opposed to flat; and the feet generally large and round. In the hind legs, the quarters should be large, powerful, broad, when looked at in profile, and square and solid from behind. The hams should be sickle-shaped, not straight, and well let down, so as to bring the hocks well toward the ground. The hocks should be large and bony, straight, not angular or convexly curved in their posterior outlines; the shanks corresponding to the cannon bones, short and flat; and the hind feet similar in form to the front. The back should be short above, from the point of the withers and shoulder-blade, which ought to run well back to the croup. The barrel should be round, and for a horse in which strength and quickness are looked to more than great speed and stride, closely ribbed up.

"A horse can scarcely be too deep from the top of his shoulder to the intersection of his fore leg—which is called the heart-place—or too wide in the chest, as room in these parts gives free play to the most important vitals. The form of the neck and setting on of the head are essential not only to the beauty of the animal, but to the facility and pleasure of riding or driving him; hence a horse with an ill-shaped, short, stubborn neck, or an ill-set-on head, cannot by any possibility be a pleasant-mouthed horse, or an easy one to manage. The neck should be moderately long, convexly arched above from the shoulders to the crest, thin where it joins the head, and so set on that, when yielding to the pressure of the bit, it forms a semicircle, like a bended bow, and brings the chin downward and inward until it nearly touches the chest. Horses so made are always manageable to the hand. The converse of this neck, which is concave above and struts out at the windpipe like a cock's thropple, is the worst possible form; and horses so made almost invariably throw up their heads at a pull, and are those most exceptionable of brutes, regular star-gazers. The head should be rather small, lean, bony, not beefy, in the jowl; broad between the eyes; and rather concave, or what is called basin-faced, than Roman-nosed, between the eyes and nostrils. The ears should be fine, small and pointed; the eyes large, clear and prominent, and the nostrils wide and well opened. A horse so framed cannot fail, if free from physical defects, constitutional disease and vice, to be a good one for any purpose—degrees of strength, lightness and speed being weighed in accordance with the purpose for which he is desired."

Color. Much stress is laid upon the colors of horses by many persons; indeed, long experience has shown that certain tints are usually accompanied by certain qualities of person or disposition. As a general rule dark-colored horses are the best, but blacks form an exception, as they are extremely variable. Light shades appear unfavorable to strength and durability. Bay is a prevailing tint, and is generally admired; it admits of many shades; there are bright bays, dark and dappled bays; the latter is esteemed for beauty; brown bay is valued for service, and consists of bay and black in variable proportions; all bays have black manes and tails. (See article Bay.) Brown horses are highly prized; the dark varieties have sometimes beautiful tan markings. (See Brown, page 151.) Chestnut is also a good color, but is said to be less depended upon than some others. The sorrel is a variety of the chestnut, but not a favorite one. Dun is a color that has several varieties, the mane and tail sometimes lighter and sometimes darker than the body, with frequently a black list along the back; they appear to be of all qualities. White horses are not in much estimation, neither is it a very common color for young horses; but some become white through age. Black is a very usual color, and seems to be an original tint. The tempers of black horses vary extremely, being either sluggish or too fiery. It is seldom that a horse entirely black is seen; there is usually some spot of white in the forehead, or a few white hairs on the breast. The roan is a mixture with white hairs. Gray horses are of many shades, compounded of black and white; there are the iron grays and dappled grays. Various other names for mixtures are enumerated, scarcely possible to define.

Examining a Horse. The criteria of the qualities of horses are derived from inspection and trial. To judges their outward appearance affords a pretty just indication of their powers, and a moderate trial usually enables the same judgment to decide on the disposition to exercise such powers. The qualities indicated by color have been already noticed. The strength may be judged of by the general form. The spirit, vigor, or mettle, as it is termed, are best ascertained by trial. A horse of vigor and true courage is highly valued, and shows his mettle only when it is required of him. He walks securely and deliberately, and moves with readiness as well alone as in company. Without requiring the whip, he will go from the walk to the gallop, and as easily from the gallop to the walk again, champing the bit and trotting glibly. He is attentive and cheerful; loves to be caressed even when on his journey. He is easily managed, good-tempered, and quiet under difficulties. A hot, fiery horse is as objectionable as one of true courage is desirable; he is known by his disinclination to stand still, and by his mettle being raised by the slightest exercise, especially when in company. Such horses are not safe; they are impetuous, difficult to manage, and are easily frightened.

In examining a horse for the purpose of purchasing, look at him standing quietly in his stable, to see he has no trick like that of putting one hind foot over the other. In doing this he often cuts the fore-part of his hind foot with the sharp calks of his shoe, thus making him lame perhaps for months. A stable examination is the best for observing indications of wind-sucking, crib-biting, chronic cough, the state of respiration, and for discovering vice. For this purpose always have a horse shown quietly; when there is much noise and bustle there is generally something wrong, and when the animal is agitated slight lameness will escape the eye.

Fig. 27.—ARAMIS.

The first thing to be observed is that when standing evenly the weight is thrown equally on both feet. If there be any complaint in the fore-feet, one will probably be "pointed," that is, extended before the other, or he will frequently alter the position of them, taking one up and setting the other down; or the hind legs will be brought under the body to relieve the fore-feet of some portion of the weight. Any of these symptoms will direct your attention to the feet when you see him out.

Respiration. To judge of his respiration, it is necessary to be acquainted with the indications of health. Observe if the flank alternately rises and falls with regularity. In health the respiration of the horse is from four to eight per minute, average six, in the day time; during sleep it is seldom more than four. If quicker than ordinary, it betokens present fever; other symptoms will be developed, such as increased pulse, heat of mouth and dullness, while the delicate pink appearance which the membrane covering the partition of the nostrils assumes in health, will be increased in color. But if none of these symptoms of ill health are present and yet the horse heaves at the flank more than ordinary, if the weather be moderate, and the stable not oppressively hot, it is probable such a horse is thick-winded.

When inspiration appears to be performed readily and quickly as in health by a single action, but expiration with difficulty by an irregular and prolonged movement, or double action, the respiratory muscles appearing as if interrupted in the act of expelling the air, and then the flank drops suddenly, it is a symptom of broken wind. His cough should then be tried. The cough of a broken-winded horse is a peculiar low, hollow grunt, difficult to describe, but when once heard easily recognized. It can generally be elicited by pinching the *larynx* or *trachea*, though occasionally this fails, for some sound as well as broken-winded horses cannot be made to cough at all. In these cases, when there is any irregularity in the movement of the flank, which would lead to the suspicion of broken-wind, and there is unusual hardness of the wind-pipe, which does not give way on pinching, it may be taken as a symptom of disorganization, in addition to the broken-wind. See page 197.

Mange. If the hair is rubbed off in some places, especially about the head, flanks and tail, or he is observed rubbing himself against the sides of the stall, there is danger of his being mangy; and in this case his coat will be found rough and staring.

Kicking and Biting. The absence of the vice of kicking and biting may be inferred from the manner of the groom when entering the stall, and by the quiet method with which he unclothes and dusts him over and combs out his mane and tail. If he be a biter, his head will probably be tied short to the neck, or the groom will seize hold of him short by the halter or bridle, sometimes giving him a shake or looking sternly at him. Desire to see his hind and fore-feet, and by the manner in which he permits the groom to lift them, a guess may be made as to his quietness to groom his heels or shoe.

While the horse is in the act of being led out of the stable to the light, closely observe his manner and action; if the ears move in quick changes of direction, as if alarmed at every noise, and he hangs back on the halter, raising his feet higher than ordinary, and putting them down as if fearful and uncertain of his step, it leads us to suspect his eyes, though sometimes these symptoms will be observed when the eyes are perfect, if the stable has been a dark one.

Lameness. When the horse is shown out, notice if he stands firm on his feet, with his weight thrown boldly on his back sinews and pasterns. If there is any appearance of shaking or tottering of the fore limbs, indicative of grogginess, it will be endeavored to be disguised by the groom continually pulling at the bit to make him shift his legs and stand advantageously. A lame horse is never permitted to stand still a moment, and the groom, though pretending to soothe, is in reality agitating him, while the shrewd and crafty seller will most probably endeavor to withdraw your scrutiny from the defective point by calling your attention to his spirit or playfulness. If any of these maneuvers are apparent, be upon your guard. The groggy horse inclines a little forward at the knee, or it is readily bent by the least touch behind, he rests his weight on his toes, and when standing undisturbed brings his hind legs under him. Some young horses, before they had been backed, have this deformity from malformation of the knee; but if, in addition to this bending forward, there is any tremulous motion of the limbs, it is a decided proof of the existence of that most destructive affection, navicular disease. Whatever his age, he should be rejected.

Another deception is effected by standing a horse up hill; the shoulder is made more sloping, and dealers, to give that appearance, desire the near leg to stand before the other.

Though the dealer is perfectly justified in these little maneuvers to show off his goods to the best advantage, more especially in so fancy an article as a horse, which is no more than is done and allowed by every tradesman, the prudent purchaser will not please his eye at the expense of his judgment, but see the horse on level ground, and with his feet placed even.

General Action. When brought out, do not allow him to be jockeyed in his paces. Take your stand on one side of the road, and let him walk naturally and quietly by; then turn and walk by, showing his other side. Now stand behind and have him walk off in front of you and from you; then turn and walk toward you. Observe if he goes freely and easily and plants his hind feet in the tracks of his fore feet. Next, have him trotted by you, and back and forth, watching his action closely.

Taking our position in front of the horse, we examine his fore-legs,—that they are in proper position; that there is no weakness in the pasterns, or enlargement of the fetlocks; and that the feet are of the same size, and stand square to the front.

Should one of the fore-feet be much affected, it will be evident by the up-and-down motion of the head, and the different degrees of force with which he puts his feet to the ground. Horses that are lame before drop their heads when stepping on the sound leg, and raise it when the weight is thrown on the lame leg; but when they are lame behind, the action (though not perceptible) is reversed; they throw up their head a little when the sound leg comes to the ground, and depress it when the lame leg propels the body, and the motion of the lame leg is slow, while the sound one is jerked quickly forward to sustain the weight.

When both fore-feet are equally tender, which is not uncommon in groggy horses, it is more difficult to judge of his action; it is not uneven, and the limp is not perceptible, but he steps short and feelingly, with a general appearance of contraction. Dishonest dealers, at fairs and auctions, resort to a scheme by which groggy lameness is disguised in one leg by making the motion even. It is known in various parts by the slang terms of diamonding, beaning, balancing or wedging. It is performed by removing the shoe of the sound foot, and paring out the sole until it yields to the pressure of the thumb. The shoe is then replaced, and a wedge of wood, a pebble or a bean is driven in between the sole and the shoe, until sufficient pain is produced to make the horse equally lame on both legs. Although the lameness is less evident, yet a person accustomed to the action of horses will easily detect it; and if the animal is allowed to stand undisturbed, it will be evident that something is wrong by his repeatedly shifting his legs.

Another trick of some dealers to conceal lameness, or to give an appearance of energy to the sluggard or worn-out horse, is the torture of the lash, termed firing. The poor animal, previously to being shown, is so barbarously flagellated that under the influence of terror of the further application of the whip, his attention is withdrawn from the disease, he feels not the lesser pain, but trots off heedless of his lameness, or at least showing it much less. Whenever there is much punishment, or a threat of it, while showing a horse, be sure there is something to conceal.

In his trot, if the action is good, the foot is boldly delivered with what may be almost termed an allegro movement. Its course is straightforward and downward, not dishing to either side; the motion should be from the elbow as well as the knee, the hind-legs gathered well under the body, following with regularity and precision; the toes fairly raised from the ground, and spread pretty accurately in the impress of the fore-feet; if they pass beyond they are likely to overreach. In the trot, he should go lightly with the fore-feet, but strike the ground energetically with the hind, taking a long, darting stride.

Though the best horse may stumble, if after tripping he springs out as if he feared the whip or spur, you may justly suspect him of being an old offender, which will induce you to look at his knees and head. Observe that he goes clear in all his paces, and that one leg does not interfere with the other; horses that go very near are more likely to cut when tired.

The carriage of the head and tail are points to which the eye of a good judge will be directed. If the tail goes to and fro when in action, like the pendulum of a clock, it is a good sign of blood and steadiness.

He should now be mounted, and the trial be repeated on the stones or hard road, or what is preferable, on a rough and stony declivity, for there are many cases of slight lameness which do not show on soft ground, at a walking pace, or when the horse is unburdened. If he step away boldly, the toe in a direct line with the body, the knee fairly bent, and his foot up and planted firmly down again upon the ground, fearlessly and flat, without any dropping of his head, you may conclude him sound in action. His hind-legs, well lifted up and tucked well under him, should follow his fore-legs with regularity; and if in running him up hill he goes without dragging his toe, you may infer the same behind. In the gallop, if he takes up his legs quick and dashes in his haunches, not bringing his hind-legs after him, his action is good. During this display of action, the examiner will have an opportunity of judging of the perfection of his wind; if he does not ride the animal himself he should stand close to the horse at the moment he comes into the gallop.

General Health. We judge of the general state of the animal's health by his breathing condition, the brightness of his eye, the color of the membrane lining the lid, and that of the membrane lining the nostril, which in health is of a pale pink. If it is a florid red, there is excitement of the system; and if it is a pale, approaching to white, it is a sign of debility. Each nostril should be alternately closed by the hand to ascertain that the air passages are not obstructed by polypus or enlargement of the turbinated bones.

Glanders. If there is any increased discharge from the nostrils, you will probably be told it proceeds from slight cold; in that case an accelerated pulse and affection of the eyes are usually concomitants; nevertheless, as a precautionary measure, the branches of the under jaw should be felt for enlargement of the glands; if, although enlarged, they are movable and tender, it is probably nothing more than a catarrhal affection. And here it may be necessary to observe that in deciding upon the disease with which the horse is afflicted, it is requisite to bear in mind the age of the animal. In examining the head of a young horse, should the space between the branches be hot, tumid and tender, the membrane of the nose intensely red, with profuse discharge from both nostrils, and cough and fever present itself, we may more than suspect strangles. Where, however, there is neither cough nor fever, but one nostril, and that the left, affected, the discharge lighter in color, and almost with small circular ulcers, having abrupt and prominent edges, there can be no second opinion on the subject.

But we caution the inexperienced examiner not to

mistake the orifice of the nasal duct, which is situated in the inner side, just within the nostril on the continuation of the common skin of the muzzle, and which conveys the tears from the eye into the nose, for an ulcer; and warn him, in all suspicious cases, to be careful he has no chaps or sore places on his head or face, as this dreadful disease is unquestionably communicable to the human being. As few persons will buy a horse with any symptoms of actual disease, however slight, if they can help it, the inquiry is better left to a professional man in case any of these symptoms make their appearance after purchase.

Crest, Skin, Teeth and Eyes. His crest should feel hard and full, and firmly and closely attached to his neck; if it be lax, he is out of condition. His skin should feel kind and look glossy, and the muscles of the body feel hard and spongy to the touch. In the old horse the head grows lean and fine, and the features more striking and blood-like, the neck fine, withers short, and the back sinks; the lips exhibit a lean and shriveled appearance, and the lower lip hangs considerably below the upper. In youth they are round and plump, and meet together, and the ridges of the roof of the mouth will be found prominent. In age, the middle of the nose will sometimes be found indented by the long-continued pressure of the nose-band of the head-stall. In lifting his lip, if the incisor teeth shut close, even, and perpendicular, he is young. As he grows older, they project forward in a horizontal direction, and the under and upper edges do not meet with evenness, the upper projecting over the under teeth. The longer his teeth are, the gums being dry and shrunk from them, the more advanced he is in age. Examine the teeth and see that they are sound, strongly set and even.

As to the age, this is readily told by the teeth till seven years old, unless they are "bishoped." It is usual for jockeys to call a horse eight when he is all the way from ten to twenty, but an adept can give a pretty shrewd guess as to this, for after ten years old the eyes begin to sink, gray hairs come into the head and there is a want of youthful look and vivacity.

If there are any marks of extraordinary wear in the central teeth there is reason to suspect crib-biting, and in old cribbers the outer edge of the front teeth are worn away, and little pieces are sometimes broken off by the attrition against the manger; if such is the case, look to the neck for marks of the "crib-biting strap."

Now look at his eyes and make a motion with your hand toward them, as if you intended to strike. If he winks quickly, or draws the head back, the vision may be depended on generally as good, and no blindness in him. The eyes should be moderately prominent. Sunken eyes are apt to get blind as the horse grows old, and often characterize a vicious temper.

Thick Wind, Roaring, etc. The thick-winded horse breathes with difficulty, and is soon distressed. The flanks heave much and rapidly; there is some little noise, but the laborious heaving of the flank is the principal indication. A horse unused to exercise, or if fat, or exercised on a full stomach, will show symptoms of thick wind; and it has been observed of great feeders, who never breathe freely until they have gone a mile or two, or begin to sweat, that they are able to do more work than others that do more labor under the same difficulty.

Avoid all defects of wind, and be sure the defect has not been temporarily covered up. A whistler or roarer may exhibit no indications of his infirmity at a slow pace, or up to a certain speed. Let him go beyond that and it is readily apparent. Broken wind is an incurable infirmity. A horse may make more or less noise and not have broken wind, yet such indications should be regarded with suspicion. He then should be tried by a brushing gallop.

The only other simple and practical plan to get at the state of the breathing is the common way of making the horse cough, which, if gross and accompanied by a short groan, is conclusive, and the characteristic grunt when alarmed is not to be misunderstood. But the cough is not always marked, and therefore, as a test, infallible. If, then, there is any cause for doubt and suspicion, it is better to call in a professional man, more especially as the slighter affections are apt suddenly to terminate in the greater, without much warning, in a very short time.

Look for External Blemishes. We now proceed to search for blemishes and those indications of unsoundness, which are apparent to external examination, bearing in mind any symptoms or suspicious appearances in his action, that may lead us to suspect particular parts, which should then be subjected to the severest scrutiny. Any scars about the head should direct attention to the knees, or they may lead one to suspect there may have been an attack of megrims or staggers.

The neck should be searched to ascertain that both jugular veins are perfect, which is discovered by pressing on the lower part of the neck, with sufficient force to stop the return of blood from the head; if the vein be perfect it will fill and swell from that point upward toward the head. The loss of one of them, if recent, predisposes the horse to staggers or apoplexy, and he cannot be turned out to grass or straw yard without risk. The withers should be examined for bruises from the saddle, as he is unserviceable as long as heat or swelling continues.

The slightest tendency to sore back makes a horse unserviceable for many months, and not unfrequently causes him to rear and plunge on mounting. The shoulders should be examined for tumors. If there are any marks of setons or blisters about the points, it is probable he has been treated for shoulder lameness, and the attention of the examiner will be directed to the foot, which, ninety-nine times out of a hundred, is the seat of lameness before. If that is found round and strong, with the heels high, we may suspect navicular disease.

The chest and breast should also be searched for

marks of rowels, setons and blisters, for the remains of them render it probable that the horse has been under treatment for inflamed lungs or chest affections, and should in prudence direct the purchaser to ascertain by a smart gallop whether the mischief is of a permanent nature, more especially if the horse is narrow-chested.

Examination of the Legs. Look at his fore legs and notice if he has strong knee joints, and that they are not sprung. Examine the hind legs closely above and below the hocks for any swellings, and especially for curbs and spavins. Now look at all the pastern joints and see if clear of cuts from interfering, or if there are any scars on them in consequence of this. The pastern should be rather short for a carriage-horse, and not much sloping. If the latter are long and elastic, they are apt to give out at a hard pull. In a race-horse such pasterns are less objectionable. In a heavy draft animal they are unpardonable.

In inspecting the leg, the eye alone should not be trusted, particularly in hairy-legged horses; but after minutely comparing the appearance of the two limbs, the hand should be deliberately passed down both shanks before and behind; any difference, before or behind, points to a deviation from health.

In the sound, flat limb the tendon is well defined, perfectly distinct, and has a hard, tense feel that resembles the touch of a cord tightly strung. If the back sinews feel thick, the flexor tendons and their sheaths swelled and rounded, leaving no distinctive marks, as it were, between the one and the other, but all swelled into one mass with the bone, great mischief has at some time happened; either some of the ligaments have been ruptured, or there has been inflammation, effusion and adhesion of the vaginal bursæ or synovial sheaths of the flexor tendons; or such relaxation has taken place from strain and subsequent inflammation as will always keep him weak. When the injury is recent, it is accompanied with more or less swelling, heat and lameness; by time and treatment the first are removed, but the swelling remains, and the thickening of the tendons shows the mischief that has been done. Whenever there is manifest alteration of structure here, and yet the animal is apparently sound in action, the purchaser should bear in mind that the soundness is often the effect of rest, and should the animal be again put to work he will become lame. And bear in mind in such case you cannot return him, for no man in his senses would give a special warranty against it.

Every excrescence on the cannon bone, in horseman's language is termed a splint. The true splint is in fact a local conversion into bone of a part of the temporary cartilage connecting together the large and small metacarpal bones. The inflammation is set up by concussion or strain. Horses are lame from them while there is inflammation in the cartilage. But when the tumor is formed, the inflammation has subsided, and the periosteum has accommodated itself to the enlargement, the horse is no longer lame, nor more likely to become lame from that splint than one without; the same causes that produced the first may produce a second.

The splint, if so large as to interfere with action, rendering the horse liable to strike, is objectionable, or so near the knee or ligaments as to interfere with their freedom of action; otherwise they are of very little consequence beyond the blemish destroying the line of beauty. The worst splints are those not discernible but by the lameness they produce.

Any marks of firing or blistering should make the purchaser cautious, and endeavor to ascertain the cause of the treatment; after blistering, the hair is sometimes a shade different in color, and stares a little, is shorter and bristly, and wants the natural gloss.

The fetlock joint from being the principal seat of motion below the knee, and from its complicated structure, is particularly subject to injuries. The fetlock should be subjected to the strictest examination for enlargements, which are best ascertained by carefully comparing them with each other, as any difference in size is indicative of strained or even ruptured ligaments, and consequently permanent weakness of that important part. If the injury is recent, there probably will be heat, and pain on pressure; and any signs of blistering or other treatment, though no enlargement or lameness is apparent, should induce the buyer to view the animal with the utmost suspicion.

If there are any sore or callous places about the fetlocks or pasterns, he is a cutter, and possibly the marks of the foot may be visible. If there is no malformation to account for it, it may have been done when fatigued or it may have arisen from improper shoeing; his feet should then be examined.

If an old offense, he may probably have a peculiar shoe, rather thicker and narrower in the web on the inside than the outside, and nailed only on the outside of the foot and around the toe; or the opposite shoe is found filed away or beveled off, with the hoof projecting a little over the shoe. Where the feet, though well formed, are placed closer than desirable in narrow-chested horses, and therefore apt to cut, particularly when tired, we sometimes find a shoe is adopted thinner on the inside than the outside.

At other times various ingenious devices, calculated rather to increase than remedy the evil, have been resorted to, such as putting on shoes narrower on the inside, and set within the crust, and the wall of the quarters reduced in thickness by the rasp. If none of these schemes have been resorted to, to obviate the defect, the horn of the opposite foot will sometimes be found polished by the attrition; for it is not the shoe that cuts once in a hundred times, but the hoof. In horses that interfere, we generally find the inside quarter lower than the outer, or the toes turned outwards, the fault being in the leg that receives the mischief while sustaining the weight, not in the foot that gives the blow. The tired horse throws his legs about, and frequently cuts himself; and it is the fault of most young, uneducated horses,

especially if they have been backed or inconsiderately worked too early.

The pastern is the seat of a bony tumor termed ring-bone. It is the result of inflammation and partial conversion into bone of that portion of the cartilages of the foot which rise above and nearly encircle the coronet. These cartilages, extending backward considerably beyond the coffin-bone, form the elastic frame of the posterior parts of the foot; they here take on the name of the lateral cartilages. When once ossified, inflammation is set up in this part; from its tendency to spread around the pastern joint, it has taken its name of ring-bone. Upon the integrity of these parts depend the elasticity and consequent usefulness of the foot. However trifing the apparent alteration of structure, it is a serious detraction from the efficiency of a hack; though on soft ground, at a slow pace, the draft horse will work apparently sound.

The feet are often passed over, but a thorough examination of these is of the utmost importance. They should be reasonably large, the hoofs clear and tough, free from cracks, not shelly, and well set up at the heels; otherwise they will soon wear down on pavements or hard roads, and the horse become foot-sore. If always to be kept in the country to work on a farm or dirt roads, low heels are not so objectionable; lastly, regard the inside of the hoofs and see that they are free from corns, and that there is a good-sized frog to soften the jar to the leg when the foot stamps on the ground.

The best way of judging whether there is any malformation of the feet, either natural or the result of disease, is to front the horse and compare the two feet together. Small feet are objectionable, and so a very large foot that is disproportionate to his size is to be avoided.

Its wall should be round, smooth, level and of a shining dark color; full in front, of a proper obliquity, and free from ribs or seams, and perfectly cool. Its proper obliquity ought to be at an angle of 45° with the plane of the shoe. If the angle is materially less, the sole is flat, or perhaps convex; if the angle exceeds it, the foot is contracted.

When the outward line or profile of the hoof is irregular, it marks what is called a "shelly foot." This is decidedly bad. If there are any protuberances or rings around it, they indicate that the feet have been affected with fever to such a degree as to produce an unequal growth of horn, which frequently leaves some injurious consequences in the internal part of the hoof, such as a deposition of lymph between the horny and cartilaginous processes, which connect the foot and hoof together. If there is any depression or hollow it betrays separation of the foot from the hoof, and sinking of the coffin bone, and the sole will be found bulging.

No man should trust to a superficial judgment of the foot, for though he may see the form and shape of the foot to be promising, yet there are other things to be considered. It may be well formed, yet thin and weak; and those feet, externally the most perfect, are sometimes contracted internally, and are liable to the insidious affection termed navicular, or joint capsular disease. Contraction is a serious defect; it is apparent and general, or occult (hidden) and partial. But, though a contracted foot is often an indication of past disease, and there is a diminution of elasticity, it by no means follows that it is an unsoundness, or incapacitates a horse from work. With care such feet will work soundly to the end of their lives; for this change in shape has been effected by gradual and slow absorption and deposit; so that nature has had time to adapt the internal parts and accommodate itself to the change, for elongation of the foot has taken place. When such feet feel hotter than ordinary, distrust should be awakened, more especially if there is a marked difference between the temperature of one and the other. If there is indisputable pointing, then the horse is unsound.

The inner quarter hoof must be most minutely inspected for sand-crack; and it is not always easy, without minute scrutiny, to detect a sand-crack, where an attempt has been made to conceal it. A month's run in marshy ground will often close it up, and low dealers, particularly at fairs and markets, and others who gain a livelihood by dealing in "screws," have a knack of neatly covering the crack with pitch, and the foot oiled, so as adroitly to conceal the crack. Any oily appearance about the hoof should excite suspicion, and any fissure at all resembling sand-crack should cause the horse to be peremptorily rejected. Cracks indicate a dry and brittle hoof. The heels should be examined for any cracks, or appearance of heat and tenderness, as they are exceedingly troublesome to cure.

The frog, in its healthy state, must be firm yet pliable and elastic. If there is any smell, or if on squeezing the frog matter exudes, there is a thrush. By many people thrushes are considered of little importance; but the pus proves there must have been inflammation; and knowing that when a horse with a thrush steps on a stone, he frequently drops with the pain as if he was shot, to the peril of his rider and the ruin of his knees, it must be admitted they are serious objections in a saddle-horse. If it can be ascertained that they are not of long standing, or that the horse has been placed in a situation so as to favor their approach, such as confinement in a hot, moist litter, they are of no more consequence than so much diminution in his price will cover the expense of keep and attendance while healing; but when a thrush accompanies a foot smaller than usual, the heels wind in, and the frog is rotten, let him go as he will, he will not long remain sound.

The sole of the foot should be subject to close examination. In its healthy and natural state it is inclined to be concave; but if in connection with high heels an extraordinary concavity is present, it is a sign of internal contraction; if the sole is morbidly thick, and does not give way during great exertion, the elasticity of the foot must be diminished. If the

sole is less concave than natural, or approaching to flat, the foot is weak.

If the foot appears to have been cut unusually deep at the angles where the shoe meets the inside heel, or if there is any peculiarity of shoeing at that part, the examiner may infer that all is not right, and that he has corns; and if he waits for the proof, send for the farrier to remove the shoe. The stifle is very rarely diseased, but it should be examined for enlargement or any marks of firing or blistering; and the groin should not be overlooked for rupture.

The hock is one of the most important joints in the animal machine, and should always undergo a most rigid examination previous to purchase, as from its complicated structure, and the work it has to perform, it is the seat of lameness behind in nine cases out of ten.

When standing behind the horse, if one of the hocks is diseased, the observer will perceive the bone does not incline gradually, as in the sound limb, but there is an abrupt prominence. Though to the unpracticed eye this is not always perceptible on comparing them, yet by passing the hand down the inside of both hocks this abruptness will be felt. If there is any tenderness or heat on pressure, or the marks of recent cutting on the inside of the fetlock, or unequal wear of the shoes, especially at the toe, you may suspect spavin. Sometimes both hocks present an enlarged appearance, though there is neither heat, pain nor lameness (for hock lameness is frequently intermittent); such hocks should always be looked upon with suspicion; they are, in fact, unsound; for though the animal may, with natural malformation or exosteal growth, the result of disease, discharge his usual functions through life without a return of lameness in careful hands, yet the probability is he will fail if called upon for any unusual exertion, and that one day's extra work will ruin him forever. In this case the examiner must be guided by circumstances; if the horse has excellencies which counterbalance the defect, the price is correspondingly low, and if the work required is but moderate, he may be serviceable for many a year.

Curb. Curb is a longitudinal swelling at the back of the hind leg, three or four inches below the hock, seen best from the horse's side; the enlargement is the result of a sudden strain of the annular ligaments, or inflammation of the sheaths of the tendon. It is attended with a good deal of lameness and swelling at first, but when this has subsided, and if any time has elapsed without a recurrence of the lameness, it is of no more consequence than the unsightly blemish; but it should be remembered that curby hocks are liable to spavin.

Thoroughpin is situated above the hock joint, between the flexors of the hock and foot, projecting on each side; it is of the same nature as wind-galls, being an enlarged mucous capsule, and is indicative of severe work or over-exertion.

Bog or Blood Spavin, is a swelling situated in front of the hock, towards the middle of the joint; it is also an enlarged mucous capsule, but deeper seated, over which one of the subcutaneous veins passing, the blood in which becoming obstructed in the return, increases the size of the tumor.

Back. If he backs with difficulty, his hind quarters swaying from side to side, and when compelled to retrograde suddenly he appears as if about to fall, he has received some injury. Some horses cannot be made to back, but when urged, rear on their hind legs. His loins should be searched for marks of setons, or blisters. Among stable-men it is termed "chinked in the chine," or rigged in the hock.

If the tail lifts hard and stiff, it is usually an evidence of a strong back and quarters. If it lifts quite limber and easily, the reverse is apt to be the case.

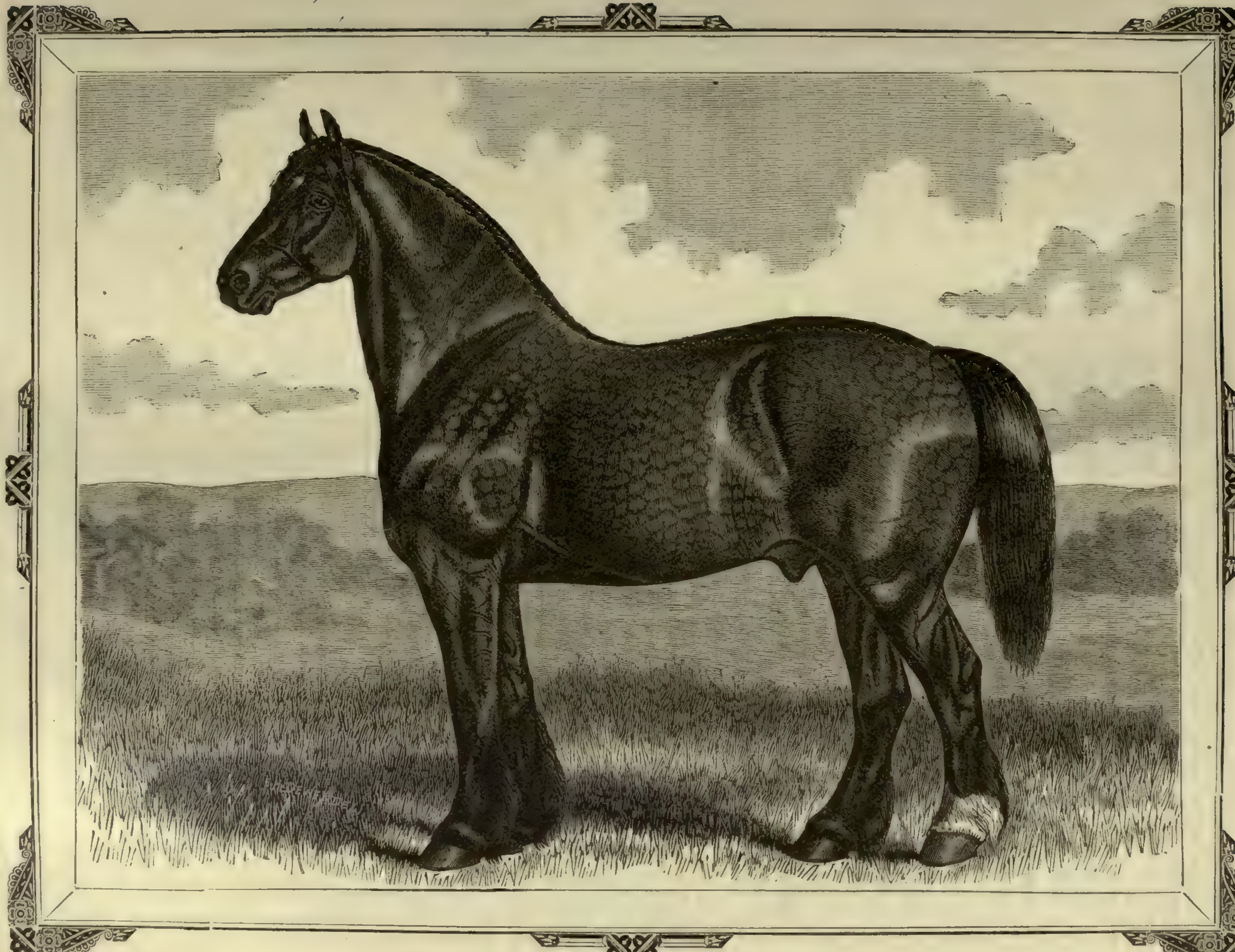
Examination of the Eyes. The horse should now be returned to the stable for the purpose of examining his eyes, the most favorable position for which is about half a foot within the stable door. There should be no back or side lights, or the rays, falling between the examiner and the animal, will prevent him seeing distinctly. The head should be so placed that a moderate light should fall on the eye of the horse, and the quantity of light can be easily regulated by bringing the horse's head more or less forward, until it is placed in the most favorable direction for observation.

Though every horseman can detect absolute blindness, yet the eye of the horse is susceptible of so many diseases, in which defective vision or partial blindness exists in such a form, long before the sight is lost, that it requires not only more observation than most people imagine, but a person unacquainted with its anatomical structure, and the different appearances it assumes, cannot perceive it at all. There are certain forms of the eye, and structural peculiarities, that show a constitutional pre-disposition to disease; thus, small, sleepy eyes, of a bluish-grey color, or when they have a flat, retracted and sunken appearance, or those of a longish, oval figure, are predisposed to ophthalmia; or when the eyes appear full, with a fleshy circle around them. These are all symptoms of badness of eye, and are the forerunners of blindness, particularly in the heads of coarse and fleshy horses, with heavy countenances, who usually go blind with cataracts at seven years old.

Slight thickenings of the lid or puckering toward the inner corner of the eye, a difference in size, a cloudiness or dullness of the iris, are several indications of disease that a purchaser should beware of.

In examining the eyes, both must have an equal degree of light; if any difference is apparent between them, one must be diseased. The cornea, or transparent part of the eye, should be perfectly clear.

Specks are best detected by standing at the shoulder; if one is evident, and it can be clearly proved to be no more than the effect of accident, no importance need be placed on it. But it is impossible to ascertain this; and therefore the safest course is to assume that natural irritability and consequent inflammation of the eye is the cause.



ENGLISH DRAFT HORSE.

If there is an excess of tears, it denotes debility, and should occasion a more than ordinary scrutiny; in fact, all horses with weeping, dull, cloudy eyes, should be rejected as unsound.

It may be remarked, as a general rule, that all diseases of the eye are incurable. Have nothing to do with a horse when the slightest trace of disease of the eye is visible, as it is impossible, from a superficial examination, to distinguish between simple ophthalmia and inflammation of the conjunctiva, the cause of which has been a blow, or the introduction of some irritating matter, such as a piece of dirt or hay-seed, which is curable by simple means, and the specific ophthalmia, as spontaneous affection, which ultimately terminates in cataract and blindness.

Viewed in front, the depths of the eye should be looked into; then sidewise, which will assist in ascertaining the clearness and absence of specks on or within its surface.

The iris varies very little in color in the horse, though it bears some analogy to the color of the skin. It is rarely lighter than a hazel, or darker than a brown, except in milk-white, cream-colored or pied horses, when it is white, and they are termed wall-eyed. If it is a pale, variegated, cinnamon color, it is good.

It is important that the oval shape of the pupil be perfect, for if any irregularity or uneveness is perceived, it is a symptom that the organ has received partial injury. In looking into the depth of the eye through the pupil, in a strong light, it should exhibit a lively bluishness; in a moderate light, it should be perfectly transparent; if milky or turbid, it is the remains of former inflammation, which will probably recur.

In bringing the horse out of the stable to the light, if the pupil is large it is a bad sign; by alternately shading and admitting light, if it enlarges and lessens under its stimulus, it is an infallible sign the eye is good. But if the retina is unmovable, the pupil larger than natural, and of one invariable size when shaded or exposed to intense light, though no disorganization is apparent, the eye appearing bright, of a peculiar glossy aspect and of a greenish color, the animal is blind from the disease termed "glass-eye"—a palsy of the optic nerve.

A decided cataract, or opacity of the crystalline lens, or its capsule, is easily detected; but when very small they may escape observation. It appears as a cloudy or pearly-white substance within the pupil towards the bottom of the eye. If the pupil be round instead of a flat oval, it is an indication of cataract; when there is the slightest deep-seated cloudiness, the eye should be condemned; but if there is any white object before it, such as a white hat, neckcloth, waistcoat, or wall, the reflection on the cornea produces a mark having so much the appearance of a cataract as to have misled many an experienced observer. Therefore, before deciding, hold the crown of a black hat against the eye and observe at the same time if the mark disappears, which it will, if it is only a reflection.

The Horse Bought. If your examination has proved satisfactory and you decide on purchasing, before you part with your money learn something of the seller. For, should your bargain not turn out as you anticipate, upon further acquaintance, trial, and second examination, you will know what chance of remedy you have against the vendor.

The horse, if returned, must of course be in the same condition in which he was received, except so far as the disease for which he is returned may have progressed in the meantime. It is advisable to inquire of the seller how he has been accustomed to diet and clothe the animal; whether his feet were stopped; and the same treatment should be pursued till his soundness is ascertained.

Beware of putting a saddle on a new horse that does not fit him; while the question of soundness is still doubtful, it is far better to use the saddle he has been accustomed to. If his back becomes galled while trying him, which is not an unusual occurrence, the dealer will object to taking him back unless full compensation is made—and reasonably so, for he is unfitted for sale or for work until it has healed, which is not to be effected in a day; and it is also a point for calculation, whether he may not chance to fall sick while standing in high condition in the stable; in which case the dealer would be subjected to heavy loss. It is therefore not prudent to remove his shoes, or in fact to do anything with the animal which may cause doubt or cavil, until you have finally decided upon keeping him.

GUARANTY. When a horse is purchased with the conditions that he is warranted sound, free from vice, or quiet to ride and drive, and of certain age, the warranty must either be in writing or given in the presence of a third person. To be on the safe side and to save future litigation, have a plainly written guaranty given you. The following is a simple form of warranty:

$75.00. CHICAGO, June 1, 1882.

Received of John Chapman seventy-five dollars, for a bay gelding, by Lance, warranted five years old, free from vice, sound, and quiet to ride and drive. T. D. TRENOR.

It is important to observe that the age, freedom from vice, quietness to ride and drive should be mentioned, because warranty as to soundness alone does not include these. Many disputes have arisen as to what is legal soundness or unsoundness. A horse is considered sound in which there is no disease nor any alteration of structure which impairs his natural usefulness, and he is unsound if he labors under any disease, or had any accident that has impaired his natural usefulness by an alteration of the structure of any part of his body. The term unsoundness does not apply to any original defect in the temper of the horse, or any deficiency in the strength or power of the animal. The principal circumstances which constitute unsoundness, besides the great number of actual diseases, are broken knees, which may indicate a stumbler, though not always; for any horse may meet with an accident, and the knee may now be quite well, though it requires great judgment to distinguish in

this case. Contraction of the foot is sometimes, but not always, unsoundness; for it is occasionally natural and not a fault.

The following defects are considered unsoundness: Lameness, through any cause; pumiced foot; sand-crack; spavin; splint; thickening of the back sinews of the leg; thrush; ossification of the cartilages of the foot; defects or diseases of the eyes; coughs; roaring; broken wind or any defect of the lungs; quidding or imperfect mastication; crib-biting; biting; kicking. Corns are considered as constituting unsoundness, but they must be discovered within a short time, say a few days of the purchase; curbs constitute unsoundness; founder is unsoundness whether it produces lameness or not; quittor may render the horse permanently unsound; ring-bones and side-bones constitute unsoundness; string-halt; breaking down, even though the horse has recovered so as not to go lame; farcy and glanders; grease and mange; megrims, if it can be shown the horse had an attack before the sale; cataract however slight; broken knees, when the joint is injured; balking; rearing; shying when habitual; weaving in the stable, that is, the horse throwing his head and body from side to side with a peculiar motion.

CLIPPING the hair of the horse is practiced but little outside of the cities. Even in these centers, where horses used for fast driving receive the best of attention, many contend that it is cruel, others claim that when the horse is humanely treated, when he is driven from one warm stable to another, and is never subjected to stoppage under uninclosed sheds or in the open air, undoubtedly clipping him in the winter season, when he is devoted to fast work, is a decided benefit. Under other circumstances, there are so many benefits and so many injuries, pro and con, that clipping will forever remain a debatable practice, on the ground of preponderating cruelties and abuses. The objections become less potent as we consider the turf horse. He is the object of more tender nursing and more scientific care. Clipping the turf horse, therefore, is attended with the least possible amount of abuse. He is provided with a warm box and a multiplicity of comfortable blankets, that buckle closely about his throat, chest, body and limbs. He is never tied after a severe drive, particularly in winter, in front of club houses, exposed to cold winds, provocative of congestion, that terminates either in founder, or lung fever, or inflammation of the stomach, bowels, or kidneys, as the constitutional weakness or the system may locally determine. But his winter work, whether it be fast or jogging, is begun and ended without intermission, and his treatment is indicated by extreme anxiety to prevent any injurious results.

The mere operation of clipping is as painless as that of cutting the human hair. Some horses are exceedingly restive during the process, simply because of the tickling sensation to their more susceptible nervous organization.

Necessarily, in clipping horses, machines for that purpose had to be improvised. There are now in the market clipping machines of many patterns and for any use desired. We here illustrate some of the best make, and speak of their leading features.

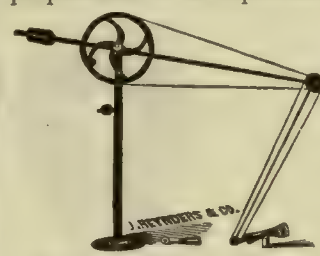


FIG. 29.—*Power Horse Clipper.*

The principal features of the clipper represented by Fig. 31 are the double set of teeth, self-sharpening and visible plates, the arch spring pressing the plates firmly together.

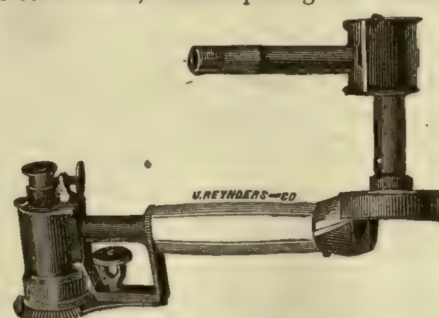


FIG. 30.—*Handle of Power Horse Clipper.*

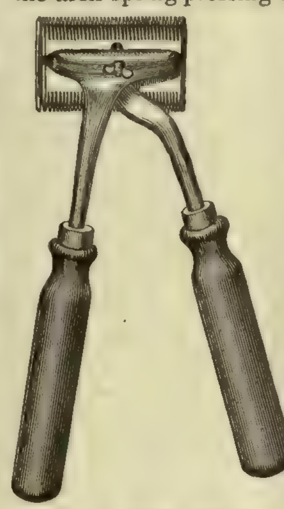


FIG 31.—*Horse Clipper.*

The Power Horse Clipper has vibrating cutters, and the power is conveyed from the balance arm to the handle by a belt. It also has the advantage of being noiseless.

Fig. 30 represents the handle of the "Power Horse Clipper" with rotary cutters complete.

Fig. 33 is a representation of a pair of clipping shears with leather-covered handles. They are a useful and necessary article in clipping the horse.

Another necessary, or at least very convenient article in clipping horses, is the circular comb, illustrated by Fig. 32.

Clipping may be done, however, with a comb and two or three pairs of variously curved scissors and a singeing lamp, which must be used at least to remove any loose hairs which may have escaped the blades of the scissors. Two men generally work together, so as to get the operation over in from 16 to 20 hours, which time it will take to clip the average-sized horse properly. While the process is going on, the horse ought to be clothed as far as possible, careful men removing only so much of the quarter piece as is sufficient to expose the part they are working at, and no more.

After the removal of a long coat of hair, the animal must not be kept standing out of doors, even blanketed, and extra protection in-doors should be given. In trimming, the jaws, nostrils and ears can be singed with a small lamp. The tail should be carefully combed out and great care taken in its trimming, for the tail and mane are two great objects of admiration in the horse.

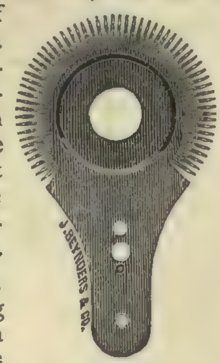


FIG. 32.—*Circular Comb.*

The process of clipping should certainly be discouraged among farmers. Horses that are driven to town and left to stand for hours sometimes, should never be robbed of the protection given by nature. It is only in cities where careful and conscientious grooms have constant care of the animal it should be practiced.

TRIMMING. Some degree of trimming is generally necessary to all horses required to look well, and great care should be observed in the operation when carried to any great degree, especially when trimming the hairs on the nostrils, jaws and ears. These may be singed, but the nostrils must not be touched inside, as the internal hairs are clearly a protection of the delicate lining membrane of the ear from the cold and wet. The long bristles of the nostrils may either be cut off, pulled out, or singed off, but the first plan is the easiest and the most humane. There are, also, some bristles about the eyes which are generally removed, but it is very doubtful whether many an eye would not be saved from a blow in the dark if they were left untouched. The hair which grows an inch or more in length beneath the jaw, being of the same nature as the rest of the coat, can only be singed off with advantage, and it should be done as fast as it grows, especially if the singeing is not universal, or there will be a different color presented in these parts. Nothing gives a horse such a low-bred appearance as a goat-like beard; and the trimming of this part alone will completely alter the character of the animal, where the hair has been at all long.


FIG. 33.—*Clipping Shears.*

The legs are trimmed partly by singeing, and partly either by clipping or pulling out the hairs. Great dexterity is required to manage this performance in a workmanlike manner, so as to avoid the stale and post-like appearance which is presented by a leg clipped all over (without a corresponding clipping of the body), and at the same time to remove all, or nearly all, the superfluous hair. In the summer an unclipped leg is totally inadmissible, and even from the legs of a badly bred horse the hair may be pulled by gradually working at it for a little time every day with the fingers, armed with powdered resin. This prevents the hair slipping through them, and by its aid such a firm hold may be obtained that, as we said before, perseverance will enable the groom to clear the legs entirely, with the exception, generally, of a strong lock of hair behind the pastern. When this is very obstinate, it is allowable to use the scissors to clear away the hair below the horny growth which is found there; but there should always be left a slight fringe round this, so as to avoid the sharp and stiff outline presented by the clipped leg. In the winter, the arms and backs of the knees, as well as the breast and the insides of the quarters, will generally want singeing, whether the body is submitted to the lamp or not; but in the summer, even if any long hairs are left there, they are easily removed by the hand armed with resin. Unless general clipping or singeing is practiced, the front surfaces of the legs do not require trimming at any season of the year.

The mane is not now usually cut, but formerly it was a very common practice to "hog" it, that is, to cut it to a sharp-pointed ridge, sticking straight upwards from the crest, and giving that part the appearance of extraordinary height. Sometimes, however, the mane is very thick, and then, for the sake of appearances, it is necessary to thin it, which is done by twisting a small lock at a time round the comb, and pulling it out; this gives some little pain, but apparently not much, and evidently not more than the trimming of the legs, and not so much as in pulling out the feelers or bristles growing out from the nostrils. A small lock of mane is generally cut just behind the ears where the head of the bridle rests, as it would otherwise lie beneath that part in an untidy manner.

In trimming the tail, various methods are adopted, when it is cut square; for if the hairs are allowed to grow to the full length, no interference is necessary beyond an occasional clipping of their points to prevent them from breaking or splitting. A square tail, however, whether long or short, demands the careful use of the scissors or knife, without which the horse to which it belongs is sadly disfigured. Two modes are practiced: in the first, the tail is carefully combed out, and then, allowing it to fall in its natural position, it is gathered up in the hand just above the part to be cut off, and here a sharp knife is drawn across it backwards and forwards, without notching it, till it passes clean through. The tail is then released, and any loose hairs projecting are removed with the scissors. The second mode is not so easy, but when well carried out is more satisfactory to the eye, inasmuch as it is capable of giving a sharper and more defined edge to the square tail. As in the first method, the tail is carefully combed out; it is then held by an assistant's hand, placed beneath the root of the dock, as nearly as may be in the position which it assumes in the animal out of doors. While thus poised, the

operator takes a pair of sharp scissors, and holding the blades horizontally open, he insinuates one of them through the middle of the tail at the place to be cut, passing it straight backwards, and cutting the hair quite level from the central line to the outside on his own left. Then, reversing the blades, and keeping to the same level, he cuts towards the right, and if he has a good eye, and can use his hands in accordance with its dictates, he will have presented a very prettily squared tail. On the other hand, if these organs are defective, or if he wants experience, he will have notched the end of the tail in a most unsightly manner. For the mode of docking the tail see Dock, page 325.

To make the mane lie smoothly on its proper side, which it sometimes obstinately refuses to do, it must be plaited in small locks, and the ends loaded with lead, if it cannot be made to lie down without. An experienced groom, however, will generally succeed in so managing the plaits that they lie close to the neck, which is all that can be effected by the aid of lead, but sometimes the hair is so obstinate that nothing else will effect the object in view.

Docking. For the mode of performing this operation see the article Dock.

Shoeing. The varied uses to which the horse has been subjected since taken from a wild condition, and the willing and cheerful manner with which he has undergone fatigue and performed duties which are, one would think, quite foreign to his nature, have certainly all been owing to his combined and unequal quality of strength, courage, speed, fidelity and obedience, as well as docility; and, though his great value has mainly depended upon a just disposition of these, yet it cannot be doubted that to the presence of a wonderfully contrived foot, the horse largely owes his exalted position over all those creatures which have submitted themselves to domestication and toil for the human species. It may be said that with the horse in a state of nature the hoof requires no protection, and before paved and hard roads were made, probably no defenses were contrived for the protection of the feet of the horse, and the first that were made use of appear to have been copied from those of his master. A sort of sandals are mentioned as occasionally employed by the ancient Greeks, and by the Romans as late as Constantine, and these were stiffened by plates of iron, and sometimes ornamented with the precious metals. The injurious effects of fastening with thongs have given place in modern times to the present method of nailing on iron shoes; and Beckman states that the first account of the modern horse-shoe occurs in enumerating the furniture of the Emperor Leo, of Constantinople; but it was not until long afterward that its use became general. It was first introduced in England by William of Normandy, and of course came to our shores with the early pilgrims.

Even in the most favored countries the usefulness of the horse-shoe can be but limited without some means of protecting the hoof from undue wear and doubtless this fact was soon recognized by the people who, at a very early period, trained and employed this animal, and who, no doubt, were compelled to resort to various devices to protect it from inefficiency from this cause. For, with the increasing spread of civilization, the demands upon the services of the horse became more urgent, and the diversities of climate to which he was carried, as well as of races which resulted, would lead one to suppose that greater wear and modification in nature and consistency of the hoof would render some kind of defense absolutely necessary.

It is obvious that the horse's foot was designed to meet every natural demand, so far as the weight and movements are concerned, but when a heavy load is imposed on his back, or attached behind, and when he is compelled to travel, particularly over hard roads, in all kinds of weather, nature's arrangements are overtaxed, and the wear of the hoof is greater than repair. Consequently, art must step in to assist nature. It is a fact, however, that great injury results from shoeing.

The injurious effects of bad shoeing only require to be pointed out to excite every endeavor to avoid them, and the importance of shoeing is evinced by the great pains that have lately been bestowed on the subject. There are some circumstances in the common practice of country smiths which ought to be guarded against by every one who possesses a horse likely to come under their hands; but the shoes at present made, and their mode of shoeing, are in in general nearly always objectionable.

Many persons are very careless as to the state of the horse's feet and his shoes. The shoes are often worn till they drop off in the middle of a journey, and time is lost, the foot broken or destroyed, and, very likely the horse lamed. If the horse be doing little work, perhaps the shoes are left on too long, and the horn is suffered to grow so as to accumulate too much; then the horse's action is fettered; he cannot step out; he cannot place his foot firmly on the ground, and he is very liable to corns. Hence at certain intervals the superfluous horn must be pared away; a month is the usual time; some may go five weeks. If the heels are weak or the seat of corns, the shoes may require removal every three weeks. If the shoes of fast workers are not worn at the end of a month, the feet should be pared and the old shoes replaced.

Almost all of the myriad diseases of the horses' foot, such as contractions, corns, quarter and toe-crack, drop-sole and pumice-foot, thrush, bent-knee, interfering, stumbling, etc., are caused by indolent and ignorant shoeing. The frog and sole are soft and cheesy, and yield readily to the blacksmith's knife, leaving a clean, white surface; hence they are whittled and shaped without reference to the divine purpose in their location and form.

The part of the hoof which suffers most from undue wear, is that which was intended to encounter it,

the wall; and when this is too much worn the sole becomes broken around its margin and sensitive parts within wounded and contused. Therefore, all that the hoof requires, in order to enable the horse to remain serviceable, is merely some kind of protection for the lower border of the wall; but this protection should not be heavy, else the muscles which were destined to move a marvelously light foot will be unduly strained, as will also tendons and ligaments; for the muscles (the moving power of the limb) are all situated at the upper part of the leg and act upon short levers, the mechanical means being designed rather for speed than strength. This protection must be durable; it should not damage or interfere with the functions of the foot, but allow every part to perform its office unimpaired; it ought to be easily applied, and secure when attached to the foot; it should not render the animal less sure-footed, if possible, than before it was applied; and finally it ought to be simple and cheap.

The preparation of the foot for the shoe is a subject of much moment. It is, of course, commenced by pulling off the old shoe. It is better not to take more than one off at a time; otherwise the horse is apt to break away the edges of the horn while standing on the bare ground or pavement. In removing the old shoes which were fastened by nails clinched, great care should be taken by the smith to raise the clinches thoroughly, or file them off, until the shoe can be taken off easily, instead of wrenching them off with violence, as is sometimes done, by which the nail holes are enlarged, and the future hold weakened by portions of the crust being detached; and the horse shows by his flinching how much he suffers by this violent operation.

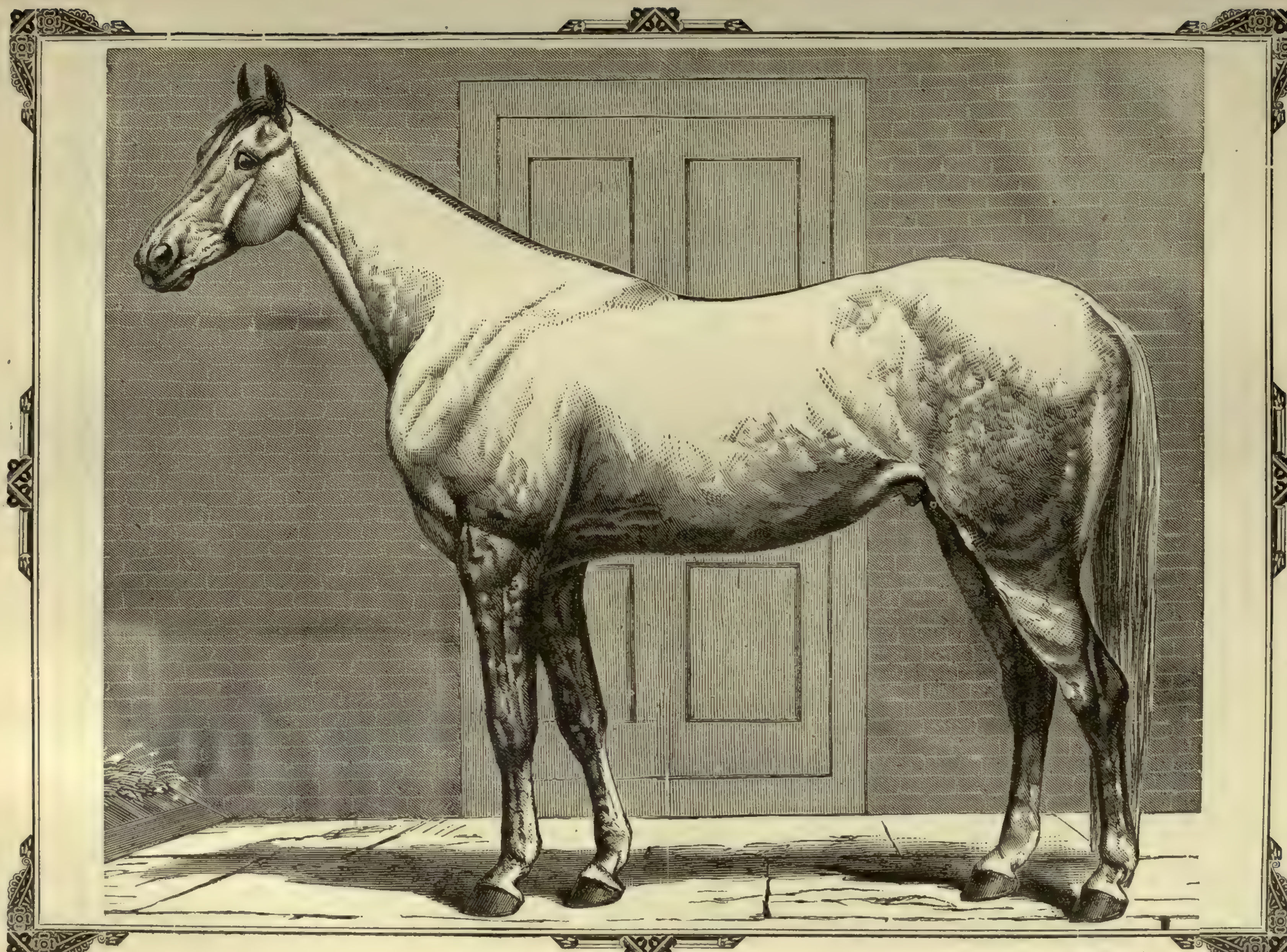
When the foot is tender, or the horse to is be examined for lameness, each nail should be partly punched out, and care should be taken that no stubs remain in the crust, the source of future annoyance. Next, the rough edges of the crust should be rasped, which prevents its breaking away when set down, and also detects any stubs of old nails left behind, and removes loose portions that would hold gravel, either of which might turn the nail that may be introduced. The whole thickness of the crust, be it more or less, ought to be left perfectly flat for the bearing of the shoe. Habit, and a correct eye, can detect any inequalities in this surface, without a momentary application of the heated shoe to try the bearing parts, as is usually done, and which, if the shoe be also previously tried with a plain iron, may very well be avoided. Nevertheless, the outcry raised against this practice is, in a great measure, unnecessary; for, unless the shoe be very hot, and held on too long, no harm probably results from its application. In common rough shoeing, also, this error is infinitely less than the application of the unequal pressure, which it is intended to prevent, would prove.

Some claim that the portion of sole between the bars and quarters should be always pared out; and, if properly done, is the surest preventive against corns. The heels should be an object of great attention, and ought to be carefully reduced to the general level of position which it may be supposed the hoof was originally placed in, and which may always be judged by observing the line of the pasterns with it. It is of great consequence that the inner heel should not be reduced beyond the outer, for its natural weakness gives it a tendency to increased wear; instead, therefore, of paring both equally, in case the outer is the highest, pare only the outer; and moreover set the shoe very lightly on the inner heel. A want of attention to this circumstance of inequality in the heels lays the foundation for corns and splints.

The paring of the insensible frog is an important part of the process; but it is highly improper to cut it much away, as is the practice of some smiths, particularly when employed by dealers to give an appearance of "opening the heels;" nor should it be pared too much, since it is intended by nature as a resisting prop to support the internal parts of the foot from pressure; it ought not, however, to be suffered to project too much. The most judicious mode is, instead of beginning with the frog, to attend first to the crust, sole and heels, and then a mistake in paring the frog is less likely to arise; for it may be regarded as a general rule, that when the frog is a very little beyond the level of the return of the heels and the crust, it is as large as it ever ought to be; and the heels of the shoe will raise it up enough for protection against too much wear, but will not elevate it against a proper share of pressure. With respect to the intermediate portion of horny substance that fills up the angles, it should be moderately pared out in every instance, for it is the seat of corns; and if accidental pressure alight and remain there, a corn is the inevitable consequence. If even a small particle of gravel should lodge here, each step forces it farther; and as soon as it has reached the sensible parts, inflammation and suppuration ensue.

Sometimes, with a view to prevent slipping, two projections, or calks, are raised at the ends of the branches of the shoe, and these, though they may to a trifling extent answer their purpose, nevertheless throw the foot and limb into a most unnatural and uncomfortable position, the pain and inconvenience of which we may realize by walking in very high-heeled boots. These mutilations and their consequences are quite common, and one can scarcely pass a horse in the street without noticing them. Great, clumsy, unsightly masses of iron, the weight of which is perfectly outrageous, are attached to the feet of horses which have to travel sometimes at a rapid pace, carrying or drawing heavy loads. This weight is not only injurious to the feet, through the strain it imposes on them, but is extremely fatiguing to the muscles, so that a large portion of the animal's power is expended in carrying about unwieldy clogs of iron.

The foregoing are only some, not all, of the evils of shoeing as commonly practiced, even as late as this, the nineteenth century; and it must be confessed that they are very serious, and sooner or later lead to painful traveling for the horse, as well as impaired efficiency; and yet this art which the farrier makes so



HOPEFUL.

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difficult and costly, both directly and indirectly, should be neither.

To shoe a horse properly, if we take observations and study of nature's plans into consideration, is certainly not a very difficult operation; and neither need it be a very expensive one. The object should be to protect the hoof from wear—nothing more; and in doing so we ought to maintain the integrity and soundness of the hoof, while we do not overburden or disturb the natural direction of the foot and limb; and as a secondary object, we should endeavor to increase the animal's foothold on the ground, if possible. The first object is attained by leaving the sole, frog and bars in their natural condition; for when they have acquired a certain thickness the outer surface falls off in flakes and dead horn, so that they never become too thick. It is different with the wall, which would grow to an indefinite length, because it is not thrown off in flakes and the shoe prevents it from being worn. This, therefore, every time the horse is shod, has to be reduced in length at its lower border to a degree corresponding with the growth which has taken place since the previous shoeing.

The unmutilated hoof only requires as much iron as will protect the lower border of its walls, say for a month or six weeks, and insure security of foothold, nothing more; and all beyond this is loss or injury; while, if possible, the sole and frog should be allowed to play their part. With regard to security of foothold, and adding to the horse's power in draft, particularly with those horses which travel at a slow pace with heavy loads in our cities, there can be no doubt that calks are necessary; but their utility is greatly diminished, and they do harm to the limb and joints if a toe-piece is not added.

The horse's foot is naturally broad at the heel, and has a wide elastic frog, intended to take all the jar from the foot. If a shoe has a high or projecting heel the frog is not allowed to touch the ground, and becomes dried and shriveled, the heel contracts and pinches the coffin-bone, and the motion of the unsupported bones within the hoof produces ulceration of the heels in the form of corns; or acting upon the dead, dry, unsupported frog and sole, so that drop-sole or pinched foot results.

Farmers are apt to insist on having their horse's shoes "put on to stay," making this point the only one insisted upon. The rapid growth of the hoof soon renders the best shoe unfitted for the foot. Shoes for farm horses should be so put on that they will stay tight, or nearly so, for five or six weeks, and then be taken off and refitted. It causes the expense of "setting" some five or six times more during the year, but saves many a lameness, besides keeping the feet always sound.

On the question of horse-shoeing Professor Slade, of the chair of Agricultural Zoology, Harvard University, makes the following observations:

"Horse-shoeing, in the estimation of many intelligent people, is invested by certain mysterious principles, a knowledge of which they have neither the courage nor the disposition to acquire. They are bewildered by the numerous theories and arguments which are advanced for this or that mode of procedure, until they give over the subject in despair, and leave it in the hands of those who know even less than themselves. This obscurity, however, vanishes, if, laying aside all theories, the matter is presented in a simple and intelligent manner, based, as it should be, upon anatomy and physiology.

"Let us consider, in the first place, whether shoeing is necessary in all cases, and if necessary, how it shall be done. In the undomesticated condition of the horse, the equilibrium between the growth and wear of the hoof, which is but a horny appendage to the skin, is exactly maintained; but when subjected to labor upon hard and stony roads, this balance is destroyed, and the wear exceeds the growth. Hence arose the necessity of providing a defense against this excessive wear, resulting in the application of a metallic rim to the edges of the ground surface of the hoof. Such was the origin of the art of the farrier. Under certain circumstances, however, as in strictly rural districts, upon soft and sandy roads, this excess of wear does not occur; and I am persuaded that in many cases shoeing might be entirely dispensed with, much to the relief of man and beast. Especially in the case of a young animal that has never been brought to the forge, the feet are eminently fitted by nature to a certain amount of hard usage, and we but blindly follow a custom when we subject him to the constant wearing of shoes. Even during the winter months, and upon slippery roads, the unshod horse will in most cases do his full share of labor, as any one can testify who has had experience.

"The preparation of the hoof for the shoe where this last is actually required, is of vastly more importance than the particular kind of shoe, and necessitates, first and above all things, the proper leveling of the hoof. When the unshod foot comes to the ground every part of its surface sustains some of the weight, and also undergoes an amount of wear. The moment, however, that a shoe is applied the weight is unequally distributed, especially when armed with high calkins, and the growth of the horn exceeds its wear, obliging the removal of the shoe at stated intervals, and the reduction of the foot to its normal condition.

"In the young animal, shod for the first time, we have the appearance presented by a perfectly normal foot, which requires no preparation whatever for the proper application of the shoe, beyond slightly leveling with the rasp the ground surface of the outer crust. In the case of the horse that has previously been shod, it will be found that in the great majority of cases the excess of horn which is to be removed exists at the toe. The wear at this point is prevented by the firm nailing of the shoe, and the consequent absence of all attrition; while at the heels constant friction goes on between the two opposing surfaces, owing to the non-use of nails, and modifies the growth.

The amount of this friction may readily be seen by examining the foot surface of any iron shoe that has been worn for the usual length of time. In so important a matter as bringing the foot to a proper level we must be governed by certain rules. Any excess of growth at the toe renders the pasterns more oblique, and consequently throws greater weight upon tendons and ligaments at the posterior portion of the limb, whereas too great height of heels throws undue violence upon the bones and joints of the extremities. Both of these conditions must be guarded against. Sufficient accuracy of level may be attained by the experienced eye, either in looking across the upturned foot, or by viewing it on the ground either from the front or at the side of the animal. In this last position the ground surface of the foot should present a level parallel to a line drawn transversely to the direction of the pasterns, or what, perhaps, may constitute a more practical rule to the majority of readers, the surface of the outer rim or crust of horn should be brought to a level with the firm, unpared sole. The sole requires no reduction whatever, and should be left untouched. Nature provides, by a process of exfoliation, for any excess of growth, and it needs no argument to convince the unprejudiced that we cannot improve upon her plans. Those who advocate the removal and paring out of the sole for the purpose of giving a supposed elasticity to this part, forget that by so doing they take away the natural defense against injury and disease, for which no substitute can be employed.

"The frog is also to be retained in its full integrity, requiring neither paring nor cutting, however great the temptation to do these may be. The almost universal custom of destroying the natural buttresses which exist at the posterior portions of the foot by cutting deep notches in them is as irrational as it is barbarous. No process could be devised which would lead more speedily or surely to the contraction and consequent destruction of all the tissues of this region, than this 'opening up of the heels.' I have never yet met with the man who could offer a satisfactory reason for this mutilation of the foot.

"Rasping the crust of the hoof should never be allowed. The removal of the external horny fibers expose those beneath to atmospherical influences when they are not fitted for such an exposure, whereby the crust is weakened, rendered brittle, and liable to crack. Moreover this process of rasping removes the natural external polish which gives such a beautitiful surface to the healthy foot, and which no substitute in the form of oil or blacking can supply. The very existence of such a polish or varnish is ignored by many farriers, who mercilessly rasp the entire wall and think to conceal their ignorance by giving it a coat of some vile compound.

"Thus it is seen to what a simple and perfectly plain operation the preparation of the foot for the shoe is reduced, and it is this preparation which, after all, constitutes the important part of the science of shoeing. If no mutilation of the foot is practiced, either before or after the application of the shoe, it cannot be doubted that the organ is in a condition best fitted to withstand the amount of labor and strength required of it. The form and kind of shoe, the fitting, the treatment of limbs, etc., are all important, but secondary."

Many attempts have been made to improve the form of the shoe, and not entirely without success; but it must be observed that no form of this defense for the foot can be adopted as a universal pattern; and it is only by understanding the anatomy of the the foot, and the defects and diseases to which it is liable, that the peculiar form can be devised best suited to each animal. As a general principle, the form of the defense should be adapted to the foot, and the foot should not be altered to the shoe; yet, in some cases of diseased feet, even this rule admits of modification. The foot of an unshod horse expands as soon as it is placed upon the ground and has received its share of the weight of the body; but when such foot is bound within a solid rim of iron firmly round the horny crust, the expansion being thus prevented, reaction takes place, and turgescence of the blood-vessels, by which heat is evolved, and the horny segment so heated contracts its dimensions, and thus presses painfully upon the sensitive part, and disorganization is the ultimate consequence. To form a horse-shoe, therefore, such as will protect the foot effectually, while at the same time it is left in full possession of its natural elasticity and expansive properties, has been the aim of many veterinarians and many ingenious smiths; but perhaps nothing has yet been contrived completely adapted to the natural action of the horse's foot.

There are many good shoes in use, and if one can not be bought to fit the foot, instead of cutting and rasping the foot to fit the shoe, it is best to have it made. In doing so, remember the points we have mentioned. As a general rule, varying, of course, with the rapidity of the growth of the shell, and the kind of work required of the horse-shoe, it should be re-set after five or six week's wear.

Colts should not be shod at all until they come to rapid and long-continued hard work on hard roads, and then only slightly. Leave the hind feet bare and shoe the fore feet with tips that only cover the toe.

Management of Feet. In the stable-horse the feet require constant care, for they are not only artificially shod, but they are allowed to stand on material which is a much worse conductor of heat than the surface of the earth, by nature designed to bear them. Hence, if neglected, they either become hard and brittle, or they are allowed to be constantly wet, and then the soft covering of the frog is decomposed and emits a disagreeable smelling discharge, which soon wastes it away, leaving no other protection to the sensitive organ beneath, and constituting what is called an ordinary thrush. It is found by experience that not only must the shoes be renewed as they wear out, but even if no work is done they no longer fit

at the expiration of about three weeks, and they must then be removed to allow of a portion of the sole and crust being cut away before they are again put on. The groom must therefore attend to the following points: First, to prevent the feet from becoming too dry; secondly, to take measures against their becoming thrushy from wet; thirdly, to see that the shoes are removed at the end of every three weeks, or more frequently, if necessary; and fourthly, examine carefully every day that they are securely nailed on without any of the clinches having started up from the surface, so as to endanger the other leg.

Dryness of the feet is prevented by the use of what is called stopping, which is composed either of cow-dung alone, or cow-dung and clay mixed, or cow-dung and pitch. If three parts of cow-dung and one of clay are used, the feet may be stopped twice a week. On the night before shoeing, every horse will be the better for having his feet stopped, the application softening the horn so as to allow the smith to use his knife to slice it without breaking it into crumbling fragments.

Thrushes are prevented by keeping the frogs free from ragged layers of the elastic substance of which they are partly composed, and at the same time maintaining a dry state of the litter on which the horse stands. The grand principle is to prevent thrush rather than cure it; but when horses are brought or come home from grass with it, the curative method must be carried out, which see, under head of Thrush, in this article.

The removal of the shoes at regular intervals, whether they are worn out or not, is a most important part of the groom. On examining the shape of the foot, it will be seen that the diameter of the circle in contact with the shoe is greater than that of the coronet, and hence, as the shoe is forced away from its original position by the growth of the horn, it confines the walls to the extent of the difference between the diameter of the foot at its old position and that of the part which it now occupies. For this reason a shoe, when it has not been removed at the end of a month, will be found to lie within the heel of one side or the other, by which to some extent contraction is prevented, but at the expense of the heel, into which the corresponding part of the of shoe has entered. This is a frequent cause of corns, and horses which have once been subject to that disease should have their shoes removed once a fortnight.

Every morning when the feet are picked out it is easy to look the shoes over and feel if they are tight. The clenches also ought to be examined, and if they are not raised at all it may safely be predicted that the day's journey will be completed without the shoe being lost. A raised clench may severely cut a horse on the inside of the other leg, and in those who are predisposed to "speedy cut" it may cause severe injury, and perhaps cause a fall of the most dangerous character.

General Hints. Match horses with reference to size and motion particularly; to color if you can, and have the other requisites.

Always have inside lines on double team quite long, and back-strap short.

Never check a horse if you wish to have him last long, except while training.

Feed in low mangers, water and oats to be given first, hay afterward.

If worked, very little water to be given in the night.

Stop at the top of a hill, and let your horse get breath.

The shoe should fit the foot, not the foot fit the shoe. Never cut the bars or frogs.

Wet the hay and not the oats for a coughing horse.

Never let a horse stand long facing a cold wind.

Feed light when changing feed.

When training in a building, have carriages, etc., removed.

Always approach a strange horse near the shoulder.

Use but a few words with a horse, but have them understood.

Be earnest and prompt, but not harsh.

Teach before whipping, and when whipping do it to frighten, not to enrage.

Never jump from a wagon when your horse is running away. More lives and limbs are lost in that way than by remaining in the wagon.

Throw away the blinds.

Burn the cruel check-rein.

Warm the bits in frosty weather.

Protect the head in hot weather with green branches.

Do not strike them when they stumble or scare.

Do not cut off the tail in fly time, and in muddy, wet weather keep it nicely tied as shown by Fig. 34,

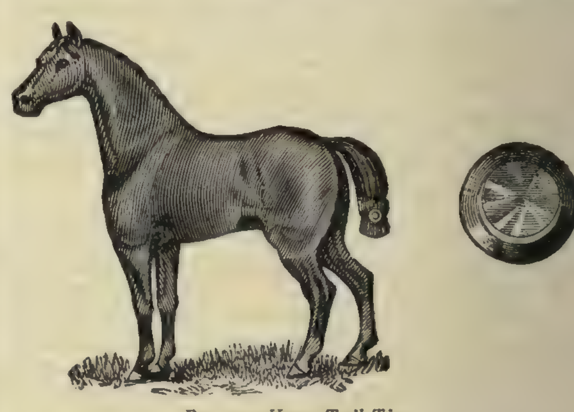


Fig. 34.—*Horse Tail Tie.*

which represents a tie manufactured by W. P. Emmert, Chicago, Ill. Any one can put it on or take it off quickly and without trouble, and the cost is trifling.

Do not cut the frog of the foot, in shoeing, more than possible.

Change the diet of the horse if you would keep him in good condition.

After work, in the evening, wash your horse's shoulders clean with salt water. If farmers commence

this practice a couple of weeks before hard work begins in the spring, keeping it up during the first month of the spring plowing, their horses will suffer very little from sore shoulders if the collars are only half-way decent.

Never startle a horse by striking him suddenly or unexpectedly. This caution is specially important if he has a blind bridle.

Uniformly gentle treatment will secure faithful and steady work. Anger, severity and sudden jerking endanger your harness, your vehicle and your life, besides permanently injuring your horse.

Wash the inside of the collar frequently with castile soap-suds, and when it has thoroughly dried gently warm the leather and soak it with oil, so as to soften it. But do not allow any oil to remain on the surface of the leather unabsorbed.

Do not be tempted by extra pay to overload your team. Overloading occasions blindness, spavin, splint, glanders, farcy and other painful and fatal disorders, and thus risks the loss of your capital, besides injuring yourself by encouraging a cruel disposition.

See that the harness fits easily in every part, and that the shoes are tight and well put on. If there are chains connected with any part of the the harness, let them be well covered with soft padded leather or fur.

Let your tones, in addressing the horse, be always gentle, soothing and pleasant. Pat him often, and encourage every sign of attachment that he gives.

Curry, rub and clean well and thoroughly, at least once every day. The effect is worth half the feed. A dirty coat and skin, when the animal is deprived of exercise in pasture and of rolling on the grass, cannot fail to produce disease.

In hot weather, keep a wet sponge on the head of the horse or mule; cool the mouth and face with wet sponges; furnish drinking water often, and sponge the legs and such parts as are liable to chafe by perspiration or otherwise; drive slowly, and lessen the weight usually imposed in cooler weather; see that the harness is not unnecessarily cumbersome and heavy; the discomfort may be materially relieved by taking off the eye-blinds, which are useless appendages, and cause much annoyance to the animal.

In icy weather keep your animal sharp shod, renewing the sharpening as often as the shoes become blunt. A few dollars expended in this way will undoubtedly save your horse from serious injury, and perhaps from loss of life.

Standing on fermenting manure softens the hoof, produces thrush and brings on lameness. Keep the litter dry and clean, and cleanse the stall thoroughly every morning.

Sharp bits make the mouth tender at first, and afterwards callous so that the horse becomes unmanageable.

If your horse kicks and plunges on mounting, look to the stuffing of your saddle, and see if it has become hard and knotty with use.

Keep your wheels well greased, and thus reduce the labor of drawing the load.

Keep the feet well brushed out, and examine every night to see if there is any stone or dirt between the hoof and the shoe. Change the shoe as often as once a month.

Disease or wounds in the feet or legs soon become dangerous if neglected.

When a horse is fatigued and hot from labor, walk him about till cool; groom him quite dry, first with a wisp of straw, and then with a brush; rub his legs well with the hand, to remove any strain; soothe the animal, and detect thorns and splinters, and give him his grain as soon as he is cool, dry and willing to eat.

On the evening before a long journey give double feed; on the morning of starting give only half a feed of grain, or a little hay.

When horses are long out at work provide them with nose-bags and proper food. The nose-bag should be leather at bottom and of basket-work or open texture above. On coming home give a double feed of grain.

Lead the horse carefully into and out of the stable. Accustom him to stand quite still till you are seated. Start at a walk, and go slowly the first and the last mile.

Never use the whip if you can help it. It will then always be available as a last resource.

Be always on your guard, just feeling the mouth with the bit, lightly and steadily.

If a horse shies, neither whip him nor pat him, but speak encouragingly, and let him come slowly towards the object.

If you value your own life, the lives of others, or your horse, never drive fast in the dark, or in town.

Never add your own weight to a load that is already heavy enough. Get out and walk when you ascend a hill. If you stop on a hill, put a stone behind the wheel.

Never tease or tickle the horse.

A good horse blanket does not cost much, and is a good investment. Horses suffer much from cold when left unblanketed after being driven, and contract diseases that result in the disabling or death of the animal. Some stables are nothing but poles between wide spaces. We have heard about stables being made too warm for horses; but if they be properly ventilated there is very little danger of this. Take your hatchet and nail a few clapboards over the cracks; build a straw shed if you can do no better; in half a day you can make a whole winter full of comfort for the faithful beast that does such a great variety of valuable labor.

Many men proceed to scratch horse's legs with a new, sharp curry-comb, and then get angry if the horse does not patiently endure this torment. A new curry-comb should never be used on a horse's leg. In fact, it is only in extreme cases that the legs should be curried with any kind of a comb. A bunch of hay or straw and a good brush is all that is necessary ex-

cept in extraordinary cases. We consider a good brush indispensable; and in this, as in everything else, the best is the cheapest. We have found it to be a good plan to make a scraper of oak, and scrape the mud off their legs at night when put in the stable. This saves much time in the end. Some horsemen wash the mud off, but this is a bad plan, cooling the extremities and making the skin tender and the pores open.

The eye of the horse is very sensitive, and, standing out from the head, is extremely liable to injury. Blindness among horses is very prevalent. How many horses we see whose eyes have been "knocked out." Generally this is done by some person in a fit of anger; sometimes sharp projections are left in the stable against which the horse unfortunately strikes its eye, destroying all use and value of that organ. It is cruel and a sin to strike a horse over the head, and sinful carelessness to leave nails and other sharp projections in the stable.

Do not put a collar on over a horse's head. Did you ever notice that the eye of the horse, like that of the giraffe, stands out from the surface of the head? As both depend upon their heels for defense it is necessary that they should see behind them as well as in front; and this is secured by placing the eye out from the face. It is almost an impossibility to put a collar on over a horse's head without bruising or injuring the eyes.

FIG. 35.—*Muzzle for Horse.*

Gedney's improved wire horse muzzle (Fig. 35), which is made of the best material, is now in general use at the racing stables. It is recommended for its ventilation, cleanliness and durability.

For record of the time made by the fastest horses, both trotting and running, see Speed.

DISEASES OF THE HORSE.

Their Causes, Symptoms and Remedies.

The diseases of the horse are numerous, as the present artificial mode of his life and his complicated structure might lead one to suspect. External diseases and cases of unsoundness are much more easy to understand than those which are internal, which can only be conjectured from symptoms. In general there are two obvious indications of disease— a refusal to work and a refusal to feed. Lameness speaks for itself; but there may be something the matter with his collar or part of his harness. Every farmer should acquire some skill in detecting the symptoms of disease, and should know how to treat the most ordinary complaints; but it should be borne in mind that the difficulty of treating a sick horse is not only as great, but in one respect greater than that of treating a human patient, since he cannot, like the latter, describe his sensations. The methods of recognizing and distinguishing diseases of horses, as well as cattle, are very fully treated on page 197, where we refer the reader.

Before the veterinary art became a distinct profession, the ignorant farrier, pretending groom, or shoeing smith, were all that the owners of horses had to consult; and the fate of these animals was commensurate with the wretched treatment they were subjected to. These men, without any scientific education, often committed the greatest blunders, though they frequently performed cures, as is the case with other quacks.

That portion of this article treating of the causes and symptoms of, and giving the remedies for, all the principal diseases that the horse is subject to, has been carefully collected from the best of most modern authors of both continents, and revised and enlarged by an eminent veterinary physician and surgeon of large experience, and a gentleman of modern, original and progressive views in the veternarian art. He has successfully treated, in the most simple and practical manner, many diseases that have heretofore baffled the skill of the veterinary world. Among these is tetanus, or lock-jaw, of which he effectually cured 11 cases of the 13 treated within less than three years, with apparently a simple, yet powerful remedy. This and the novel manner of administering it won for him much favor. He has also saved the lives of many noble animals by an operation called tracheotomy, by the use of the trocar in flatulent colic, and performed many other critical surgical operations most successfully; he has also most signally brought to a successful termination quite a number of cases of cerebro-spinal meningitis, big head, etc. We speak of these things that those who consult this article for the treatment of their horses may have all confidence in the remedies prescribed.

Several of the favorite remedies with which this veterinarian has performed these cures have never before been given to the public. They are the result of many years of hard study and practice of the profession, and up to this period he has reserved them for his own use. Several of these he has frequently refused liberal offers for. He has, however, incorporated them in this article.

In explanation of the system of medication adopted here we have but to remark that it has been this veterinarian's motto during his long and successful practice to stand as nature's hand-maid and en-

deavor to assist her by removing obstructions and aiding her in harmony with her laws, instead of trying either to reverse them or to prove a hindrance. He has ever guarded against the barbarous treatment which results as the cause of disease, by weakening the vital energies of life, as practiced by the schools of the past. Indeed, he has done much toward arresting the streams of blood that has for centuries flowed in consequence of an evil system of medication. He regards drastic cathartics, firing and the indiscriminate use of the strong liquid blisters as articles of an ignorant and barbarous age. For years he has endeavored to help others to usher in a milder and more rational system of medication.

go without any medicine than to dose him with "every man's remedy," with the expectation that some of them will hit the case and bring about the desired result; and many valuable horses are killed by the over-anxiety of the proprietor, who will allow medicines to be administered without having the faintest idea of the ailment, or what particular remedy is adapted to the case. By a careful perusal of the diagnosis given, a correct study of the symptoms shown by the horse, a fair understanding of rules laid down for recognizing and distinguishing diseases on page 220, and observing the principles of administering treatment and the various methods as given on pages 216, 217, 218 and 220, the reader may venture to prescribe for horses with a fair prospect of success.

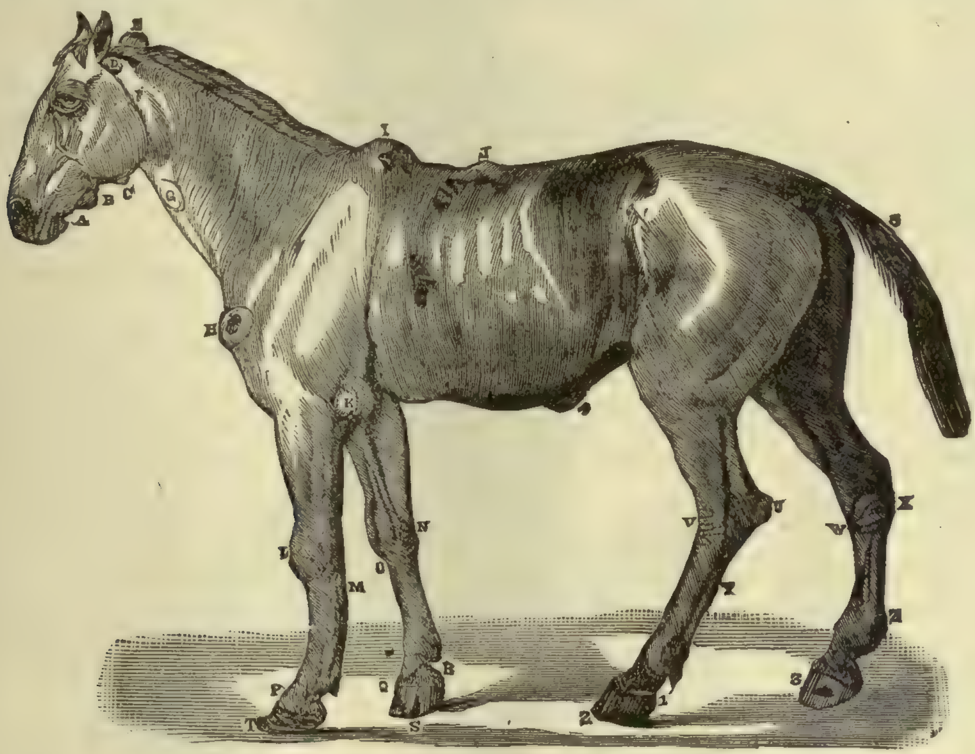


FIG. 36.—*External Manifestations of Some of the Diseases of the Horse.*

Technicalities and obscure language, such as quacks frequently used in order to cover their ignorance, are not used in this work. Nothing but plain, comprehensive language is employed, so that all may understand and no mistakes be occasioned.

With a word on the general treatment of this noblest of beasts when in ill health, we will proceed with the treatment of diseases, giving them in their alphabetical order. To treat diseases properly, it is necessary for the reader to give particular attention to the symptoms, so that he may form a correct diagnosis of the diseases and prescribe the medicines adapted thereto. It is in this particular that the most mistakes occur, where non-professionals find it necessary to treat sickness. It is much better to allow a horse to

EXTERNAL MANIFESTATIONS OF DISEASE. Before entering upon the treatment of diseases of the horse, we wish to present an illustration of some of the principal diseases of the bones and tissues, showing their location and speaking of general character and causes. The explanation of the letters and figures indicated on the cut (Fig. 36) is as follows:

A. CARIES OR ULCERATION OF THE JAW. Ulceration of the lower jaw sometimes ends in mortification. Caused by bruises from barbarous bits and curb-chains.

B. FISTULA OF THE PAROTID DUCT. Fistulas are caused by bruises or undue compression of the parts producing inflammation and abscess.

C. Bony Excrescence, or exostosis of the lower jaw. A blow upon a bone will produce inflammation, followed by exostosis (long growth through increased nutrition), that of the joints being very painful.

D. Swelling by pressure of the bridle, causing inflammation and sometimes tumors.

E. Poll Evil. This is exactly similar in its nature to fistulous withers, being produced by a blow on the prominent ridge which is situated on the top of the poll.

F. Inflamed Parotid Gland. Caused by a bruise or compression.

G. Inflamed Jugular Vein. Caused in various ways; often by carelesssness after bleeding.

H. Fungus Tumor, produced by pressure of tne collar; the result of galls and subsequent want of care and inattention.

I. Fistula of the Withers, generally caused by pressure of the saddle.

J. Saddle Gall, caused by a bad-fitting saddle.

K. Tumor of the Elbow, caused generally by interference of the shoe in lying down: sometimes by a blow.

L. Induration of the Knee, caused by blow in falling.

M. Clap of the Back Sinews, caused by severe exertion in running and leaping, destroying the integrity of the sinews of the leg.

N. Mallenders, scurfy manifestations of flexions of the knee, sometimes becoming cracked and itchy.

O. Splint, caused by blows, etc., on the shins, more often by using the horse too young. They are to be dreaded as interfering with the action of the sinews.

P. Ringbone, caused by starting heavy loads, or excessive pulling in going up hill, or bruises.

Q. Tread upon the Coronet, the contusion of the shoe of the one foot by treading on the other, causing larceration of the coronet and of the horn of the hoof.

R. Quittor, confined pus from prick of the sole, corns, or injury to coronet.

S. Quarter Sand Crack. Imperfect secretion caused by dryness of the hoof; rupture of the laminæ.

T. Contracted Hoof, or ringed hoof of a foundered horse. The result of laminitis.

U. Capped Hock. Injuring the point of the hock.

V. Sallenders. Scurfy eruptions on the seat of flexion of the hock; similar to mallenders.

W. Spavin. Inflammation causing painful bony enlargement, sometimes stiff joint; caused by blows, slipping and hard work, often from weak limbs.

X. Curb. Inflammation and lameness of the posterior part of the hock, ending in bony formation; caused by wrenching or straining the limb, or bruise.

Y. Swelled Sinews, caused by strains or bruises, producing inflammation and ending in enlargement.

Z. Thick Leg, caused by various injuries to the joint. Any inflammation may result in a thickening of the integuments.

1. Grease, caused by debility, excessive labor and neglect, filthy surroundings, from stoppage of the secretions. Scratches are from the same cause, as working in the mud without proper cleaning, etc.

2. Toe Sand Crack, caused by the same difficulty as quarter sand crack.

3. Quarter Crack. See Sand Crack.

The last two are occasioned generally by severe labor of animals not strong in the feet, by which the walls are ruptured, by breaking the hoof with the calk of another foot. False quarter is occasioned by the absence of the outside and harder portion of the hoof.

4. Ventral Hernia. Rupture by which the bowel lies next the skin. When hernia is accompanied with strangulation it becomes dangerous

5. Rat Tail, loss of the hair of the tail.

For more extended facts relative to the symptoms, causes and treatment of these disorders, we refer the reader to each subject in its alphabetical order in this article. We wish here to observe that besides the remedies prescribed for the respective diseases, the horse must have the best possible care—warm, dry, clean, well-ventilated quarters, good, nourishing food, pure water and rest.

Prevention of Disease. A word should be said in reference to the prevention of diseases, which, if strictly observed, the farmer will seldom need the aid of the veterinarian.

When a horse is simply out of health and spirits, without showing symptoms of any specific disease, he should be allowed to rest and have a change of food, and, if possible, of location. Nature's own remedy, rolling, should never be denied a horse, no matter what his ailment. In acute diseases and serious accidents, unless the farmer has had unusual experience and knows exactly what to do, he should call the best veterinarian in reach. Farmers who are far removed from such a physician would do well to purchase a set of remedies, with the accompanying directions, which will enable them to use them intelligently. Large doses of powerful remedies, administered by inexperienced owners, or equally ignorant country "hoss doctors," will be apt either to injure or kill the animal.

There are two classes of farmers who do great injustice to horses. One neglect their animals or abuse them, producing many diseases from which they suffer or die; the other class are always dosing or doctoring, using ointments or pouring drugs into them of the medicinal properties of which they now nothing. Farmers spend hundreds of dollars upon condition powders and other useless drugs. We often see horses overworked, exposed, or improperly fed and cared for. Many times these animals are kept in this condition and dosed with medicine, with an imagination or hope that they can create an unnatural appetite, purify the blood, loosen the skin, smooth the hair, or give good health and spirits. This is all useless and expensive. There are quack doctors all over the country who want to sell useless ointments, condition powders, and all sorts of nostrums, simply to make money out of the farmer, and not

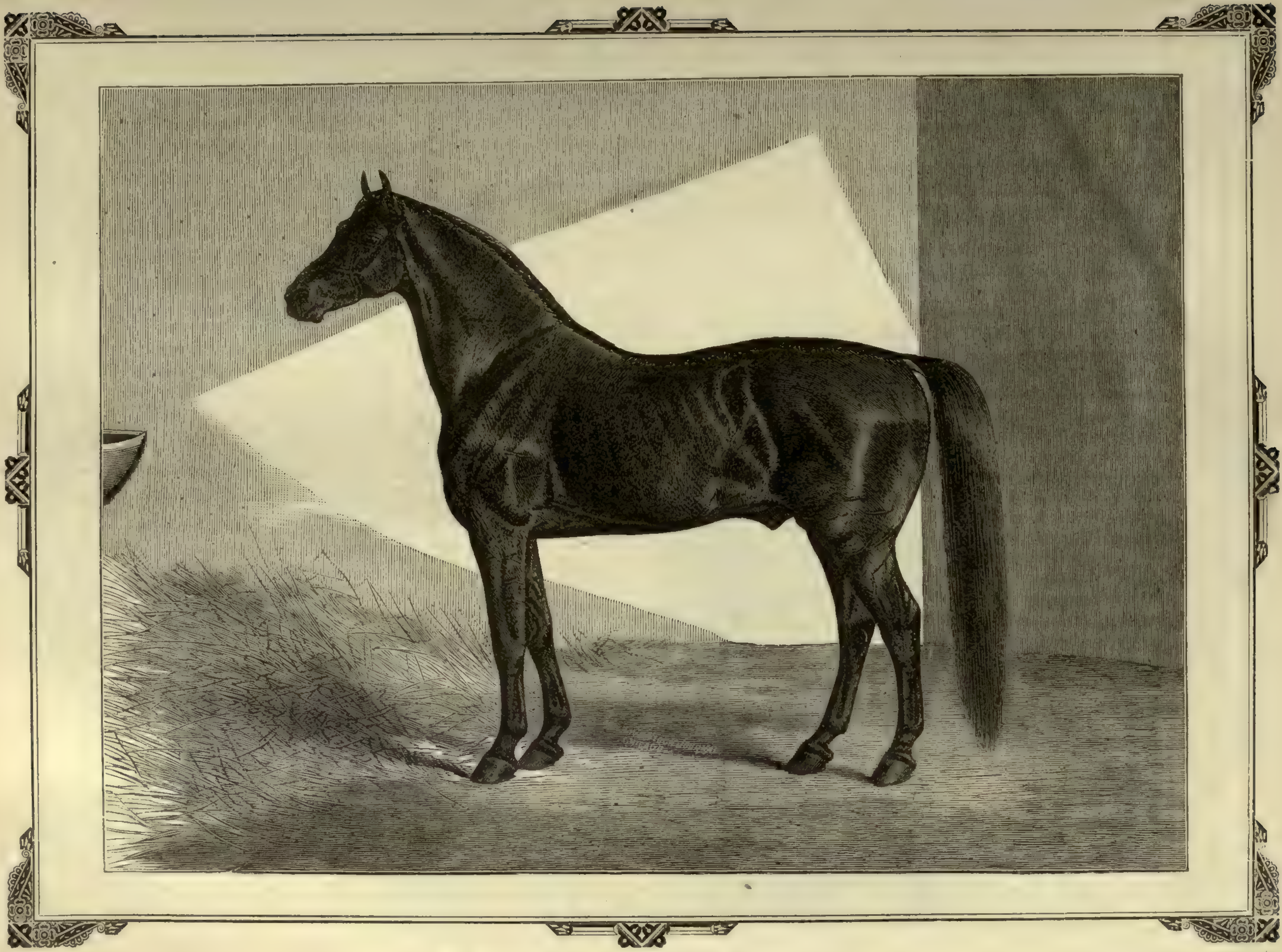


Fig. 38.—TROTTING STALLION, FAIRY GIFT.

that his horses need them. The same farmer who purchases these will frequently produce all the diseases his horse has by bad management. Medicines do not cure bad treatment or prevent it, and nothing but good treatment will permanently relieve the horse. Horses, like men, require the observance of proper rules and laws of health, without which medicines are valueless. The sensible farmer realizes the truth of this assertion, and governs himself accordingly.

MEDICINE CASE. Every farmer who has much to do with horses should provide himself with the principal medicines required and a pocket-case of instruments. With a case of this kind the farmer is enabled to perform many simple operations, which, in the absence of the same, he will be at the expense of employing a veterinary surgeon to do.

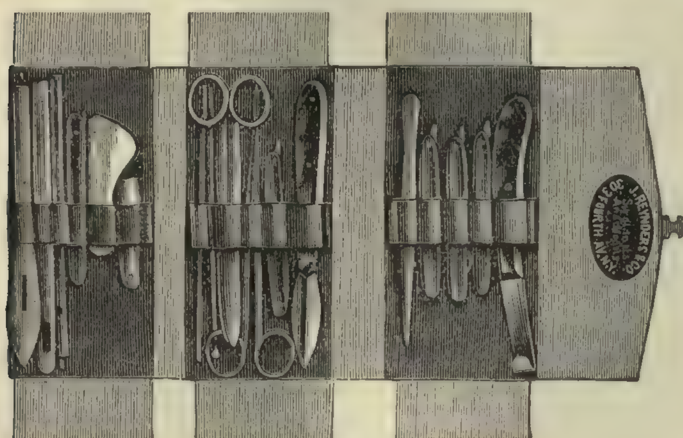


FIG. 37.—*Pocket Case.*

ABDOMEN, DROPSY OF THE. This is a collection of water in the abdomen which is generally the result of chronic inflammation of the peritoneum, a tough, white membrane which lines the abdomen and embraces the bowels within its folds. When this membrane has been subjected to violence and is associated with a local inflammation of the muscular tissues, the effusion is directed inward.

Sometimes it arises from obstructed circulation caused by diseases of the liver, lungs, or heart, and again from a poor, watery state of the blood, superinduced by exhaustion or by scanty and innutritious food. It is more frequently found in old than in young, vigorous animals.

Symptoms. Generally a low state of health precedes the more unmistakable manifestations; there are thirst and loss of appetite; the pulse is hard and small; the membrane of the nose is pale; the eye is dry; the head droops; there is a condition of weakness and languor; and there are some signs of heart and liver diseases; pressure upon the abdomen is so painful as to cause a groan.

Sometimes there is local dropsy of the sheath, legs and breast, as well as of difficulty in breathing. In the chronic stages of the disease the progress is slow, but the belly becomes more and more baggy, and in some instances the hair of the tail comes away easily or drops out, showing that the skin and capillary glands of that part of the body are affected.

The presence of the water, when it has collected in any considerable quantity, may be detected by placing the ear to the abdomen and having some one slap the horse on the opposite side with the open palm.

In mares this enlargement of the belly is sometimes mistaken for a pregnant condition, but it may be readily distinguished by a fluctuating feeling which follows a pressure upon the parts with the fingers,—a sort of fluid motion, as of water forcibly displaced.

Treatment. If it is known to proceed from local injuries, or from diseases of the vital organs, it is scarcely necessary to adopt any course of treatment, unless, indeed, the primary disease itself can be removed; but when it depends upon inflammation of the peritoneum, or when it results from bad or deficient food and unwholesome surroundings, place the horse in a good, dry and well ventilated stall, feed him generously, and give him the following tonic ball night and morning:

4 drachms golden seal,
1 ounce powdered digitalis,
½ ounce sulphate of iron.

The treatment is the same as for dropsy of the brain, except wetting the head.

ALBUMINOUS URINE. See Urine.

AMAUROSIS. See diseases of the Eye in this article.

ANKLES, SWELLED. This affection invariably arises from a diseased condition of the feet. Its origin may sometimes be traced to diseases of the navicular and lower pastern joints, but is known to proceed for the most part from the hoof rot. It seems occasionally, however, to result from a plethoric condition of the general system, a superabundance of blood, hard work, severe strains, etc.

Symptoms. Confined almost wholly to the ankle joints. It is not difficult of detection,—the only point of importance being to determine whether the swelling is merely spasmodic and temporary, or whether it is the result of a primary disorder which requires attention. It is generally perceptible of a morning, and disappears during the day, because exercise restores healthful action; but when there is really diseased condition of the bottom of the foot, the fever caused thereby inflames the membrane of the joint, under the skin, while the horse is inactive, and the swelling again takes place. If the ankles present a swollen appearance from morning to morning, attention should be directed to discover the real condition of the foot, and appropriate treatment must be resorted to before the disease takes the chronic and more advanced form of swelled legs, cracked heels or scratches.

Treatment. If the swelling proceeds from plethora or too great fullness of the general system, give an occasional dose of Epsom salts, to reduce the tendency to inflammation, and feed upon green and succulent food. If it proceeds from soreness of the bottom of the foot, apply the same treatment as for grease and scratches, every day for four days; then omit for two days and apply again. If there is any appearance of thrush or cracked heels, treat as directed for the removal of these.

Aphthæ or Thrush. This is a disease of the mouth and occurs among sucking animals and young horses.

Symptoms. White patches will appear on the tongue, cheeks and lips, which assume a whitish color, caused by a fungous growth. The lips swell; the tongue hangs out of the mouth; vesicles form containing a clear, gelatinous fluid. At length these burst; crusts form and recovery ensues.

Treatment. To purify the blood and promote the general health, give the following:

1 ounce hypo-sulphite of soda;
1 ounce powdered sassafras bark;
2 ounces powdered golden seal;
4 drachms of cream tartar;
1 ounce flowers of sulphur.

Mix, divide into four portions and give one every night in scalded shorts, allowing it to get cold. Or give it in cold gruel as a drink.

Take 1 ounce of powdered borax and 3 ounces of molasses; mix and apply with a soft brush, or soft piece of cloth. Give the animal soft feed or grass.

Arteries, Enlargement of the. Dilatation of the arteries is rarely found. It is a thinning and weakening of the coats of the vessels, sometimes to bursting, causing a pulsating tumor containing blood. Severe strains in the vicinity of an artery, blows, kicks, stabs, or weakening from overstretching, as in fatty degeneration, are the causes. In the mesenteric arteries of horses, they are common from immature worms in the circulation.

Symptoms. There is a soft, fluctuating, visible tumor if near the surface, which may be reduced by pressure, but which instantly re-appears.

Treatment. Treatment is not successful except when near the surface. Then steady pressure by a pad if taken early will sometimes cause its disappearance. An animal with enlargement of the arteries is unsound and should never be bought. The same rule applies to all diseases of the heart.

Big Head and Big Jaw. These are but one form of disease, only located in different parts. When the upper jaw becomes the seat of affection, and enlargement of the facial bones will be observed, the attention will be attracted by the unnatural appearance of the face. We might say at the outset that the disease is incurable, in so far as the enlargement, dilation and softening of the jaw bone are concerned; yet, like spavin, ring-bone and various other diseases, they may be relieved so that the animal may be able to perform his ordinary duties.

It finally breaks out in small holes, which discharge a thick pus, and at last ends, if not treated opportunely, in a complete decay of the bone. The bone continually enlarges, and cells or channels are formed as the minute bony plates become thinner and thinner till the structure can be easily cut with a knife or crushed with the fingers. The interstices are filled with a red bloody mass.

In some cases the ligaments and tendons are separated by decomposition of the bone, and crumblings, dislocations and fractures take place for want of firm attachment for these supporting ligaments.

The primary cause of the disorder is not known, but it may have been hereditary. In speaking of this disease Prof. Dadd says: "In certain localities, under the ordinary mode of feeding and general management, we grant that at first the disease might have had an accidental or spontaneous origin, and finally become permanent and transmissible. For example, glanders and farcy afford illustrations of a spontaneous disease becoming contagious and transmissible. There must have been a time when neither of the two latter diseases existed; hence, when the first subject became glandered, he could not have taken it by infection or contagion, but it must have had a spontaneous origin, and finally became permanent. We do not pretend to urge that the active disease itself is transmissible; yet, in certain cases, a predisposition is transferred to the progeny. This may be called the predisposing cause; the ordinary exciting causes are those which disturb and derange the digestive function. The digestive or nutritive function is deranged both by excessive and defective functional labors, or by the animal existing on food that does not contain the necessary amount of nitrogenous or muscle-making matter. This is the case when Indian corn is used as food for a great length of time. It is hard to digest, is deficient in nitrogen, and almost always over-distends the stomach; for, when submitted to the action of heat and the gastric fluids, it increases in bulk to about five or six times its original capacity. I have noticed that where much whole corn is fed, as in Ohio and Indiana, the disease is most prevalent. Associated with the predisposing causes are others—for example, hard usage, sore abuse, and bad stable management." It is difficult to assign any reason why the general predisposition should be determined primarily to the face.

Symptoms. Before the visible swelling of the face there will generally be evident weakness, loss of appetite, laziness; a slight suffusion of the eyes with tears—one or both according as one or both sides of the facial bone is affected; then a swelling, about half way between the eye and the nostril, small and hard, but gradually increasing in size. If the swelling is pressed upon with some force the horse will wince with pain, but gentle rubbing seems to give ease. The lower jaw, under the chin, will next appear thickened; a degree of general stiffness sets in; at last the joints are swollen, and seem puffed up with wind; the horse rapidly fails in flesh; and the head becomes enormously swollen, and finally breaks into little openings

which discharge a pus of a very offensive odor.

Treatment. It is well, perhaps, to warn the reader in the outset not to do any of those foolish things which characterized the old practice, such as boring into the diseased part and injecting corrosive poison; laying open the jaw and sawing out a portion of the bone; blistering, burning, etc. The disease is not local, but constitutional, and though perhaps having no other visible manifestation than on the face, it has extensive connection with various portions of the frame, so that purely local treatment is of little consequence.

The first step will be to see that the patient is well stabled or otherwise cared for according to the season of the year, and put upon a systematic course of food, drink, and moderate exercise in the sun. Give him from five to seven quarts of oats per day, and if these are boiled and mixed with a little wheat bran, all the better. When green vegetables can be had, they should be fed liberally, to counteract a sort of scorbutic or scurvy tendency which marks this disorder. Apples, beets, carrots, turnips—whatever fruit or vegetable you can get him to take is good. When seasonable, put him upon a bountiful pasture.

Give the following dose night and morning in such food as he will most readily eat: ½ ounce stramonium seed; also take 1 drachm corrosive sublimate, finely pulverized; add 1 drachm Venice turpentine, and apply every two weeks, greasing between times.

Bladder, Inflammation of the. A disease very rare in animals, and when occurring, the effect of violent external injury, or the result of irritating medicines, as croton oil, cantharides, administered by the ignorant.

Symptoms. The principal symptom is frequent urination accompanied by straining and pain. Sometimes the urine dribbles away, involuntary or not, as the case may be. It appears that the least distension of the bladder causes pain; hence the effort to keep it empty. The urine is usually high colored, or rather of a dull red color.

As a sure test, grasp the horse by the mane, half-way between the head and shoulder, with the left hand, place the right hand under the flank when all nervousness has passed, press more or less strongly on the abdomen. If inflammation be present, the animal evinces intense pain. If the muscles be tense and hard there is no inflammation. A better treatment is to insert the hand into the rectum up to the elbow, turn the hand down and see if there is more heat than need be.

Treatment. Give full doses of opium, 2 drachms, to relieve pain. Give linseed tea, milk, and white of eggs beaten up with water as drinks. As a laxative to relieve the bowels give 1 to 2 pints of olive oil as may be needed. Inject into the bladder the following, if you have an instrument:

1 drachm opium,
1 drachm gum arabic,
1 pint blood-warm water.

In severe cases, the ammoniacal blister may be applied (see Fig. 39), if there is paralysis of the parts, with or without fomentations.

Fig. 39.—*Application of Ammoniacal Blister.*

The acute symptoms having subsided, give small doses of copaiva 1 to 2 drachms, or buchu, 2 to 3 drachms, as may seem to be needed. Let the animal drink slippery-elm bark. Give soft or sloppy diet with linseed tea or other mucilaginous drinks.

Bladder, Rupture of the. This difficulty occurs only in the female, except in stricture, the result of difficult parturition. The animal strains violently, and on examination a red, tumid, rounded mass is shown between the lips of the vulva.

Treatment. Wash the parts carefully with tepid water, in which an ounce of laudanum has been mixed with each quart. Then return carefully by pressing the center of the mass inwards to correct the eversion. The difficulty will be in returning it through the neck of the bladder. There will be more or less inflammation and softening; therefore, care, judgment and time must be used not to tear the tissues. If there is renewed straining, place a truss or compress the vagina.

Bladder, Stone in the. This is a formation of carbonate of lime and common chalk held together by the secretion of the mucous membrane. Cystic calculus may be present for a long time before the animal shows symptoms of its presence.

Symptoms. Frequent endeavors to urinate will be made. The urine is of a whitish color and is voided in small quantities, abdominal pains are present, the back is hollowed, often the point of the penis is constantly exposed, and going down hill the horse often stops suddenly, pawing, kicking at the belly, rolling, lying down and getting up quickly, are symptoms generally present.

Mr. Youatt says that "the symptoms of stone in the bladder much resemble spasmodic colic, except that, on careful inquiry, it will be found that there has been much irregularity in the discharge of urine, and occasional suppression of it. When fits of apparent colic frequently return, and are accompanied by any peculiarity in the appearance or the discharge of the urine, the horse should be carefully examined. For this purpose he must be thrown. If there is stone

in the bladder it will, while the horse lies on his back, press on the rectum. Several cases have lately occurred of successful extraction of the calculus, but to effect this it is always necessary to have recourse to the aid of a veterinary practitioner."

Treatment. Administer 2 drachms of muriatic acid in a pail of water once a day; by these means the calculi may be dissolved. Should this fail, the operation of lithotomy is necessary, by which the stone can be removed. This, however, is the business of a veterinary surgeon.

Preventive Measures. The seed of Jamestown weed, or thorn-apple, has been given with good effect in preventing the formation of large calculi. Give an ounce of the powdered seed in the feed every day until six doses are given. In connection with this give the following:

1 ounce bicarbonate of soda,
1 ounce oil juniper,
1 ounce oil of sassafras,
4 ounces sweet spirits of niter.

Form into four doses, and give one morning and night for two days. Animals predisposed to gravel should be fed on sound hay from old meadows, sound grain and watered only with soft water.

Bleeding. This relic of barbarism, so far as domestic practice of medicine is concerned, has been entirely discarded. In veterinary practice it has grown into great disrepute, and is looked upon by the profession of to-day as needful only in rare cases, and indeed, by some, as never required. Upon this subject Prof. McClure says:

"Avoid these measures and substitute a rational and successful system of treating the diseases of your animals. Ascertain whether your horse is suffering from a disease of an exalted or inflammatory kind; substitute aconite, pure air and cold water for bleeding, and in a few hours you will have no cause to regret the change. If the disease be of a depressed kind, accompanied with weakness and debility, give nux vomica, iron and a generous diet. If the disease be an eruptive fever, give sulphite of soda to purify the blood. In rheumatism, administer colchicum and carbonate of soda. In mange, apply the sulphuret of potassa to the skin, and thereby destroy the small insects which cause the trouble.

"In hard swellings use the preparations of iodine, to cause their absorption. In lameness, allow absolute and entire rest, and apply hot or cold applications and slight irritants to the parts, to remove the products of the sprain. Ascertain the cause of disease, and having found it, have it removed, and the effects will cease. If the animal be costive from eating dry, concentrated food, remove it by giving green feed or bran, but do not give physic. If diarrhœa be present, leave it, at least for a time, to itself, as it is nature's plan of getting rid of the offending matter. But, if it should continue, chalk and opium, as an astringent, are what is wanted. The reader cannot fail to see how simple, and his experience will demonstrate how successful, these measures are in arresting and curing the diseases of all our domestic animals."

Undoubtedly Prof. McClure's theory is an excellent one, yet many good veterinarians regard the use of the lancet as necessary in some rare cases.

These are brain disorders and some form of inflammatory disease. The jugular vein is the one to be bled from, and when the object is to deplete the system, two, three and even four quarts should be taken. Sometimes even six or seven quarts must be taken from a large, plethoric animal. Always catch the blood in a vessel, as it is necessary to know how much we take.

First moisten the hair and smooth it down. By pressing on the jugular vein along the neck, below the spot selected for the incision, it will soon rise up prominently. In bleeding, always make the incision in the line of the vein, never across it. Make the incision large, but never through both walls of the vein. When sufficient blood has been taken, raise the lips of the vein between the fingers, thrust a pin through and wind some thread dipped in the blood about it to hold it. In a couple of days the pin may be withdrawn.

In staggers and diseases of the brain it is usual to bleed in the roof of the mouth.

Whenever a horse is to be bled it is better to blindfold him, since it prevents his starting, and thus causing a miss with the lancet or fleam in the hands of an inexpert person.

Bleeding from the Nose. This often occurs from various injuries to the mucous membrane of the nostrils, from hard pulling up hill, too tight a collar, and from other causes, especially if the animal be full of blood. In these cases the bleeding is from one nostril and in drops, accompanied by sneezing. If the bleeding comes from the lungs, it will be bright red and frothy, and there will be a cough. If from the stomach, it will be black, clotted, sour and accompanied by retching.

Treatment. In simple cases tie the head up as high as possible, blow strong alum water from a tube at each inspiration, and if obstinate, plug the nostrils with pledgets of tow. Give internally one scruple of acetate of lead, to be followed in half an hour with another if necessary. Inject well up in the nostrils a weak solution of muriatic tincture of iron.

If both nostrils are involved, and the flow is continuous, only one nostril must be stopped at a time, unless tracheotomy is performed, since the horse cannot breathe through the mouth.

Blind Staggers. See Staggers in this article.

Blistering. See page 218.

Bloody Urine. See Urine in this article.

Bog, and Bog Spavin. See Spavin in this article.

Bots. For a description of the fly that causes the bots in horses and the manner in which it gets into the stomachs, we refer the reader to the article on Gad-fly. So long as the animal is in perfect health, they do little if any harm while in the stomach. But in case of disease or insufficient food they may become troublesome. Much has been written upon

the subject as to whether bots were a source of pain or injury or not. Prof. Dadd says:

"Veterinary surgeons have long since discarded the absurd notion that bots are the cause of pain and and suffering to horses. In fact, some of the most distinguished of them assert that these little creatures, with their rough exterior, are rather beneficial than otherwise, and that, by friction and irritation, they arouse the sluggishness of the stomach, and thus promote digestion. Persons unacquainted with these facts are, therefore, apt to attribute effects during life to causes which happen after death, and consequently the poor horse has to be dosed with all sorts of nostrums."

Upon the same subject Mr. Percivall said:

"You may boldly assert that bots are in nowise injurious. Still you cannot persuade the world so, and therefore you must be prepared to meet the complaints of those unbelievers who will now and then declare that their horses have bots which must be got rid of. But I know of no medicine that has the power of destroying; and even if we possessed such, I am not sure that we could, even when dead, detach them from the cuticular coat of the stomach, to which they are attached by small horns."

In speaking of the location of the bot and its remarkable power to resist the action of medicines, Prof. Dadd says:

"He may be said to be a 'slow coach,' and when once located in the stomach of a horse, he generally makes it his abode for a season at least. He is a sort of aristocratic entozoon. He lives in the upper region, the stomach. He seldom condescends to mix with the lower orders that infest the alimentary regions. The little creature seems to exercise considerable tact in selecting his location. Although he has but a squatter's title to it, yet it is best and safest in the whole diggings. He is in the upper part of the stomach, where the fluids (poisons or medicines) with which you are about to coax or drive him off, are inoperative (for they merely give him a sort of shower-bath) and pass immediately through the stomach into the intestines, where all the fluid a horse drinks is generally found; therefore they cannot act on the bot. Then, again, he is located on the cuticular coat of the stomach, a membrane as insensible as the horse's hoof, and therefore not liable to become diseased, nor to be acted on by either medicine or bot nostrums. You may kill the horse by the same, but the bot, being within his own castle, can refuse whatever you offer him.

"We cannot make medicine act on the external surface of the bot, for it does not absorb fluid; it is impervious. These creatures have been put into muriatic acid, and kept there for a time without being injured. You may put them into new rum, and keep them for weeks, and on taking them out and exposing them to the sun's rays, they will manifest vitality.

"We often hear wonderful stories related of bots burrowing through the coats of the stomach. This, we think, rarely takes place while the horse is alive. That cavity is the home of the bot, its natural habitation; for we know of no other. Here it generally remains until it is capable of exercising an independent existence. In this situation the little creature is too comfortably located to burrow through the stomach into a cavity where it might perish for want of food. If the time has arrived for it to vacate its stronghold, instinct teaches it the most safe and expeditious route, which is through the alimentary canal. Turn a horse out to grass in the spring, or give him some green fodder in the stable, and the bots will soon leave him, if they are matured; otherwise they must remain until that period arrives, unless nature has some work for them to perform. We shall not contend that bots are never found in the abdominal cavity, for some persons have testified to the fact; but during a practice of several years, and having opportunities of making many post-mortem examinations, we have not yet been able to observe the phenomenon, except in cases of ruptured stomach. Still, a few solitary cases are on record, and hence it remains for us to explain how they got there."

In the spring when the horse is hungry and there is indication of intestinal difficulty, they may be suspected. If the horse turns up his upper lip, and if the edges of the tongue are red and fiery-looking, it will be evidence of their existence. The only remedy for ridding the system of them is to turn the horse to grass in May. At this time physic will hasten them away. They may also be hastened by the following: poplar bark and rock salt, ½ ounce each, 3 times a day. A strong decoction of wormwood is also a good vermifuge, used as an injection.

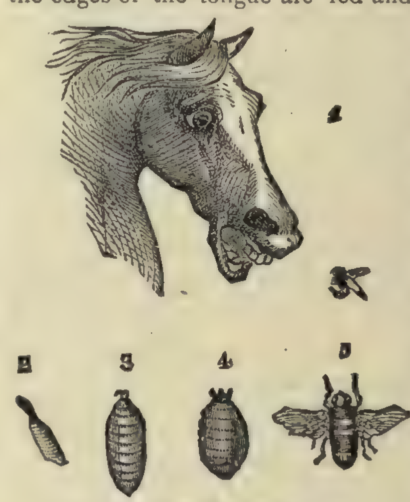


FIG. 40.—*The Bot Fly.*

1. The female about to deposit an egg. 2. The egg magnified. 3. The bot. 4. The chrysalis. 5. The male fly.

As a preventive against bots, keep the long hairs of the jaws, breast and fore-limbs trimmed close, and apply a little oil daily; and brush off any eggs that may be found. Animals kept in stables and well-groomed are seldom troubled with bots.

When ready to pass away, they sometimes cause irritation of the bowels and anus by sticking there.

BOWELS, INFLAMMATION OF THE, or ENTERITIS. This most painful and dangerous malady is often brought on by sudden changes from heat to cold. Horses are sometimes driven fast and compelled to draw heavy loads, undue exertion quickens the cir-

culation, the blood is driven to the skin and copious perspiration is the result. The animals are hitched to a post, or perhaps put into the stable, or let stand, façing a cold wind. The heat of the body produces evaporation, and cold of the lowest degree ensues. The animals shiver, the blood is repelled to the internal organs, the intestines, being debilitated by fatigue, are prepared for inflammation, and enteritis is the result. Colic wrongly treated or prolonged, or congestion, may end in enteritis.

Symptoms. The horse appears heavy and dull, picks over his food, shivers, rolls, plunges and kicks, bringing the hind feet up to the belly; the breathing is quickened, the mouth is hot and dry, the pulse is quick and wiry, the legs and ears are cold, pressure on the abdomen gives pain.

Treatment. The animal should be placed in a roomy box-stall, the legs should be bandaged with flannel bandages, the body should be warmly clothed. The speedy use of the lancet is here called for; open the jugular and abstract ½ gallon of blood. Give upon the tongue every hour for the first three hours 10 drops of tincture of aconite; or, laudanum, 2 ounces; aconite root in powder, ½ drachm; tincture belladonna, 5 drops; water, 1 pint. Take aqua ammonia 2 parts, and water 1 part; saturate a woolen cloth, large enough to cover the abdomen, in the mixture; hold the cloth under the abdomen by means of a blanket folded and held up tight by girths. See page 670. This blister often acts quick, and one must examine it often. Throw up copious injections of soap and water gruel. Tobacco-smoke injections are also beneficial; avoid purgatives. Hay and bran should not be given. Boiled roots should constitute the food on recovery, after which a few ground oats may be added. The post-mortem examination alone shows the violence of the disease. The intestines are black and swollen, often presenting a greenish hue. Their structure is destroyed. They tear upon the slightest touch, and are gorged with inflamed blood. Prompt and energetic treatment is required to check a disease whose ravages will take the life of so powerful an animal in so short a time. The disease runs its course in from 8 to 12 hours.

Brain, Abscess of the. Man's brutality often brings about this serious affliction. Almost every person deems himself equal to the task of breaking and training his own colts. It is customary to begin this operation by bitting the animal. A surcingle, crupper and bridle are placed upon it; the reins are tightened and the head is drawn up to suit the vanity of its proprietor. The torture of a living body is an expensive mode of gratifying vanity. The animal, trying to free itself from torture, throws itself backwards. The head being checked up is the first part to come in contact with the earth; the concussion is liable to create an abscess on the brain. Sometimes teamsters gratify their passions by striking the horse upon the head with the butt end of a whip, and abscess on the brain is the result.

Symptoms. The animal for some time is dull and stupid; at length it falls down and commences dashing its head upon the ground. While life lasts this dreadful occupation is carried on, nor can any power quiet the sufferer until death closes the scene. No treatment is of any use; but as a matter of charity the horse should be killed, that his sufferings may be ended.

Brain, Dropsy of the. This is the termination of some disorder in the brain itself, or the membranes surrounding it. The immediate causes, or the excitants to its development, are various, as castration, foot puncture, staggers, acute diseases of the stomach, defective nutrition, etc.

Symptoms. At first an unnatural sleepiness will appear, with apparent unconsciousness and a tendency to reel when moving on foot. The pupil of the eye is perceptibly dilated; the animal breathes in a hard and grunting way; he tosses his head about and throws it upward or backward, as though in much pain. When down, with neck lying prone, as is often the case, he will sometimes raise his head, then drop it spasmodically, beating it upon the ground. If unrelieved, convulsions finally set in and death ensues.

Treatment. If the head is hot with fever, denoting an acute attack, sponge frequently with cold water and see that the bowels are kept moderately open. If there is decided constipation, as is sometimes the case, use an injection of soap-suds at intervals, until the bowels are moved. Then give the following, in doses of two ounces, morning and evening:

4 ounces fluid extract of buchu,
2 ounces iodide of potassium,
6 ounces water,
4 drachms hypo-sulphite soda,
1 drachm cream tartar.

Clothe the body well; keep cold-water bandages constantly on the head. Continue this, keeping the horse from labor and as quiet as possible, until all symptoms of feverishness disappear from about the head and the unnatural torpor no longer manifests itself.

Brain, Inflammation of the. Of all diseases to which the horse is liable, this is the most terrible. The symptoms commence with loss of spirit; the animal is dull and stupid; the horse, which was formerly a willing and obedient slave, seems altogether changed. The lines may be tugged, the whip applied, the voice of the driver may bawl in the highest key, and the usage which formerly would strike the timid creature with terror now seems to be unheeded. The eyes have a vacant stare, the membranes of the nose are much reddened, the pulse is quick and full, the appetite is lost. Ultimately the mad stages come on. The animal is unconscious of its surroundings and seems bent on self-destruction.

Treatment. If observed in its earliest stages, before violent frenzy attacks it, resort may be had to bleeding. Open both jugulars as quickly as possible and allow both streams to flow until the animal falters. Give the following ball: Aloes, 1 ounce; croton oil, 10 drops; ginger and gentian, of each 1 drachm;

molasses or honey sufficient to form a ball. Give upon the tongue every two hours tincture of aconite, 10 drops, until the pulse vibrates more naturally. Bags of ice, or cloth saturated with cold water, should

FIG. 41.—*A Horse Mad with Inflammation of the Brain, or Phrenitis.*

be kept upon the head. Give cold water to drink. The most nutritious food should be given on recovery, but only in very small quantities. Should the animal recover, treat it very kindly; any thing which excites it is liable to bring on another attack. In ninety-nine cases out of a hundred, however, relief will come in death. Phrenitis is caused by blows upon the head, powerful stimulants, over-feeding, etc.

BROKEN HOCK, BROKEN KNEES AND BROKEN WIND: see respective subjects in this article.

BRONCHITIS. This is an inflammation of the mucous membrane lining the bronchial tubes, or air passages of the lungs. Exposure of a heated and steaming horse to chill or over exertion, and leaving the horse in the stable when the system is quite relaxed, or riding to town and leaving a horse in the cold and wind, while the owner is making himself comfortable, are the chief causes of bronchitis. There is first a cold, enlarged glands and swelled throat. The inflammation extends down from the larnyx through the trachea into the bronchial tubes and air passages of the lungs, and ends sometimes in confirmed and incurable bronchitis.

Symptoms. In the acute stage there is difficulty and rapidity of breathing, from the filling of the membranes with blood and the consequent diminishing of the size of the tube. After a time mucus is formed and increases the difficulty of breathing and causes a cough. The pulse will be 60 or 70 beats per minute; the cough will become hard and dry, and the sound in the throat will be rattling, and after the secretion of mucus a gurgling sound will be given similar to that made in blowing soap-bubbles. In extreme cases the breathing becomes extremely laborious, the cough is constant and distressing, the legs are extended, and at length the animal dies of suffocation.

Treatment. The first step is to find the extent of the inflammation. Never bleed. Clothe the animal warmly and give an injection of warm water to relieve the bowels. Avoid all strong purgatives. In fact, give none unless the bowels are decidedly bound up. Let the food be soft and laxative, green grass in summer, or mashes and gruel in winter. For the throat, scalded soft hay fastened by bandages will be good. Wash the neck with a weak decoction of tobacco as hot as it can be borne. When dry, shave the hair from the chest and apply a blister of better strength than that advised for chest founder. The following will be good:

1 ounce aqua ammonia;
1 ounce powdered cantharides;
1 ounce powdered resin;
4 ounces lard oil.

Melt the resin and lard together, add the cantharides and stir until it sets together. Apply to the chest and throat if the case is desperate. If only irritation is desired, the following will be good:

4 ounces lard oil;
1 ounce turpentine;
6 drachms powdered cantharides.

Shave the hair and apply by rubbing in.

BRUSHING, OR SPEEDY CUT. This is a bruise, abrasion of the skin, or contused wound, produced by the shoe of one foot striking the opposite fetlock ankle, or even the knee. It is more owing to weakness than other causes, though a horse striking once is more liable to the same injury thereafter. It is really the foot that is resting on the ground that causes the hurt, from its being put down out of the proper line.

FIG. 42.—*A Case of Incurable Bronchitis.*

Treatment. For horses of slow or moderate driving, the difficulty is confined to striking the ankle and below. The usual remedy is to cause the horse to set his foot in proper line by raising that side of the shoe,

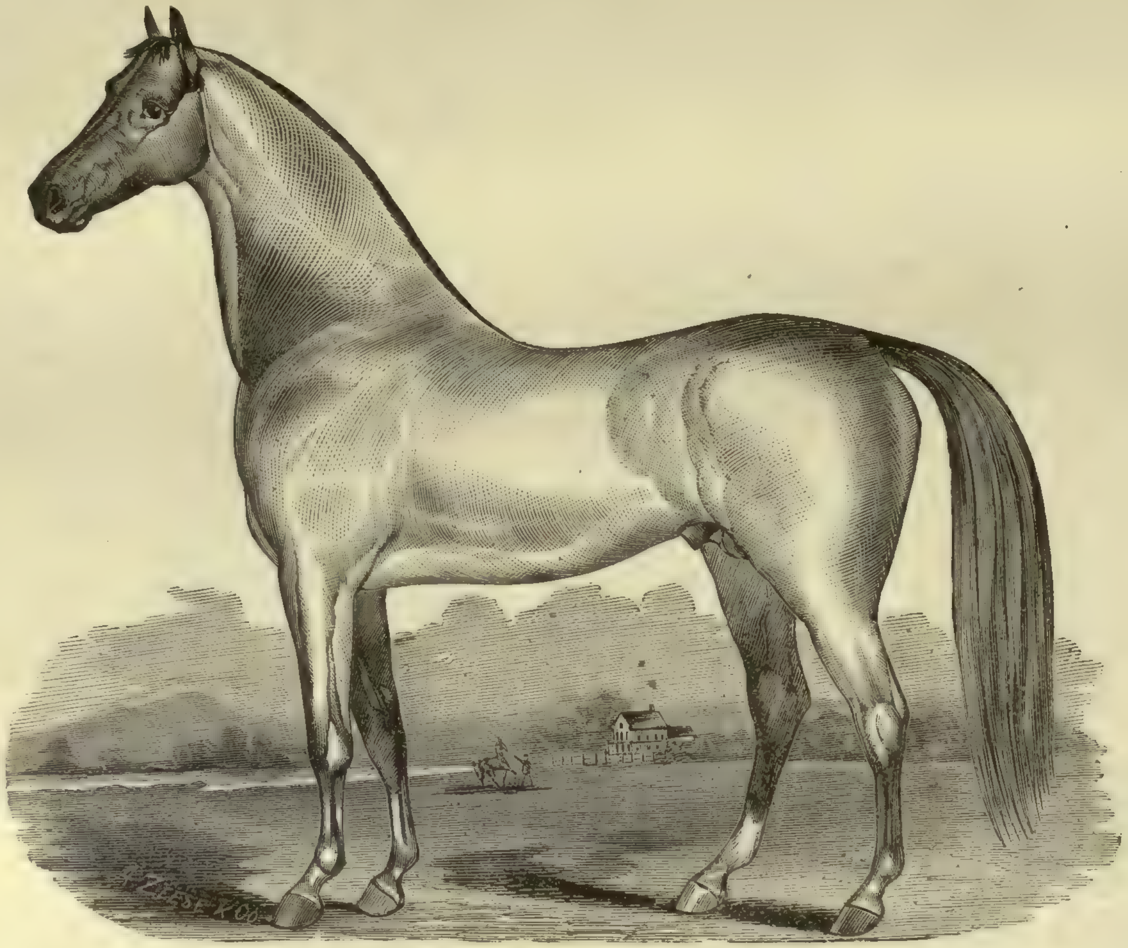


Fig. 56.—GOLD-DUST.

thus throwing the inside of the ankle slightly up. Any common-sense blacksmith should know how to do it. For fast horses the limbs must be further protected by means of pads (see Fig. 43) and other appliances to be found at all saddlery establishments.

Fig. 43.—*Ankle Pad.*

Burns and Scalds seldom occur in horses on the farm or employed on the road. They are, however, of frequent occurrence where horses are employed about mills or factories where steam is used; or in iron foundries and in cities.

Treatment. Sprinkle common baking soda thickly on the part, or moisten with water into a thick paste and bind or lay it over the injury. For slight burns which sometimes cover a large surface, there is nothing better than several coats of thick white-lead paint laid on with a brush; cover the whole with cotton and bind on close. Sometimes indolent sores follow burns and scalds. If so, the ulcers should be well and carefully washed with tar water, and the following mixture dusted over the parts: 1 ounce oxide of zinc; 2 ounces powdered starch. Mix intimately and sprinkle on thickly to form a crust. Whenever the moisture appears through, keep adding the mixture until the crust becomes permanent and fixed. In chronic cases, sprinkle the part with powdered slippery elm, charcoal, golden seal and powdered myrrh.

Among the best treatments for burns is an application of one pint of linseed oil and half a pint of lime water, stirred together, or rather whipped (as cooks usually do eggs) till the mixture is like thick cream. This is to be applied for a few days; then the sores are to be dressed with green ointment.

Cancer, Epithelial, is a nipple-like cancer, which sometimes appears on the lips of horses. It should be promptly removed with the knife, after which the part should be burned over with lunar caustic.

Canker. This is a fungoid secretion into the horny sole of the foot, from whence fungoid granulations start up. The fluid secreted has an offensive smell and often the horn sloughs off in large quantities. The fungus is secreted in the largest quantity near the edge of the sole, and the granulations attain their greatest size, as the papillæ are largest in that region. Canker is generally the result of neglected thrush, and often baffles all attempts to cure. It may arise from the prick of a nail.

Symptoms. It is most prevalent in heavy, coarse-boned horses. The frog will become large, spongy, and covered with a fungous growth of cheesy texture, and throwing out an abundant colorless bad smelling liquid. If cut away it will again quickly spring into growth. The discharge is more offensive than in thrush, and the disease more obstinate, often resisting treatment a long time.

Treatment. The horse must be kept in a clean, dry, well ventilated stable. All diseased portions of the hoof must be neatly pared off so far as the knife may be able.

The cure consists in destroying the fungoid granulations. Thus, in cutting do not be alarmed at the sight of blood from the canker. Over the well portion of the hoof apply corrosive liniment and cover the diseased parts with the following:

1 drachm carbolic acid,
½ ounce chloride of zinc,
4 ounces flour.

As the canker improves, the dressings may be extended to the third or fourth day, and during the whole time of treatment the horse should be liberally fed, and be exercised for an hour every day.

Capped Hock: see Hock.

Caries. This term means an ulceration of the bone. The most frequent form of caries is seen on the lower jaw-bone. Caries of the lower jaw bone, between the tushes and grinders, is caused almost wholly by the barbarous use of bits and curb-chains. Injury is also sometimes inflicted upon the bony plate of the roof of the mouth by pressure of the curb, when a tight nose-band keeps the mouth shut down. The gums of the lower jaw are very often hurt, and not unfrequently the bone itself is so bruised as to result in this ulceration. When this is the case the gum, unless forcibly opened, must slough, so that the injured portion of the bone can be cast off. Thus a stinking sore is made, and one of long continuance, as the sealing of the bone and the escape of the loosened particles is a tedious process.

Symptoms. Examine the gums, and if it is a bruise the spot will appear of a different color from the adjacent parts, and pressure upon it will cause the animal to wince with pain. On contact with the bit, however, there is a mixture of blood and watery matter, and some of this escapes constantly while the horse is in use.

Treatment. When the discharge has somewhat thickened, and is peculiarly offensive to the smell, showing that the bone is decaying and that nature is making an effort to cast off the injured portion, wash it out with the syringe, several times a day, with the following solution:

1 scruple chloride of zinc,
4 drachms essence of anise seed,
1 pint water.

If treatment is deferred, however, till there is an open, ulcerous gum, with existence of proud flesh, push a stick of lunar caustic deep into the unhealthy granulation in the cavity, so as to destroy it. Then keep down the fungous growth by the use of the caustic, day after day, until the stinking discharge has ceased. This will not be until the bone has ceased to scale away; and the wound may now be safely left to heal.

A cure effected, the next thing to do is to select a bit that shall press upon another part of the mouth or one that will not hurt the mouth. The bit may be

covered with a rubber covering, as shown by Fig. 44

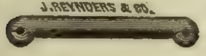


Fig. 44.—*Cover for Bit.*

The snaffle may be used with comparative safety where the curb has inflicted serious hurt.

If the upper teeth be ulcerated to any extent, a fetid discharge will run from the nostrils upon the side on which the diseased teeth are situated. This has often been mistaken for glanders by ignorant persons. If caries of the bones of the head exists, the swelling of the head will be enormous. It is then termed Big-head, which see, page 759.

Chest, Dropsy of the Skin of the. This is an effusion of fluid underneath the skin of the chest; and it is a sequel to various diseases—beginning generally to manifest itself only after the animal is reduced to a debilitated state. It is most likely to occur in the spring and in the fall of the year, at the time of changing the coat.

Symptoms. A swelling appears in the chest and somewhat between the fore legs; and its dropsical character may be known by its yielding to pressure of the fingers with a fluctuating feeling.

Treatment. If it is the accompaniment of any more general disorder the first thing, of course, is to remove that primary disease. Meanwhile if the fluid accumulates in any considerable quantity, draw it off with the trocar; and if there is not too much soreness, subject the part to regular and moderately vigorous friction occasionally for some days. Give

¼ ounce hyposulphite soda,
1 drachm cream tartar,
1 ounce sweet spirits nitre.

Diuretics are always good in these dropsical complaints. It is important that the bowels be kept regular, and that good nutritious food, as boiled oats or boiled barley, with wheat bran, be given regularly, and in sufficient quantity to nourish well. Give 4 drachms of gentian every other day for a week or two.

It must be remembered that these medicines are to be given only in case there is no treatment in progress for a more general disorder.

Chest Founder: see Founder (Chest).

Choking. This very rarely occurs in horses, though frequently in cattle. When it occurs in a horse, and he be a spirited animal, and the substance be high in his gullet, there is little chance of saving his life. Choking occurs in two distinct forms. The high choke, when the substance is lodged in the throat or neck, and the low choke, when the substance is lodged in that part of the gullet lying low within the chest. In high choke, the animal may die in a few minutes; in low choke, there is not such special need of haste.

Symptoms. There is intense distress; the head is raised; there is slavering, violent coughing and continual efforts to swallow.

Treatment. Examine carefully the furrow on the left side of the neck for the substance. If solid, endeavor to press it upwards with the fingers on each side. If not, endeavor to extract it by putting a balling iron into the mouth to hold it open; pull out the tongue; pass the hand into the throat and endeavor to dislodge it with the finger, the head being held out in a straight line with the neck. If this do not succeed, and the obstruction is in the gullet, and is clear of the windpipe, procure a probang, oil it thoroughly, cast the horse, put the balling iron in the mouth, introduce the probang, and by steady pressure for a few seconds at a time, endeavor to move it. If it moves, continue the pressure until it is pushed into the stomach.

If the substance is so firmly held that the probang will not move it, the mass must be cut down upon and taken out. Let an assistant press the off-side of the neck to get as much bulge as possible. Then with a bold cut of a sharp knife, cut through skin, tissues and gullet, to the mass, with an ample cut, and remove; bring the edges of the gullet together, stitch them with fine cat-gut or strong silk, and then the wound in the skin. The difficulty here may cause subsequent stricture of the gullet, which may thereafter prevent the animal swallowing solid food. In any event only semi-liquid food should be given for ten days after choking, or until the animal seems well.

In desperate cases, where there is instant danger of death from choking, take a small needle, run through the integuments on each side of the wound, and tie to a portion of the mane to keep the integuments from closing over the orifice.

The Low Choke. This is where the obstruction is low in the gullet, or in the thoracic portion of the œsophagus. In this form there is great distress, but

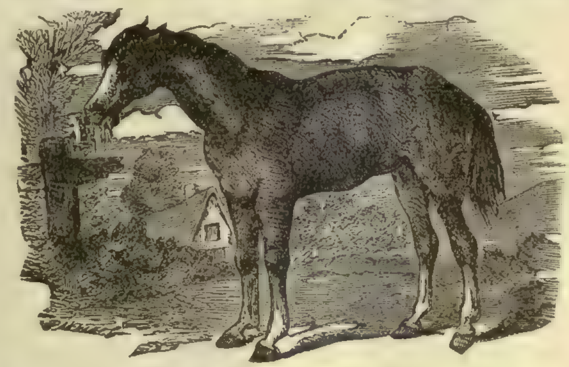


Fig. 45.—*The Low Choke.*

the head is not held so high; saliva runs from the mouth, and the discharge is copious from the nose; if the animal attempts to drink the water is cast forth from the nose; the breathing is laborious, the flanks tucked up, the back roached, and the animal shows symptoms of great distress.

Treatment. Give a gill of linseed or lard oil once an hour, and between these doses, every hour, the following anti-spasmodic:

1 ounce tincture lobelia,
2 ounces sulphuric ether
2 ounces laudanum,
½ pint water.

Use the probang carefully after such anti-spas-

modic. If the whole of the dose is apparently returned, administer chloroform from a sponge, by inhalation, until entire insensibility is produced. Then extend the head, insert the probang, well oiled, and use steady but constant pressure, until the substance moves. It may take ten to fifteen minutes or more. When the substance moves do not use much violent pressure, but move it carefully until it enters the stomach, care being taken not to force the instrument too far, and thus wound that organ, remembering always that sudden violence may bring on spasmodic action, in which case efforts must cease. Violence may also rupture the œsophagus.

COLDS in horses, as in the human family, are usually the result of improper care or undue exposure. Taking a horse from a hot, ill-ventilated stable, and allowing him after driving to become cold, is one prolific cause of colds. There are so many means of causing this disability that it would be impossible to enumerate them. If the attack is light, all that will be necessary will be to clothe the animal warmly and relax the bowels with a warm mash, and give rest for a few days.

Sometimes, however, the attack is prolonged and severe. The appetite ceases, the coat roughens, parts of the body are hot and others cold, the membrane of the nose at first dry and pale, with the facial sinuses clogged, at length terminating in a discharge more or less great, but without improving the health of the horse.

FIG. 46.—*A Horse with Cold.*

Treatment. Keep the animal warmly clothed, in ample box stall, with plenty of bedding. If the cold does not give way in a few days after the first attack, and the symptoms are as we have indicated, or if the membranes of the nose are dry, make a sack of coarse gunny cloth, large enough so it may fit the nose properly, but enlarging to the bottom and two feet or more long, with a slit covered with a flap in the side, half way down. Put into the bag half a peck or more of coarse pine sawdust or bran, with which half an ounce of spirits of turpentine has been thoroughly mixed. Place the bag on the nose, as shown in the cut in the next column, Fig. 48.

Turn two gallons hot water into the slit, and every twenty minutes repeat, allowing the bag to remain on an hour each time; use this six times a day until the discharge begins. When water runs freely from the nose, three times daily will be enough. Let the food be good scalded oats or other like food, with mashes, if the bowels are constipated.

An animal with this kind of a cold should not be put to steady work until entirely recovered. The result of protracted cold is great weakness, and work before recovery often leads to disease of the air passages and lungs. If there is much fever give the following:

2 drachms spirits ammonia,
2 drachms ether,
10 drops tincture aconite.

Mix and give in a little gruel twice a day. If the throat is involved poultice it with linseed meal, in which a little mustard has been mixed. When the symptoms give way and improvement begins, or if the appetite is not good, prepare the following:

FIG. 47.—*Head with Lymphatic Gland of the Throat Swollen.*
1. The enlarged lymphatic within the jaw.

1 drachm golden seal,
2 oz. powdered gentian,
2 oz. carbonate ammonia.

Form this into a mass with linseed oil and molasses, divide into eight parts and give one twice a day. If the cold becomes chronic it ends in catarrh. When there are catarrhal symptoms and sore throat, give the following:

1 drachm extract belladonna,
1 drachm Indian hemp,
2 drachms powdered camphor,
4 drachms nitre,
1 drachm blood root.

Mix in water and give as a drench, and give one every three or four hours. In inveterate or chronic cold there is a discharge and swelling of the lymphatic gland. We give a cut showing the enlargement of the lymphatic gland in chronic cold. If the appetite keep good nothing more need be done; but on the contrary, if the breathing quicken and the appetite be poor, and debility be setting in, tonics and stimulants will be necessary. Get the following medicine and give one powder morning, noon and night, mixed with a little cold water, and drench the horse with it. Take powdered gentian root, powdered pimenta berries, powdered carbonate of ammonia, of each two ounces. Mix and divide into twelve powders. When the appetite improves give good feed, but not in sufficient quantity to bring on indigestion. Give green feed if it can be had.

FIG. 48.—*Nose Bag for Steaming Horse with Cold.*

COLIC, FLATULENT. This is an accumulation of sulphuretted hydrogen or carbonic acid gas in the stomach and intestines, caused by the decomposition of food. It is a disease of frequent occurrence among horses, always sudden in its attack and very dangerous, often resulting fatally. Green grass, clover, carrots and turnips are said to occasion it, yet it sometimes

appears in stables where nothing but corn and hay are fed.

It may be the result of some other disease, or appear as a consequence of the spasmodic form, or may

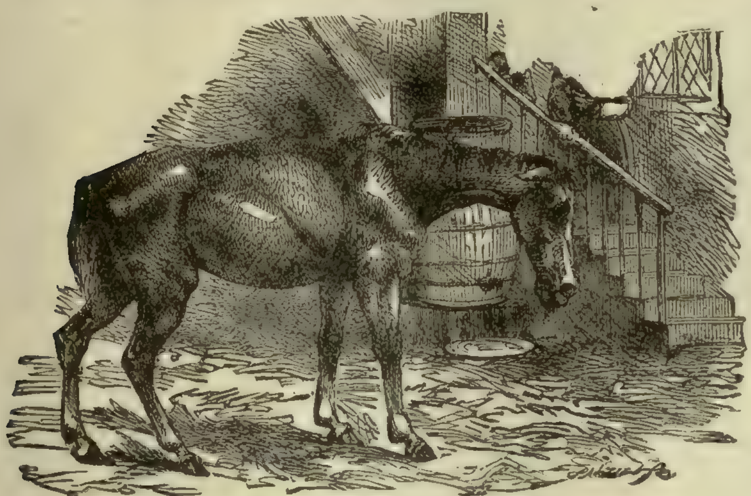


FIG. 49.—*Horse in the Last Stages of Flatulent Colic.*

be produced by the same causes as those assigned to the acute form.

Symptoms. The expression of pain is constant but not so acute; the pulse is rapid and feeble, with difficult breathing; the feet and ears are cold; the abdomen is tense and swollen, and it sounds drum-like when struck. The animal is weak and sometimes delirious; the intestines are painful.

Treatment. Be careful about giving purgatives; act by injections of soap-suds and oil of turpentine, removing the impacted contents of the rectum with the well oiled hand. Give the following injection: ½ pint oil of turpentine, 1 quart of soap-suds. Repeat in half an hour if necessary. This operation requires not a little skill and courage. Give the patient a large stall, plenty of bedding and administer the following drench:

1 ounce fluid extract golden seal,
2 ounces fluid extract Jamaica ginger
1 ounce hyposulphite soda,
4 ounces of water.

Dissolve the hyposulphite of soda in water, then add the other ingredients to it. The dose may be repeated should it be necessary.

Give easily digested food; avoid large draughts of water and over-feeding; give good grooming; blanket if necessary and keep the circulation active by hand-rubbing of the body and limbs. The following is a remedy that seldom fails to give relief: Take two or three ounces chloroform and the same of sulphuric ether. Pour on a sponge or handkerchief and hold to the nose until the patient is etherized.

This is a disease that, unless relief is speedily afforded, will prove fatal. Should the remedies presented fail to give relief an operation must be performed. Where the sound, when tapping the flank with the knuckler, is most drum-like, force in a trocar into the distended bowels, and hold it there until all the gas has escaped. The location may also be indicated by measuring an equal distance from the haunch-bone and the short rib, and not too high upon the back. Should you not have a trocar at hand, sharpen a knife and insert it. When the trocar or knife is removed put a piece of sticking plaster over the wound. I have never failed to relieve the animal by this operation, except in two cases out of a large number treated. I have often used my pocket-knife in performing the operation. The main point to be observed in treating colic is to relieve pain. This done for a time the animal will doubtless recover.

COLIC, SPASMODIC. Colic is of two kinds, spasmodic or flatulent, the latter of which is treated above. Spasmodic colic is the result of cramps or spasmodic contractions, causing severe pain, with tendency to inflammation. It is known as cramp, fret, gripes, etc. It arises from various causes, such as fast driving, drinking cold water when heated, change of food, washing the belly with cold water, etc. When early treated this affection is quite tractable, but should wrong treatment be practiced, or the case be neglected, the most serious results may be looked for.

Symptoms. All at once the horse that a few moments ago was well, apparently, shakes his head, leaves his feed, looks around at his flank, mostly at his right side, and scrapes the ground with his front foot, and strikes his belly with the hind foot, lying down and suddenly getting up, rolling, or lying stretched out for an instant, then suddenly rising. There may be frequent small discharges from the bowels and bladder.

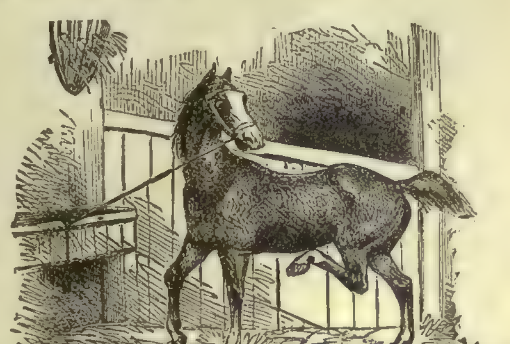


FIG. 50.—*The First Stage of Spasmodic Colic.*

Treatment. If the disease be wrongly treated the pulse soon becomes wiry, the pain becomes more acute, the animal lies down, rolls upon its back,

partial sweat bedews the body, the legs turn cold and the enteritis sets in; at this point the treatment is very uncertain. Relieve the pain by means of an

Fig. 51.—*Second Stage of Spasmodic Colic.*

opiate, and cause movement of the bowels. To do this, in mild cases, the following will be good in connection with injections of warm water:

1 ounce tincture lobelia,
½ to 1 ounce laudanum,
4 to 5 drachms aloes,
1 pint hot water,
1 ounce spirits turpentine.

Cool as quickly as possible and give every two hours.

If there is abundant formation of gas, give the following promptly:

1 ounce aromatic ammonia,
1 ounce sulphuric ether,
1½ ounces warm water,
1 ounce hyposulphite soda.

Mix, and give at once. Another colic drench in good repute is the following:

1 ounce tincture assafœtida,
1 ounce sulphuric ether,
1 ounce laudanum,
1 ounce tincture lobelia.

Put in 1½ pints of hot water; cool, add the other

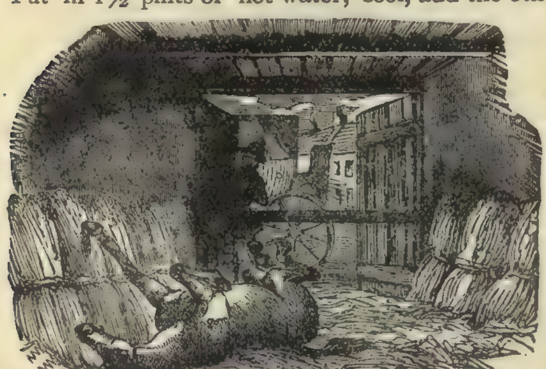


Fig. 52.—*Last Stage of Spasmodic Colic.*

ingredients, and give immediately. If relief is not obtained, give as second dose, the following:

1 ounce sulphuric ether,
½ ounce laudanum,
½ ounce spirits camphor,
½ ounce essence peppermint,
½ ounce chloroform.

Mix in a pint of gruel.

Contraction of Hoof. See Hoof.

Corns are simply a congestion of the parts, caused by either bruise or pressure of the contracted hoof.

Causes. In general, the production of corns may be laid to the charge of the horse-shoer, and sometimes to the owner allowing the horse to go too long before the shoes are removed, or before the foot has grown from the shoes. Sometimes there is an inflammation, owing to the formation of matter, which works out either at the top of the hoof or at the toe, from the formation of a fistula. Then it is Quittor. They may be found on either side of the heel, but usually on the inner or weaker side.

Symptoms. There will be flinching when the walls of the hoof and sole are seized and strained with the pincers (see Fig. 53), thus revealing on which side and the locality of the corn.

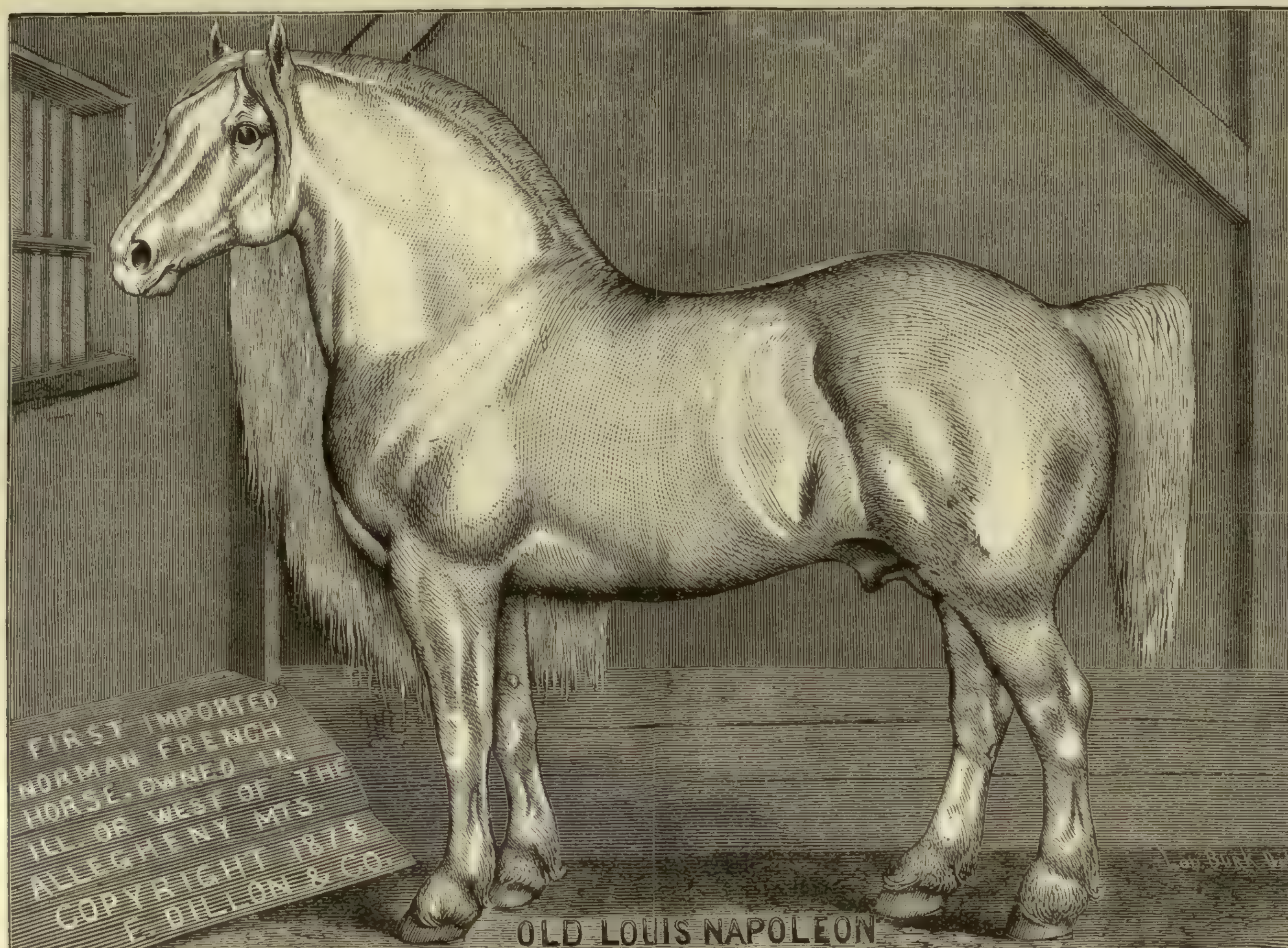
Fig. 53.—*Hoof-searching Forceps.*

The toe will be pointed when at rest, and with the heel slightly raised. In motion the gait will be short and stumbling. If it has proceeded to suppuration, the pain will be so extreme that the horse will fear to put the foot to the ground. If there is a horny tumor forming, it may be known upon paring the hoof by the appearance of a white, spongy, horny formation, as in sand-crack.

Treatment. If the corns proceed from other diseases, causing contraction and other disabilities of the hoof, remove these causes and the corns will disappear. If the corns proceed from a simple and recent bruise, which is generally the case, remove the shoe and rasp down the bearing surface of the heels, so there may be no pressure; that is, the heels should be rasped lower than the other bearing surfaces. If there is inflammation, let the hoofs rest in cold water, or keep them moist with a wet cloth, and the sole with a soft sponge, or the whole hoof may be enveloped in a large sponge cut to fit. The animal should wear a bar shoe, arranged to avoid pressure on the parts affected. When the foot ceases to be tender, keep the hoof and sole smeared with the following ointment, to render it soft and promote healthy growth:

1 ounce Venice turpentine,
½ ounce tallow,
1 ounce oil turpentine,
4 ounces beeswax.

Use the horse at light work until fully recovered. If the difficulty be found to be a suppurating corn, one containing matter, the hoof must be cut down to let all the matter escape; cut away all the horn


FIRST IMPORTED
NORMAN FRENCH
HORSE. OWNED IN
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that has become separated from the quick, and pare away all the horn around the parts to a thin edge. Poultice the part with a linseed poultice, renewed until there is no longer tenderness, and the surface is smooth and healthy. Then put on a bar shoe with a leather sole, and fill the space from behind with tar, held in place with a stuffing of tow. Give entire rest and no pressure on the heel until the sole of the foot has grown out naturally.

If the corn has become a tumor it should be cut out, and the same treatment pursued as advised for a corn that has formed matter.

Old corns sometimes result in disorganization of the parts, or death of a portion of the heel, disease of the bone of the foot, or ulceration of the cartilage. For the treatment of this stage, see Quittor.

COUGH is a symptom of a chronic disease of the respiratory organs, as tubercles of the lungs, thickening of the lining membranes of the windpipe, and enlargements of the glands of the neck. Cough is an attendant upon so many disorders of the air passages, from the most trivial difficulty in teething to glanders, that it should not be overlooked in the diagnosis of diseases; and so many diseases leave the patient with a chronic cough that its symptomatic stages should be carefully observed.

FIG. 54.—*A Horse Quidding.*

Coughing tends generally to a thickening of the membranes. When the membrane covering the larnyx becomes thickened, the cough becomes chronic.

The chronic cough, resulting from colds, is hard and metallic. For this rub the following on the throat and around the windpipe once in ten days:

15 drops Croton oil,
1 ounce glycerine,
1 ounce soap liniment (opodeldoc).

Give twice a day, for a week, the following:

40 drops diluted Prussic acid,
1 ounce niter,
1 ounce bicarbonate soda,
1 quart water.

If this does not give relief, the following, valuable for irritable chronic cough, the result of influenza or sore throat, may be used:

½ ounce chlorate potash,
½ drachm tincture belladonna,
½ drachm tincture lobelia.

Give two times a day in water or gruel and note results, ceasing after a week or ten days, if no improvement ensues. For cough and sore throat, when first discovered, take:

1 drachm powdered camphor,
1 drachm extract of belladonna,
2 ounces sweet spirits niter.

Give in a pint of cold gruel three times a day. Tar water is well known to be valuable in obstinate colds.

CRAMPS. The equine family are very frequently attacked with cramp of the muscles of the hind legs, and the symptoms which usually accompany it are very similar to what is usually present in cases of dislocation of the patella—so much so that one is often mistaken for the other. The animal thus affected has great difficulty in lifting the leg off the ground, and when he succeeds in this effort the leg is thrust backward in a rigid manner, it being out of his power to extend the limb forward.

Treatment. Clothe the body warmly, find the seat of the difficulty by feeling of the parts until the sore place is touched. Wash the parts with salt water and rub dry. Then apply the following liniment:

1 part sulphuric ether,
1 part solution of ammonia,
1 part spirits of camphor,
1 part olive oil,
1 part oil cedar.

Rub it in well, and hold a hot iron or brick to the parts to heat it thoroughly.

CRIB BITING. This is not a disease, but a vice—a bad habit, which the horse has learned, of sucking wind into the stomach by placing his lips against the manger. The habit has been so strong in some horses that when they could get no place to press the lips against, they have stooped down and placed the lip against the arm of their own front leg. This vice is sometimes called wind-sucking.

Causes. Idleness, indigestion, and learning it from other animals in the same stable.

Prevention. Keep horses in loose boxes, or other places where there are no fixtures but the walls; regular feed and regular work.

Treatment. Do not let the horse stand in the stable twenty hours out of twenty-four. Feed him regularly, and work him as regularly. Turn the animal to pasture, and when he is brought home in the fall of the year, have a loose box prepared for him without any fixtures, as manger, trough or rack. Place his hay upon the floor, and his oats or corn in a small trough, and remove it as soon as he is done.

CURB is a swelling in the middle of and just behind the lowest part of the hock joint.

Causes. This is another mark with which cruelty characterizes the obedience of its subject. The history of nearly every horse in the land is a struggle to exist against human endeavors to deprive it of utility. Nearly every horse-owner imagines that the animal over which he has authority possesses superior powers of action and strength, and to gratify his folly, the animal is pushed over rough roads at his utmost speed, or compelled to show his superiority by dragging heavy loads. The creature seems to comprehend and derive gratification from obeying the desire of its superior, and it complies with his wishes without a thought of prudence for its own personal safety. In its efforts to propel its body, or perhaps a ponderous load along an uneven surface, injury is inflicted upon the perforans tendon or its investing sheath, inflammation starts up and curb is the result.

Symptoms. There is heat, inflammation, tenderness, lameness, and a tendency to knuckle forward at the fetlock and an enlargement on the back part of

the hock joint, usually about six inches below it.

Treatment. Absolute rest, a high-heel shoe, and cold-water bandages, generally, will remove the difficulty if applied in the early stages of the disease. After the lameness becomes decided, apply the following: 2 ounces tincture arnica in 1 pint of water. Apply three times a day. After the disease becomes chronic, take red biniodide 1 part to 8 of lard, rub the parts well twice a week, greasing between times with hog's lard.

Diabetes, or Profuse Staling, called by various names, as diuresis, diabetes insipidus, poluria, etc., is simply an excessive secretion of urine, causing loss of flesh, weakness, and at length terminating in exhaustion and a general breaking down of the system.

Symptoms. There is excessive thirst, profuse and frequent staling of pale-colored urine, thin and with little odor, loss of condition and spirits; the appetite fails; the skin is hard and dry; the hair harsh; the pulse will be weak, whether fast or slow; depraved appetite for licking noxious substances.

Treatment. Change the food at once; well seasoned hay and grain, with linseed tea, given freely in the drink. The horse must not suffer from thirst, but inordinate drinking should not be allowed. The following will be a good formula, to be given three times a day in water:

20 grains iodine
1 drachm iodide of potassium,
4 drachms carbonate of soda,
3 drachms fluid extract witch-hazel.

Another good formula, to be given once a day, or in bad cases twice daily, is the following:

2 drachms fluid extract witch-hazel,
30 grains iodine,
2 drachms sulphate of iron,
½ ounce powdered gentian,
1 drachm Collinsonia.

Give the above as a ball, made with molasses and linseed meal. If four or five doses do not show decided effect, discontinue. Six or seven days should effect a cure.

Diarrhœa is a condition of frequent watery discharges from the bowels, and may be produced by many causes, as irritating and indigestible food, worms, severe purgations by medicines, disorders of the liver, or constitutional tendency. The owner of the animal must find the cause before proceeding intelligently to give relief. The most we can do is to give some general indications. From whatever cause, however, the diarrhœa may arise, treatment that will allay pain is demanded.

Treatment. Sometimes diarrhœa is an effort of nature to rid the body of injurious matter. Early in the effort give the horse one pint of linseed oil; or if an active purge be required, a pint of castor oil. If the diarrhœa does not cease, check it with 1 ounce slippery elm bark, glycerine one-half pint, laudanum 1 ounce. If the difficulty refuse to give way, doses of 2 scruples of tannin may be given, or, doses of 3 drachms of catechu every hour until checked. The ox requires double the dose. Follow with tonics, say 4 drachms of gentian daily, or 1 ounce of Peruvian bark, with sound, easily digested food. If caused by bad water, throw a handful of charcoal in the water before giving it to drink. The following will be found beneficial in the several cases mentioned.

For sour and fetid discharges mix the following ingredients in the food twice or thrice daily:

½ ounce gum arabic,
1 ounce powdered chalk,
1 ounce bisulphate of soda.

For sour discharges with griping, take the following, formed into a ball with linseed meal and molasses:

1 drachm powdered opium,
1 drachm powdered chalk,
20 drops carbolic acid.

When the result of medical purging, the following:

1 ounce gum arabic,
2 ounces laudanum
2 ounces powdered chalk,
½ ounce bayberry bark.

Mix and give in a quart of thin starch or flour gruel.

Astringent injections may be given as follows:

2 ounces laudanum,
2 drachms acetate of lead,
1 quart starch water.

Dislocations in the horse are rare, and when they occur are difficult to manage, except with the aid of a veterinary surgeon. See the article Dislocation.

Treatment. In any case the first thing to do is to put the joint in place—not always an easy matter. The means to be employed are so different that it would be impossible to state them, only in a general way. If inflammation and swelling have set in, it must be reduced by cold-water applications or hot water fomentations. Then the joint must be brought to place by traction and force. When a starch bandage may be employed, this should always be used to hold the parts together. If not, the dislocation must be splintered or padded, or both, to keep the parts intact and in place. The slings (see Fig. 69.) should always be employed to rest the horse when they may be had. This, with cooling lotions, rest, proper care and feeding, will insure recovery.

Distemper, or Strangles, an eruptive contagious fever, characterized by swelling in and between the bones of the lower jaw, terminating in an abscess. It is most prevalent among colts, although horses are sometimes subject to it. This is supposed to be a disease to which all horses are subject once in their lives, some distinguished veterinarians claiming that few, if any, escape it, should they live to the age of ten years. There are, however, in our opinion, many horses which escape it. Distemper is undoubtedly one of the evils of domestication, and generally results from poor diet, foul air and bad management. Indeed, if it is not actually generated by filth and uncleanness in the stables, the disease is certainly aggravated by causes producing miasma and bad air in the stables. Therefore cleanliness is essential not only as a means of preventing disease, but in rendering it of a mild type when it breaks out. When it once breaks out all the animals in the stable are likely to be infected with it, unless they have already had it. Colts and young horses will take it from older ones more easily than older ones from the young.

Take a colt from its mother, whose milk contains all the elements for sustaining life and developing the organization of the young subject, and place it on a diet of hay or like unnutritious trash, a whole truss of of it would not give one-half the nutriment contained in a quart of its mother's milk. However profitable and well adapted hay may be for stock of mature growth and powerful digestive organs, it is a sad mistake to suppose that will do for the young.

It has been claimed that distemper is more surely communicated at an early than a late stage, and in a certain form more readily than in others. Distemper will assume the herpetic character, simulate farcy and glanders, settle in the mesenteric glands, or may follow castration. In regard to contagion may be mentioned, as most readily communicable, that form of distemper which assumes the character of eruptions on the lips, nose and pituitary membrane.

Horses will contract the disease from others when at a distance. It is supposed to be communicated both by actual contact and also from germs proceeding from the breath. Hence, when once it breaks out, at the first symptoms, isolate the sick animal or animals, and fumigate the stable thoroughly and daily.

To do this, fill the stable with tobacco smoke, both the stable from whence the sick horses have been taken, and the place where they are confined during treatment. Let the smoke be so thick as to be quite inconvenient. Make all the animals inhale as much as possible. Wash every part of the stable, and especially the feeding places and hay racks, with a strong decoction of tobacco stems, using for the purpose cheap, rank tobacco. Keep powdered tobacco leaves in the mangers of all the horses. This being early attended to its spread may be generally arrested.

Symptoms. The disease has three stages. In the early stage of the disease there is a dry, hacking cough, and there will be noticed a discharge from the nose, first of a thin, watery fluid, succeeded by a thicker, purulent discharge of a whitish color.

The next stage of the disase shows itself in a swelling of the throat. The salivary glands, which at first were inflamed, are now closed, and pus is being formed. At length an abscess is formed.

The third stage is the suppurative stage, in which the abscess breaks; sometimes there are two. From this time on, the animal is in a fair way to mend, and every means should be taken to promote the discharge. In bad cases the suppuration may continue for weeks, and in extreme cases it may continue for months. From first to last there is a fever. The pulse is quickened and hard. The appetite fails, both from fever and inability to swallow. As the fever increases the eyes become dull and glassy; the hair is dry, will not lie close, looks dead; and the animal stands with its head drooped, and the whole appearance is stupid.

Treatment. Never bleed in any case, as it is very prostrating. The animal must be warmly clothed and kept in a thoroughly well ventilated but comfortable stable. Let the food be light but nourishing. Mashes made of oat-meal and bran, also boiled oats, oat-meal gruel, and hay tea should be given for a drink. Give the following three times a day:

¼ ounce golden seal,
1 drachm copperas,
1 drachm blood-root,
4 drachms hyposulphite soda,
1 drachm gentian.

Fig. 56.—An Abscess Lancet.

Let all drink and food have the chill taken off before giving it. If there is considerable fever and the tongue is coated, give a little cream of tartar in the drink. If the limbs are cold bandage them and hand-rub to promote circulation. Give once a day in the food the following: 3 drachms flower of sulphur, 1 ounce resin. If the tumor forms, then every means must be employed to cause it to suppurate. Poultice the throat with warm bran and corn-meal mixed. It will be dangerous to scatter it. If the bowels are obstructed, remove the contents of the rectum by the following injection:

4 drachms powdered aloes
1 drachm common salt,
2 pints hot water.

Mix, and inject when blood warm. When the tumor has formed pus and is nearly ripe, which may be known by a soft place where it is working its way to the suface, open it with a knife with a curved-pointed blade, and if necessary increase the opening with a button-pointed bistoury, to allow free exit of matter. It will give almost immediate relief.

Dropsy of the Brain: see page 749.

Dropsy of the Heart, Lungs, Abdomen and Legs: see respective subjects in their alphabetical order in this article.

Ear, Diseases of the. Injuries to the ear are generally the result of brutal treatment. Twitching them, nipping and pulling upon them with the blacksmith's pliers, and blows upon the head with cudgels, from the use of the whip, the bite of a dog, or from another horse biting it, sometimes result in troublesome bruises, ulcers and tumors that close the auditory passage.

Deafness may be an organic defect, or it may be the effect of some disease which has disordered the head, and, by sympathy, the auditory nerve; and the sense of hearing is no doubt dulled by old age, even when the horse may have been well used and reasonably free from disease; but it results in most cases from pulling the ears, cutting or clipping either them or the surrounding skin to remedy supposed defects, and from beating upon the head.

Sometimes scabby or mangy eruptions make their appearance upon the tips of the ears and spread downward, covering them entirely; but this is most probably the accompaniment of some skin disease.

Symptoms. The cuts, breaks in the skin, or sutures, that result from pulling, pinching, and twitching are readily discernible, as are also the ulcers or suppurating sores in which they sometimes end. When the tendons which sustain the ear in its upright position are broken, there is no difficulty in perceiving it, as the ear drops down and flaps about with the motions of the head and neck.

Treatment. A simple laceration of the skin, and even of the cartilage, if small, will require no special attention more than to be treated as for a common sore by simple ointment and cleanliness. Remove foreign substances by the use of the forceps.

Sometimes tumors of various shapes and sizes are seen in the ear of the horse, producing a kind of canker in that organ.

Symptoms: Shaking of the head; will not let much familiarity be made with it; running or starting back, when the collar or bridle is being taken up over the ears. *Causes*: Irritation and inflammation of the skin of the ear, producing small pimples of proud flesh. *Treatment*: Removal with the knife, scissors, or caustic; then apply the simple ointment as for a simple sore.

Elbow, Tumor or Capped Elbow. This tumor, which is situated at the back point of the elbow sometimes grows to an enormous size, and it is not only unsightly but greatly interferes with the action of the elbow and its articulation. It is generally caused by a bruise inflicted by the calkins of the shoe while the horse has slept with his legs doubled up under him. Inflammation of the sub-cellular tissue is established, and that condition sets in which gives rise to enlargements by increased deposit near the part. It may be produced also by long heels, as well as calkins, by striking with the shod hind foot, by a blow, and by lying on uneven surfaces.

Symptoms. A slight swelling of the point of the elbow is first perceived, and unless the cause is removed this will gradually develop into a large-sized tumor. When of any considerable size, it will contain serum, or a watery matter, and has a fluctuating feeling to the fingers. This fluid is contained in tough, fibrous walls, and may remain for a long time, or it may at last be absorbed, and leave a hard tumor. At this stage there will of course be no fluctuation.

Treatment. If discovered in its early stage, and serum is evidently present, let it out by opening the sac at the lower edge with a keen knife, or a thumb lancet. Press upon it so as thoroughly to remove the fluid. Then, with a small rubber syringe, inject a mixture of equal parts of pyroligneous acid, linseed oil, and spirits of turpentine. Before the horse is allowed to lie down again, make a soft pad, covered with chamois skin, without a seam on the outer side, of such thickness as to keep the shoe from striking the elbow when the leg is doubled under him, and tie it securely around the pastern. This should be on every night; and even after cure is effected it will be necessary for the animal to wear this pad, to prevent recurrence of the bruise, or else to have the shoe shortened. The pad must be at least two and a half inches thick. If it is in its new state, it can be assuaged, by using frequently at moderate intervals, some cooling lotion. If large, watery, somewhat pendant, and unsightly, have an experienced surgeon remove it entirely, and then dress as an ordinary wound.

If after it has been opened, and the fluid pressed out, it heals with large substance left behind, rub frequently with acetate of mercury until the natural state is restored.

If there is constipation or feverish tendency in the animal, the care of tumors or other local troubles will always be more difficult unless this tendency is removed by suitable purgatives and regulated diet.

Enlargement of the Heart, Hock and Spleen. See respective subjects in this article.

Epilepsy or Fits. Epilepsy consists of a temporary suspension of consciousness. This disease, if properly managed, is not often fatal. It varies in duration. Sometimes a horse will suddenly fall, lose all sensibility and consciousness, exhibit spasmodic contraction of the voluntary muscles, go into convulsions, recover, and get up again in the course of ten minutes; or he may lie on the ground and have a succession of paroxyms, which may last for half an hour or more. If protracted beyond an hour or so, the patient is very apt to die.

The fit is generally brought on by a derangement in the relation between the arterial and venous circulation within the head and a temporary pressure on the brain; in other words, a determination of blood to the head. After the horse has fallen, by his struggles and herculean efforts to battle with the malady, although unconsciously, he soon breaks out into a profuse prespiration. This has the effect of relaxing the capillaries so that the blood circulates more freely and uniformly. An equilibrium of the circulation takes place, and this is the end of epilepsy for the time being. But a horse once having had a fit of this kind must be looked upon with suspicion; for he is liable, when under excitement from wanton punishment, or from exercising great feats of strength in drawing heavy loads, to have a re-attack.

Symptoms. Suppose the horse attached to a vehicle, and traveling along at any given pace. He gives a sudden, snorting, loud noise, and falls to the ground instantly, as if felled by some unknown power. Here he lies, to all appearance, totally unconscious, violently convulsed in every limb, his eyes staring as though they would burst out of their sockets; the mouth foams with saliva, and violent convulsions will sometimes affect the whole frame. Such are the principal symptoms attending this formidable malady.

Treatment. So soon as the horse falls, some hay or straw should be placed under his head and around him. Bathe the region of the cranium with cold water, and carefully wash the foam from his mouth, taking care not to let any water, hay, or dirt enter the nostrils. Never raise the horse on his legs. Let him rest quietly until consciousness returns; then, should he

attempt to get up, help him. When on his legs, deal gently with him. Let the external surface of the body be rubbed until the skin is dry; then administer two ounces of fluid extract of valerian, and let the patient be provided with comfortable quarters. For a few days he should be excused from work, and be fed lightly. The only way to prevent a re-attack is to keep him at light work, and treat him in the most gentle manner, both in the stable and out of it.

Eye, Diseases of the. The construction of the the eye, its general appearance, etc., is fully described in the article on the Eye. It is of paramount importance that the eye of the horse should be clear, sound and strong; and though a most delicate organ it does not receive the care from the master of the horse that it should. The consequence of this is many diseases of the eye and frequent blindness among horses.

Inflammation of the Haw. Hooks is the name by which this disease is frequently known. It consists of inflammation of the membrana nictitans, situated in the corner of the eye, and whose function it is to clean the eye of dirt and dust. The horse cannot use any artifical means of cleansing foreign substances from the eye. Therefore nature has provided him with the haw. When inflammation exists, the membrane swells, and protrudes from the corner of the eye. Quackery frequently sanctions the excision of this important structure, thereby leaving the eye in an impaired condition ever after. This method is most barbarous, and would certainly not be adopted by a person with the slightest knowledge of the injury that the operation inflicts upon the animal. *Treatment:* Take

1 ounce tincture of opium,
10 drops tincture of aconite,
1 pint soft water; mix.

Bathe the eye three or four times each day. The bowels should be relaxed with one-half pint dose of raw linseed oil. The food should consist of bran mashes.

Simple Ophthalmia. This is caused by injuries from some foreign body getting into the eye. A practice commonly indulged in by teamsters, that of slashing the whip around the animal's head, is frequently the cause of the disease; in short, anything which injures the eye and causes inflammation of its membranous investment is termed simple ophthalmia. The eye suddenly closes, the lid swells, the membrane covering the eye is of a whitish color and is very sensitive. *Treatment:* Bleed from the vein under the eye and apply the following wash:

6 drachms tincture of opium,
2 drachms tincture of aconite,
1 pint rain-water;

or,

1 ounce belladonna,
1 pint rain-water.

Use either of these washes three or four times each day. A good plan is to saturate a flat piece of sponge in either of the above lotions and bind it upon the eye. Care, however, should be taken that the sponge does not become dry, as the heat of the sponge may cause more inflammation.

Specific Ophthalmia. This is a constitutional disease affecting the eyes. Its origin has been traced to a variety of causes, and various erroneous opinions have been formed concerning it. Some attribute it to the change of the moon, others to wolf-teeth, sometimes called blend-teeth. Those opinions, however, to the educated mind prove to be nothing more than the superstition of ancient farriery. The most frequent causes to which science has traced the affliction are: filthy stables, unhealthy food, impure air, etc. Upon seeing some of the small, filthy prisons in which animals are confined, we cannot wonder that so sensitive an organ as the eye would be affected. Often the hovels in which horses are compelled to live have low ceilings, close walls, and the putrefying excrement is allowed to remain in the interior until some convenient time for its removal arrives. Probably half a dozen huge pair of lungs inhale the stinted quantity of air inclosed within those walls. The atmosphere becomes hot, the fermenting manure sends forth its ammoniacal odor, which, upon entering the stable, often causes the human eyes to water. Is it, then, any wonder if the horse's eye, being constantly exposed to this contaminated atmosphere, should become diseased? The symptoms are well marked, the eye is tightly closed, copious tears flow from the inflamed organ, the color of the eye is changed to a whitish hue, the pupilary opening is firmly closed, and the animal strongly resents the admission of light upon the eye. Specific ophthalmia comes on periodically, and generally terminates in blindness of one or both eyes. *Treatment:* Open the bowels with the following ball:

1 ounce aloes,
2 drachms ginger,
Honey and molasses sufficient to form ball.

Remove the animal to a dark place. Bleed from vein running under the eye, place a cloth over the eyes saturated with cold water. Bathe the eyes with the following lotion: Tincture of opium, 1 ounce; rain-water, 1 pint; mix and apply four or five times each day. Should the pulse be much increased give upon the tongue every two hours eight or ten drops of tincture of aconite root.

Cataract. Of this there are four kinds. The capsular cataract is indicated by a white spot upon the capsule surrounding the lens. The turbid appearance of the fluid in which the lens floats indicates milky cataract. A speck on the lens is termed a lenticular cataract, and a glistening appearance behind the capsule is termed a spurious cataract. Cataract generally follows specific ophthalmia, and little good can be accomplished by way of treatment.

Gutta Serena. This is known as amaurosis or paralysis of the optic nerve or of its expansion in the retina. Nothing can be noticed upon the eye to cause suspicion, yet the animal is partially or totally blind, and will run against a building or any other object which may come in its way and display the

actions of a blind horse. The best way of detecting the disease is by exposing the eye to different shades of light. When diseased, the pupil remains unchanged, while the sound eye, on exposure to strong light, contracts, and upon removing into a more shady place it expands.

Gutta serena is sometimes called glass eye, incorrectly, however, as the term is understood in the West and South. In glass eye, as understood there, the pupil is sound and perfect, the iris distinct and natural, but has a white ring around the cornea. It may injure the sale of a horse, but simply from the singular expression it gives the eye of the animal.

True gutta serena, or paralysis of the optic nerve, is due to functional and organic disease of the optic nerve. In the early stages of the disease, it may sometimes be relieved, but is likely to occur again. In the latter stages it is incurable. *Causes:* Congestion, tumors, dropsy or other diseases of the brain. Also by injury to the nerve of sight, by pressure or other cause, from inflammation, excess of light, and may be symptomatic, from indigestion or during gestation. *Treatment:* Give the following: Powdered aloes, 1 ½ ounces; ginger ½ ounce; molasses or honey, sufficient to form a ball. Apply a blister behind the eye. The food should consist of bran mashes. No corn should be given.

Impediment in the Lachrymal Gland. The lachrymal ducts of the eyes are small canals leading from the eyes into the nose. When it is closed by inflammation or other temporary cause, the water of the eyes flow over the face as shown in Fig. 58. Occasionally, however, the duct becomes permanently closed. The usual remedy is to swab the nostrils where the duct enters with tobacco water and afterwards with clean water. If this does not effect a cure after two or three trials, the duct must be opened with a probe.

Fig. 58.—*Obstruction of Lachrymal Gland.*

The duct commences by minute openings near the terminations of the upper and lower lids at the inner corner of the eye. It comes out upon the dark skin which lines the commencement of the nostrils, lying on the inner membrane. A delicately thin elastic probe must be used, and about 12 inches long, the horse being cast and securely fastened. It may be necessary to introduce the probe both from the corner of the eye and from the nostrils. Next charge a fine-pointed syringe with tepid water and placing the point into the nasal termination of the duct, force the water through. The operation should only be performed by a surgeon.

Fungoid Tumors in the Substance of the Eye. This is a rare affection, and fortunately so. The causes which produce it are obscure, but probably the same as in any other cancerous affection. The end will probably be death, for the taint of the cancerous affection is probably in the system. Upon close examination, the eye ball may be clear, but a brilliant yellow substance may be seen at the base of the interior.

If it be not deemed best to destroy the animal, the eye must be extirpated. Two knives are required, of a peculiar shape, one of small size and slightly bent to one side; the other larger and curved to one side until it nearly reaches the shape of a semi-circle. A sharp scalpel (the knife ordinarily used in surgical operations) will also be required. Two straight, triangular pointed needles threaded with strong waxed twine, a curved needle, similarly threaded, water, a sponge, lint, injecting tube and bellows. Cast the horse and fasten him so that he cannot move. Pierce each eyelid with one of the straight needles and tie secure for raising and holding the lids as shown in the cut.

Fig. 59.—*Extirpation of the Eye.*

Let an assistant then hold the lids wide open. The surgeon with the straight knife quickly discribes a circle around the globe of the eye, severing completely the conjunctive mucous membrane of the eye. He then takes a small curved blade and passing it through the divided comjunctiva it is carried around the eyeball close to the bone, severing the levator and depressor muscles. The cornea is then pierced with the curved needle, in and out, the thread drawn and a loop fixed. Then the eye being drawn out as far as possible the curved knife is passed around the rear of the eye with a sawing motion, the integuments are severed, and the eye is drawn forth.

It is quickly done when all things are ready, but should not be attempted except by a competent surgeon. Some bleeding will follow. Inject cold water: if this does not check the hemorrhage, force cold air into the cavity with the bellows. If this does not avail, plug the cavity softly with lint, bandage the wound to secure the dressing, and leave the result to the natural process of healing. If the animal loses his eye and is a valuable animal, and the farmer desires to preserve his appearance, he can purchase an artificial eye, Fig. 60 which greatly adds to the animal's appearance, and is in common use among horsemen.

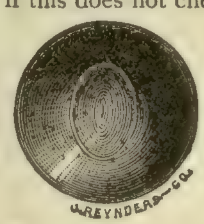


Fig. 60.—*Artificial Eye.*

Worms in the Eye. These sometimes, but rarely appear and may be extracted by a skillful puncture. It should be undertaken only by a competent veterinary

or other surgeon, the horse first being securely hampered so he cannot struggle. Insert a seton three inches under the eye with needle.

Sore Eyes. In the beginning of more serious diseases, soreness of the lids of the eyes is common. It is also produced by irritation of various kinds. In inflammation of the eyes, soreness of the lids is always present. If from other disease, it is sympathetic, and will pass away with the disease itself. There is one form, however, that is characterized by a redness, swelling and itching, the edges becoming raw and exuding matter. This must have specific treatment. *Treatment:* The horse should have a laxative dose, if the bowels are not in a natural state. The following will be indicated:

1 drachm flowers of sulphur,
2 drachms powdered mandrake,
3 drachms powdered aloes,
1 drachm cream tartar.

Form this into a ball with honey and give as a dose.

In aggravated cases that will not yield to treatment, and that remain raw and exude matter, the edges should be carefully touched with mercurial ointment, the utmost care being taken that it does not come in contact with the eye.

During the whole treatment the horse must be tied up by two lines to the rear post of the stall, so he cannot rub the eyes, and must be fed from a nose bag. Wash them with 3 grains sulphate zinc to 1 ounce water.

Weak Eyes. Very many persons, otherwise well informed, when from any cause the eyes of horses become weak, inflamed, watery, or drop tears, suppose the cause to be from the natural weakness of the sight. So "blind teeth" are supposed to cause serious trouble, and even blindness in horses. Nothing could be further from the truth. It is exceedingly rare that horses have naturally weak eyes; it can almost always be traced to some local cause. Thus, watering of the eyes is caused by a stoppage of the lachrymal ducts leading from the eyes into the nostrils, the natural channels for carrying off the superabundant moisture of the eye. Inflammation of the eyes is not uncommon from a turning in of the eye-lashes. The remedy is to snip them off with the scissors.

"Blind teeth," or "wolf teeth," as the immature supernumerary tushes are called, do no injury whatever. If it is feared they may, it is easy to take them out with a pair of forceps, or to knock them out with a punch and hammer.

Occasionally a supernumerary tooth is found growing in the upper jaw, between the first and second teeth, and lapping over both of them. This is considered by many persons as producing inflammation of the eyes. It is true that if pain results, the eyes may be affected by sympathy. This tooth should always be removed, and may be done with a strong pair of forceps. It may cause distress from pain in the jaw; nothing more. They occasionally press upon the nerve of the eye, producing inflammation.

FIG. 61.—*Seton Needle.*

Colts are often subject to inflammation of the eyes in a slight degree during teething. Examine the teeth, lance the gums and the eyes will recover. It is a case of sympathy.

Foreign Bodies within the Eyelids. When foreign bodies, such as small particles of hay or dirt, get within the eyelids, they create great pain, and if allowed to remain there produce a very grave form of disease, often ending in disorganization and total blindness. Should anything of the kind be discovered it may be removed by raising the upper or depressing the lower lids; then introduce and explore the eyeball by means of a camel's-hair pencil, to which the foreign body will usually adhere, when it is easily brought away. The parts should then be sponged with lukewarm water. After the lapse of a few hours, should the membranes of the eye and lids appear much reddened, use the following: Rose water, 4 ounces; fluid extract of gelseminum, 2 drachms. Put the patient on a diet of sloppy bran mash, and place him where the rays of sunlight shall not affect the eye.

FARCY: see Glanders in this article.

FEVER, OR GENERAL INFLAMMATION. When from any cause injury is done to any part of the frame, or inflammatory action is set up either in the tissues, membranes, or any of the organs of the body, heat is produced, and this is fever. This often becomes general from sympathy, thus in a measure relieving the pressure on the more closely affected parts. Fever is not the disease itself, but the result of disorganization; a symptom of disease or internal disorder; in fact, an abnormal symptom arising from sympathy of the system with disease in the animal economy. Remove the cause and the fever will cease. We may do something to alleviate it in connection with the treatment of the disease itself, but we must not lose sight of the latter.

In intermittent fevers there is a cold stage, a hot stage and a sweating stage. These may vary in succession and degree, but the real difficulty is in a morbid state of the viscera, but particularly of the liver and organs employed in the formation of bile, and of the mesentery. In fevers the tongue is coated. But no quack is so ignorant as to suppose the fever can be cured by scraping the tongue, and yet this is fully as sensible as to suppose fever to be the disease itself, when it is an effect of disease. A rational system of veterinary medicine contemplates, in the treatment of febrile symptoms, nothing more than a kind of expectancy.

If the patient be in the cold stage, administer warm diffusible stimulants and diaphoretics, aided by

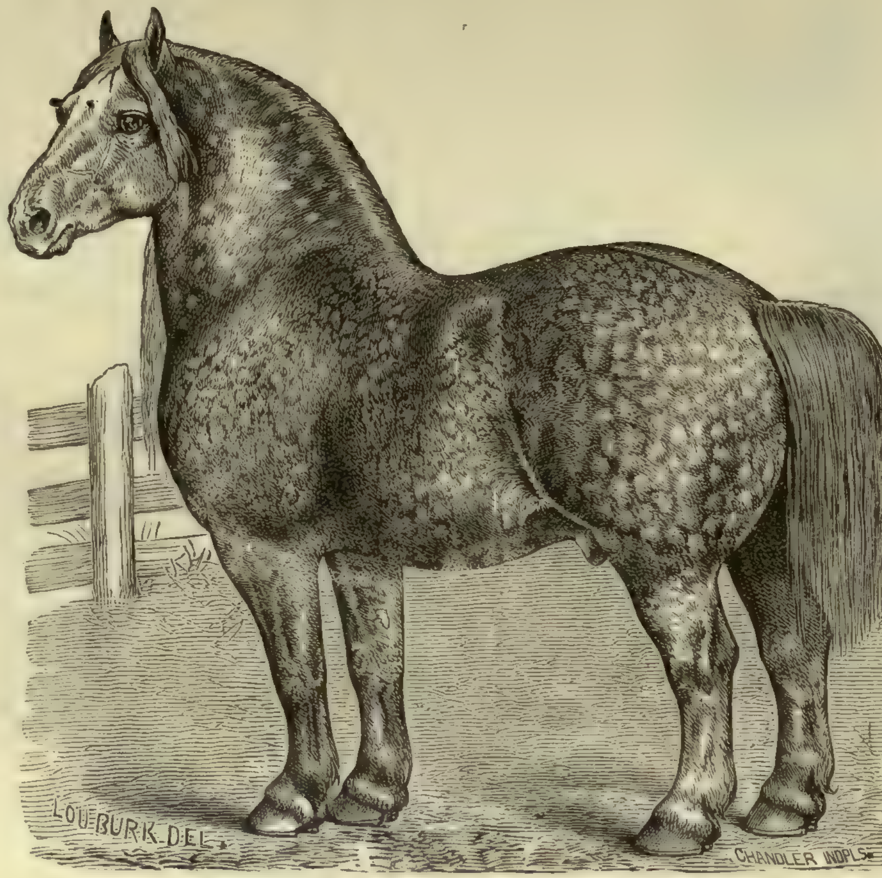


Fig. 62.—NORMAN STALLION, NOGEANT.

warmth and moisture externally; friction on the extremities, and if necessary, stimulating applications to the chests and the extremities. In the hot stage, and when the superficial heat of the body is great, cooling drinks are indicated; water acidulated with cream of tartar makes a good febrifuge.

The patient may be occasionally sponged with weak saleratus water. The alkali has a beneficial effect on the cutaneous vessels, while the water lessens the temperature of the body. No treatment, however, can be of any rational use unless it contemplates a restoration of the healthy equilibrium of the whole system. Let the doctor treat the *disease* and a good attentive groom can manage the fever.

FIRING. This subject is very fully treated on page 462.

FISTULA OF THE FOOT is treated under the head of Quittor on page 800.

FISTULOUS WITHERS is similar to poll-evil, the location only changing; is caused in like manner by bruises. In the case of fistula, these bruises may be caused by a bad fitting collar; by a lady's saddle, particularly if awkwardly ridden; by the pressing forward of a man's saddle, especially in case of high withers; by striking the withers against the top of a low door-way; by rolling and striking the withers against some hard substance; by the biting of another horse and by a blow of a blacksmith's hammer.

Symptoms. The first indication will be a swelling on one or both sides of the withers, generally rather broad and flat. Upon examination with the fingers this will be found hot, tender and apparently deep-seated. If observed when first formed, it will be of uniform hardness throughout; if unattended to while in this state the tumor soon becomes an abscess; and owing to the difficulty in the way of the matter's escaping (its natural outlet being at the top of the shoulder), the pus sinks downward and the abscess sometimes becomes enormous before there is any well defined head, and before there is any opening. When it breaks, or is opened, a large quantity of extremely offensive matter flows out. When the discharge has begun the tumor does not begin to grow healthy and heal, but the walls of the opening thicken and continue to discharge matter, which becomes more and more offensive. The matter burrows between the shoulder blades and spinal points and everything around seems to be rotting away; and it is both difficult and dangerous to trace the opening. In process of time several holes will appear along the course of the muscles in contact with original abscess, and from each issues a foul discharge, till the ulcerating process seems to extend itself to nearly all the muscles of the shoulder.

The health of the animal may at first be excellent, and there may be no lameness; but as the inflammation extends, there is lameness of the shoulder and he suffers generally often greater. He is averse to motion and will suffer for food and drink rather than undergo the pain of trying to reach and partake of it. In its worst stages the bones extending into the sinuses decay.

Treatment. Be careful to ascertain, in the first place, whether the tumor has newly risen. The matter may form in one, even while it is quite small; and it is important to know when the knife may be used to advantage.

If matter has already formed, it can be detected by the somewhat soft and fluctuating feeling of the abscess.

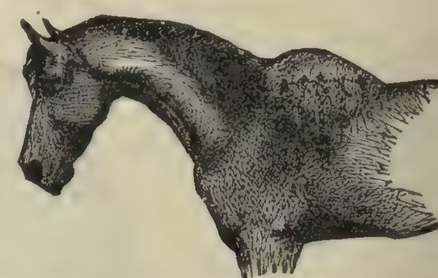


Fig. 63.—*Slight Enlargement which may end in Fistulous Withers.*

If discovered while a new formation, take the horse from work, if possible; if not, take especial pains to protect the injured point or points from pressure. A bruise at that point of the withers where the collar rests will not unfit a horse for the saddle unless considerable inflammation and extending soreness have already set in; nor will a saddle bruise farther back on the withers necessarily unfit him for harness.

A recent swelling should be immediately treated with liniment recommended for poll-evil; this will scatter the worst of cases if used in time.

When the tumor begins to soften and shows signs of heading, have a suitable, fine-pointed, sharp knife. (See Abscess Lancet, Fig. 56.) Ascertain the lowest point of the abscess. Then stand close to his side, near the middle, to avoid both hind and fore feet in case of kicking or striking, with the back of the knife to the shoulder; point upward and outward, stick at the lower edge, and cut open with a free incision. Next, syringe the abscess till it is as thoroughly cleansed as possible with a solution of carbolic acid and water, one part acid to two of water. After two or three days, the wound should be thoroughly cleansed by syringing with warm soap-suds; then use the carbolic acid water and salve dressing; and so on till a cure is effected.

Fig. 64.—*Fistulous Withers—Worst Stage.*

The patient should in every case be turned out to grass, as lowering the head causes the matter to

flow freely and the exercise taken,—all has a tendency to facilitate a cure.

When the case has become chronic, and holes in considerable number have appeared, make a cut so as to reach the bones, and to include in its course as many holes as practical. If there are other openings (particularly below) cut from them into the main incision. Have an assistant to press back the sides of the greater opening till the matter is cleared out; and if the spinous process or points are found to be carious or rotten, nip off with a pair of bone forceps till the healthy bone is left; the wound will inevitably matter and break through again, though it may for a time appear to have healed. After thus cleaning out the bulk of the matter and picking out the bone, use the syringe and warm soap-suds still further to clean the parts; then inject the carbolic solution as previously directed. But instead of coal oil, use this ointment once a day:

½ ounce litharge,
½ ounce copperas,
1 ounce turpentine,
1 drachm carbolic acid.
Mix with ½ pint hog's lard.

The copperas must be finely powdered; then mix thoroughly. When a kind of thick, whitish discharge is observed to have set in, discontinue the ointment; but still wash or syringe thoroughly at intervals, with warm soap-suds. To keep away flies cover the wound after each dressing with a large cloth saturated with oil or tar, and arnica, equal parts.

Should the horse grow feverish from the effects of blood-poisoning, which takes place in a greater or less degree in this chronic stage, by reason of absorption, give an alterative or tonic composed of

½ ounce sulphur,
2 drachms bloodroot,
¼ ounce golden seal,
¼ ounce hyposulphite soda,

three times a day in bran or cut feed.

In very desperate cases it is sometimes best, or indeed almost indispensable, to use the rowel.

The pipes (or sinuses, as they are sometimes called), the openings whence the matter exudes, take a dangerous direction, and tend from the withers to the chest. Use an elastic probe to ascertain the direction and the depth, and if it is found that cutting will not answer, use the guarded seton or rowel needle.

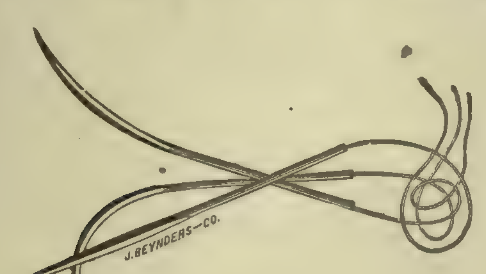


FIG. 65.—*Setons.*

Insert it as far as it will go, and then give it a firm rap on the handle, so as to force out the cutting edge and drive the point through the flesh. Knot one end of a long, slender tape, place the other through the opening near the point of the needle and draw it through. Then tie a knot at the other end, and leave it. In this way the sinus will have an opening below, and the tape will act as a drain, while tending also by friction to remove the hard-lining of the pipe. As soon as a healthy-looking matter is seen to be issuing from the lower orifice, remove the seton, but cleanse occasionally with warm soap and water. Anoint the tape daily with

2 ounces verdigris,
1 drachm red precipitate
1 drachm arsenic,
1 drachm alum,
1 drachm corrosive sublimate,
¼ pint of hog's lard; mix.

When the party has neither the ability nor boldness to either cut or rowel for either poll evil or fistula, or where the sinuses or tubes run deep, so that it is both dangerous and difficult to search for them, a very effectual remedy is to take

1 pint of strong vinegar,
½ ounce of litharge,
2 ounces muriatic acid,
½ ounce corrosive sublimate.
Finely pulverize and mix.

Take a metallic syringe with a long pipe, inject a small portion of this mixture to the bottom of the tubes, twice a week, until well. Do not let the animal get wet while using this mixture.

FISTULA OF THE PAROTID DUCT. The parotid duct, which is formed by a union of the smaller ducts of the parotid gland, enters the mouth after it leaves the gland, in front of the large masseter muscle of the cheeks—having passed for some distance upon the inner side of the jaw, and then turned under the lower border of the bone. The saliva secreted by the parotid gland, which lies at the spot where the neck joins the jaw, is poured into the mouth by the parotid duct, to be mingled with the food during the process of mastication. If the mouth of this little tube is closed in any way, so as to prevent the free egress of the saliva, distension of the duct takes place, and the confined secretion causes suffering, inflammation and finally rupture. This stoppage is sometimes caused by hay-seeds or other particles of food that enter the mouth of the channel while the animal is feeding. The presence of food in the mouth and the motion of the jaw stimulate the action of the gland, and since the saliva thus secreted cannot escape by its natural opening, there is constantly more and more pressure until some outlet is found. This, as we have said, may be by bursting, or it may be by external accident. A wound inflicted on the jaw by any pointed instrument, as a hay-fork, has been known to penetrate the channel. The saliva thereupon pours through the opening, and by its constant flow it prevents the healing of the wound,

so that its edges speedily become hard and without that liveliness essential to the closing of punctured or gashed flesh.

Symptoms. The digestion becomes deranged when the process of mastication is carried on for any considerable length of time without the foods being moistened by that secretion which the parotid duct in a healthy condition furnishes; but the orifice in the skin, under the jaw, or on the cheek at the large muscle, discharging a liquid somewhat resembling the white of an egg, is the unmistakable indication of the disorder under consideration. During the act of feeding, this fluid is freely discharged, even sometimes squirting from the wound, and especially so if the food is dry and hard to chew. It will be noticed that in chewing the horse uses the opposite side of the mouth from that on which the opening occurs, and that the process is slow and difficult. The edges of the wound soon become callous, the running of the stream down the cheek destroys the hair, and the whole part has a filthy and fistulous appearance.

Treatment. In the first place, especial care must be taken to keep the animal during the period required for effecting a cure, upon food that requires no chewing.

It should be sufficiently plentiful and nutritious to prevent the uneasiness of hunger. Soft mashes and gruels alone should constitute the diet. All the treatment necessary is an injection of 1 drachm carbolic acid with 1 pint water. Put a seton through the duct.

FLATULENT COLIC. See page 754.

FOOT, INFLAMMATION AND ULCERATION OF THE. It is thought that a rheumatic constitution predisposes an animal to this disease. Certain it is, that highly organized and weak-limbed animals most usually suffer from it, probably from the fact that they are not able to withstand an injury that a stronger-limbed animal would do, especially when carrying a bad-fitting shoe, or subject to violent exertion or overstrain of any kind. Another very common cause is grain founder. The most common cause is overheating the animal and allowing him to cool off too suddenly, causing what is generally called founder, but in fact is inflammation of the laminæ of the foot. Heat is always present in the inflammatory stage.

Symptoms. The foot will feel hot, the toe will be pointed, in the stable, eight or ten inches before the other, and with the heel slightly raised. The animal will be observed to step short, and on the toe, with liability to stumble when first taken out of the stable. This will disappear as the animal gets warm, but return as soon as he is cool. By bending the foot back and pressing with the thumb in the hollow of the heel on either side of the flexor tendon with considerable force, it will cause intense pain. These are all characteristic tests.

Treatment. If the injury is new, the first thing to be done is to reduce the inflammation. Do this with cold-water applications or any of the remedies advised for ring-bone, spavin, or other inflammation. Give in laxative doses, 4 drachms of aloes; have the shoes taken off and let the horse stand during the day-time in pure, wet clay up to the top of the hoof, and at night poultice the foot. If there is much inflammation, bleed the arteries above the coronet. Keep the horse perfectly quiet, and if he has a fast pulse give an ounce of saltpeter in the drinking water night and morning. At the end of two weeks, or sooner if the inflammation is gone, blister the coronet all around. Or, use the following:

1 ounce camphor gum,
1 ounce corrosive sublimate,
1 pint oil turpentine.

Grind the sublimate thoroughly in a mortar, and put into a strong bottle; pour on the turpentine and shake occasionally. It should be fit for use in from 20 to 30 hours. This is to be applied every other day to the heel and bottom of the foot, first paring away all scaly, ragged parts with instruments in cut shown by Fig. 66.

FIG. 66.—*Drawing Knives.*

Anoint the external walls of the hoof with equal parts of coal oil and honey, or fish oil. Heat it in with a hot iron.

FOOT. The following small items on different diseases and accidents of the foot, not treated elsewhere, we insert here:

Nail in the Foot. Pull out the nail and enlarge the opening to allow escape of matter, but do not make the opening larger than the head of a nail. Then poultice the foot during a day or two with equal parts of flaxseed meal and bran, after which tack on a light shoe with a couple of nails loosely. Apply once or twice daily in the wound a portion of tincture of iron, and cover the hoof with a light bandage to prevent dirt from clogging up the wound. The horse should be kept in a shaded, cool place on earth floor, and be fed on loosening mashes and cut grass instead of hay. Give him water at least twice daily from a bucket.

Dry Rot. Keep the animal on a clean floor, and occasionally remove all decayed horn without injuring the vital parts. This, together with frequent applications of tar, will be all that is needed.

Cracked Heels. Apply a poultice made of linseed meal 1 pint; bran, 3 pints; sugar of lead, 2 drachms; hot water, a sufficient quantity to each of the affected parts, and continue this treatment for four days, changing the poultice once every 12 hours. After the poulticing has been got through with, the following lotion may be applied to the parts every night and

morning: Sulphate zinc, 1 ounce; glycerine, 4 ounces; water, 12 ounces; mix. The horse should have freedom from work until the wounds in the heels are thoroughly healed.

Brittle Hoofs. Equal parts of pine tar and fish oil make an excellent application for brittle hoofs. It may be applied with a brush once or twice a day.

Split Hoof. Put in wood screws and join the parts or walls of the hoofs together so they will not work or move (open and shut) as the horse travels, and then, as new hoof forms above, it will remain whole, and when it grows off—which will be in about one year—he will have a smooth, sound hoof.

FOUL SHEATH. A horse with a foul sheath is a misfortune to his master, unless the difficulty occurred before purchase.

Treatment. Clean the sheath of all foul matter with warm soap-suds, removing all lumps. To wash the sheath, take hold of the yard when protruded, and without undue violence hold it with gentle pulling until there be no resistance, when it may be pulled out its entire length. When washed, oil thoroughly with lard. Every other day or every three days wash again.

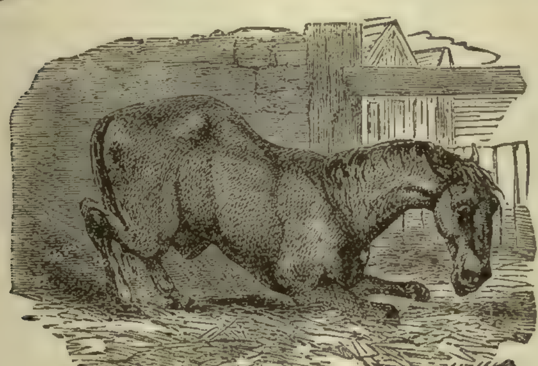


FIG. 67.—*Position Assumed by Horse Suffering from Grain Founder.*

FOUNDER, CHEST, OR WATER FOUNDER. Nine times out of ten, in this case, the trouble will be found in the feet. When it is not soreness of the muscles from hard work, it is rheumatism in its acute form. It may be brought on by suddenly allowing the horse to become chilled after heating, giving large drafts of cold water when warm, or driving him into cold water up to his belly when heated.

Symptoms. The horse is dull; his coat may be staring; he is stiff and moves unwillingly. Sometimes the soreness extends to the limbs; there is fever in the parts affected, also sometimes profuse sweating and heaving at the flanks but the legs will remain warm.

Treatment. Clothe the horse warmly, and put him where he may be kept so. If the animal is fat, and full of blood, if there is evident determination of blood, give 20 drops of aconite, in a little water, three times a day.

FOUNDER, GRAIN, OR GORGED STOMACH. Gorged stomach is usually the result of overfeeding, by which means the stomach becomes overtaxed in its function, or overburdened in its capacity. When engorgement of the stomach occurs, and is associated with flatulency, the sufferings are doubly severe, because then the intestines are also the seat of distension, and the pain from that alone is sometimes terrific.

Treatment. The bowels should be immediately relieved by removing the contents with repeated injections of warm water. Let the animal be gently walked about, and warmly clothed in cold weather. If discovered early, or before colic sets in, give the following to evacuate the bowels after having relieved them by injections:

6 drachms golden seal;
6 drachms powdered aloes;
1 ounce syrup of buckthorn;
1 ounce tincture of ginger;
1 ounce tincture capsicum;
1 ounce common salt;
½ ounce hyposulphite soda.

Give in a pint of warm water, and repeat every half hour.

Or administer the following drench:

1 ounce extract of ginger,
2 ounces fluid extract of golden seal
2 drachms hyposulphite of soda,
4 ounces water.

The dangers to be apprehended in cases of this character are either rupture of the intestines or diaphragm. In either case, death is sure and certain. Sometimes, however, neither of these ruptures occurs; then the distended intestines exert such pressure on the diaphragm and organs of respiration that the animal dies of suffocation and loss of pulse. When, therefore, it becomes impossible for the patient to swallow medicine, in a case of this character, recourse must be had to the trocar and canula, in view of liberating the imprisoned gas. The lack of a little knowledge on this subject has been the cause of the loss of very many valuable horses.

FOUNDER, FOOT; LAMINITIS. This is an inflammation of the sensitive laminæ or inner portion of the foot. It is one of the most painful maladies to which this noble animal is subject. The cartilaginous portion of the foot being enclosed in a horny and inelastic case, becomes greatly inflamed. Thus the secreting portion, which is highly vascular when inflamed, and swollen and compressed within the horny wall, is rendered acutely painful. Horses with hard, brittle hoofs are most liable to this disease. Man enslaves the mute creature with a selfish view of bettering his own condition, yet as long as the quadruped moves soundly, no thought is taken for the prevention of the diseases to which he is liable. Animals are allowed to stand upon dry floors, and worked upon dry roads, without any consideration being made for the moisture which the hoof requires to keep it in a healthy condition. The causes of laminitis are: Driving far and fast upon hard roads, watering while sweating, and stand ing in a draught of air while warm. So it may be brought about by other diseases, as inflammation of the lungs, especially when the feet are prepared for its reception, by allowing them to become dry for want of the

necessary moisture. Heavy fast horses are especially predisposed to founder, and so are those with small and deformed or large, flat feet.

Symptoms. There will be general fever and stiffness and soreness; there may or may not be shivering.

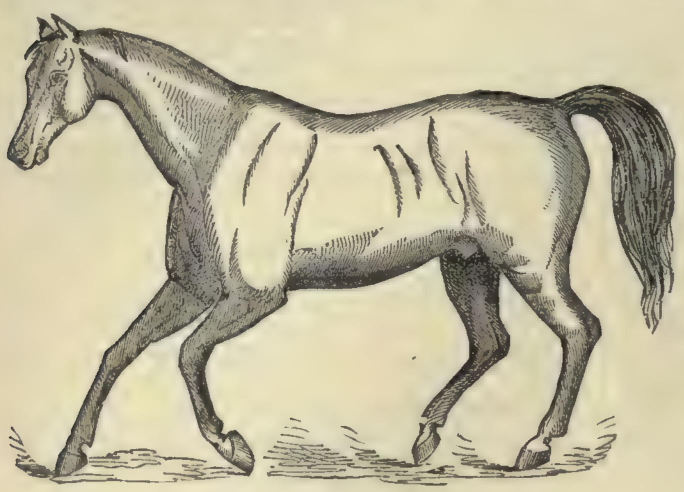


FIG. 68.—*A Foundered or Dead Lame Horse.*

Soon extreme tenderness of the feet follows, generally most severe in the forward part, but soon in the heel; the pulse is strong, full and rapid; the breathing quickened with dilated nostrils; the intensity of the pain will often cause the animal to groan and to break out into a sweat. If pushed backward the horse will elevate the toes and throw his weight on the heels by a peculiar motion. The hoof and frog will be hot and very sensitive to pressure, and the arteries of the pasterns will beat with violence.

When the inflammation is in the hind feet, which is very seldom, the fore feet are carried as far under the body as possible to support the weight, while the hind feet are thrown forward to bring the weight upon the heels. In either case, the animal will often lie stretched out for hours to relieve the intense pain of the feet.

Founder has sometimes been mistaken for a disease called myositis, an inflammation of the muscles of the limbs, especially of the hind quarters and loins. They should never be so mistaken, as an observation of the several symptoms will show. In founder, first one foot and then the other is lifted from the ground. Lying down lessens the pain and the fever of the feet, and the difficulty usually occurs in the fore feet. In myositis, both feet are kept on the ground with refusal to move either. The animal will not lie down, and if thrown down the pain is increased and the disease is generally in the hind quarters.

In many cases the symptoms are not so aggravated as we have shown, but the symptoms, whether one or more of the feet are affected, are the same, and often, especially when repeated attacks have been suffered, leave the animal with seedy toe, pumiced feet, corrugated and otherwise distorted hoofs, and always more or less liable to recurrence of stiff spells during life.

Treatment. In light cases, when discovered early, clothe the animal warmly, give twenty drops tincture of aconite every two hours preceded by a gentle laxative, say:

2 drachms cream tartar,
2 to 3 drachms powdered aloes;
1 ounce bicarbonate of soda;
1 quart linseed oil.

Mix in a pint of water and give as a drench. If there is severe pain give ounce doses of laudanum every hour until an effect is produced.

As an application to the feet keep them in large warm poultices of linseed meal and water, or let the feet be placed in water kept as hot as the animal can bear. Put him in slings by all means, if they can be procured. Have the shoes carefully taken off as soon as the sedatives given will allow him to bear the pain. As early as possible the animal should be bled in the veins above the coronet of the affected feet. The bleeding will be assisted by the feet being placed in hot water, and for this reason, if for no other, the slings should be used as quickly as possible.

If at the end of two days the fever and tenderness does not get better pare down the soles and open them at the toe to let out any watery matter that may exist, for fear the horn may separate from the quick, keeping on the poultices afterwards as before. When the inflammation subsides blister the pasterns and apply corrosive liniment to the soles of the feet, and keep the horse standing on soft clay, or if in summer time turn him into a moist, soft pasture.

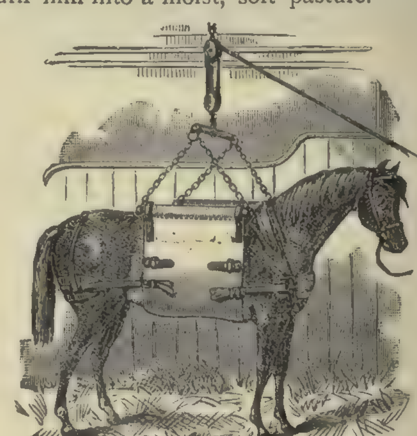
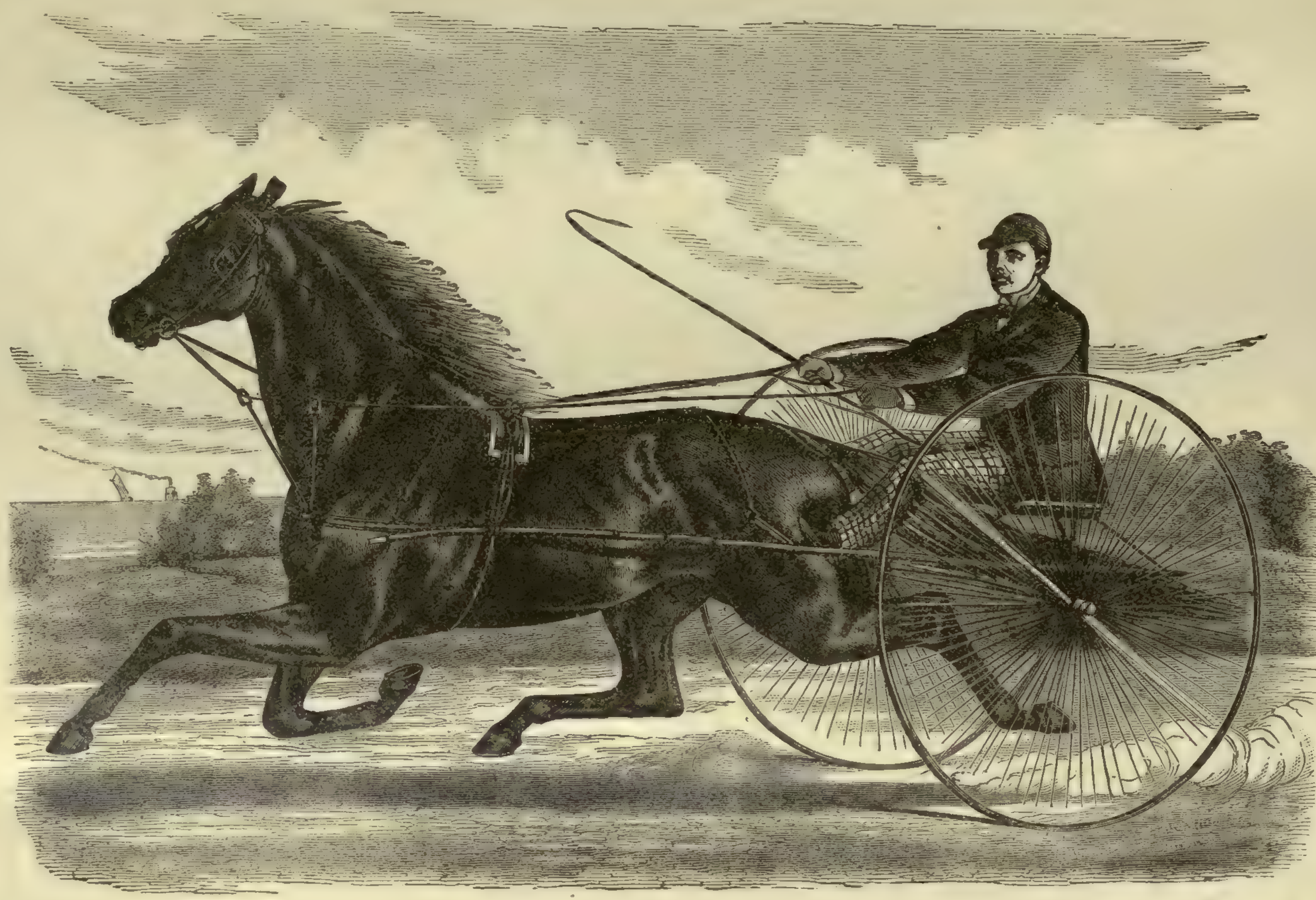


FIG. 69.—*Slings.*

FROG, INJURIES OF THE. The frog of the horse's foot is especially liable to injury from being bruised on projecting stones or pierced by nails and splinters. It is also liable to inflammation of the secreting membrane, resulting in the formation of matter, and to canker.

Treatment. In all bruises with soreness pare away



GOVERNOR SPRAGUE.

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the frog carefully until the difficulty is found. If bruised, treat it by using the liniment recommended for navicular diseases. If pierced with some sharp substance, extract it and inject tincture of aloes and myrrh. If the difficulty be thrush, caused by exposure to wet and filth, bruise of the frog, hard substances lodged in the cleft, or other cause, there will be soreness of the skin behind the cleft of the frog, and bad-smelling discharges from the cleft, with more or less lameness. Wash the affected parts thoroughly; cut away all ragged surfaces and press into the cleft of the wound Venice turpentine.

FROST BITE. The results of frost bites may appropriately be termed chilblains, which again gives rise to extreme swellings of the heels and back parts of the hind legs, until finally the skin gives way, terminating in sores and ulcers that may at once be taken for scratches. Injury from the effects of frost is more common in the North and West than is generally supposed, and in many cases rheumatism, founder, and other stiff complaints, may be attributed to this as the predisposing cause.

The causes of frost bites are long exposure to cold, either standing in the open air or confined in cold stables; standing in half-melted snow and slush; keeping young animals in exposed yards, where they cannot take sufficient exercise and without sufficient food.

Symptoms. The skin of the injured parts, in light cases, turns purple, cracks and exudes a bloody serum; or if severe, the skin and tissues beneath lose color and become dead and eventually shrivel. The skin, especially of the heel, will crack, often from one side to the other, refusing to heal.

Treatment. If the limbs are simply chilled, friction will be all that will be necessary. If actually frozen the animal should be warmly clothed and the frozen parts rubbed with snow until circulation is partly restored. Then put the parts in cold water and continue rubbing until warmth and circulation are entirely restored. Then dry thoroughly with cloths and hard rubbing. If the frosting has been neglected and raw sores make their appearance, prepare the following: Equal parts of lime, water and linseed oil; rub the whole thoroughly together and apply twice a day to the raw or ulcerated places.

GASTRITIS, OR INFLAMMATION OF THE STOMACH. Acute inflammation of the stomach very seldom, and we might very safely say never, occurs among horses as a spontaneous affection. Any thing which impairs the digestive functions may produce this disease. It is usually occasioned by irritating medicines or poisons.

Symptoms. There is a dry cough; the membrane of the mouth and nostrils are dry and pale; the breath is tainted; the evacuations smell badly; the eyes are sunk, the coat dry and ragged; the horse loses condition and becomes pot-bellied; the anus is lax and prominent. The ordinary food will be refused and the animal will persist in eating foreign substances —old lime mortar, the wood-work of the stable, earth, litter and bedding.

Treatment. To cure will take time. Prevent the animal from indulging its unnatural appetite. The following will be indicated:

½ ounce sulphur,
½ drachm bloodroot,
1 drachm gentian,
4 drachms poplar bark,
1 drachm cream tartar.

Give three times a day in food.

If the animal has simply chronic indigestion—that is, if the disease does not show in the severe form we have depicted, to improve the general health the following will be indicated:

1 ounce powdered assafœtida,
1 ounce powdered golden seal,
2 ounces powdered ginger,
2 ounces powdered poplar bark,
5 drachms powdered sulphate of iron,
1 drachm powdered red pepper,
1 pound of oatmeal.

Mix, divide into sixteen messes, and give one every night in the food. By the time the mixture is used the general health of the animal will be improved.

GLANDERS AND FARCY. We here treat glanders and farcy both under one head, as they always should be. They are one and the same disease in different stages—or differently located, and manifested by somewhat different symptoms. For the benefit of a few "quacks" who are a disgrace to the veterinary profession, and who will, in the face of all the facts to the contrary, maintain that farcy is a separate disease from glanders, and basing their reasons entirely on what they choose to call "farcy buds," we will say: Those lumps are nothing more than ulcerated lymphatic glands, caused by the virus in the system; and while it is a fact well known to the true veterinarian that those buds or lumps are not always present in glanders, they are never found except where glanders is present. Where they are found they require no special treatment, as they are the effect, and not, as ignorantly supposed, the cause.

There can be no better evidence put forward to prove our former statement correct, as regards the identity of these two diseases, than the following well established fact, which has been demonstrated time and again beyond all doubt. If you take some of the virus from the ulcer of a farcy horse and inoculate a sound one, the subject thus inoculated will, in a few days, become thoroughly glandered; and, vice versa, if you take the matter of a horse afflicted with the glanders and inoculate a sound horse with the virus, the victim will in due time have what is termed farcy, in its most malignant form. With such facts before us, and, at the same time, with a full understanding of the highly contagious and infectious nature of this loathsome and incurable disease, we have no hesitation in condemning all animals found afflicted either with glanders or farcy; they should be destroyed forthwith.

Glanders seems to be primarily a disease of the lymphatic and nasal glands, and confined to them in the early stages; but the more advanced stage is an inflammation and ulceration of the absorbent vessels of the entire system, and this stage is usually termed by veterinarians farcy. The disease is contagious

only by inoculation and not inhalation, but it is doubtless due far more frequently to predisposing causes than to contagion. It is found as a prevalent disease where neglect, filth, and foul atmosphere exist; and we may reasonably conclude that poisonous inhalations, acting upon the delicate and easily irritated membrane of the nose, produce that incipient ulceration from which the subsequent general poisoning proceeds. In close stalls, the carbonic acid given off from the lungs (which gas is of a deadly poisonous character), passes again and again into the lungs, mixed with other impurities of the stall itself; this acting perhaps more readily upon the nasal membrane than upon the other linings of the air passages, produces inflammation. This inflammation may long exist, and unsuspected by the ordinary observer, till some intense action is set up, when ulceration takes place. Or it may be produced by anything that injures and weakens the vital energy of the membrane, as violent catarrh, accompanied by long continued discharge from the nostrils, a fracture of the bone of the nose, and the too frequent injections of stimulating and acid substances up the nostrils. Everything that weakens the constitution, may, under peculiar circumstances, produce glanders.

It must be observed that its infectious nature is not general, but particular, depending upon inoculation with the matter exuded from glanderous ulcers, or at least from poison received in some way from the glandered animal and communicated directly to a wound or to some delicate membrane of another horse, an ass, or a human being. In the first stage the discharge so much resembles that which attends some other nasal affection as sometimes to pass unnoticed; but examination will disclose a curious fact which has not been accounted for: It will be confined to one nostril, and that, in the vast majority of cases, the left. Occasionally it is the right, very seldom both. This, however, must not be regarded as a peculiarity of the first only, as it is common to every stage of the disease. The second stage is characterized by an increased flow, and it also becomes more mucous and sticky, while its color changes from an almost transparent clearness to an opaque whitish or yellowish tinge.

It often begins now to drip from the nose in stringy clots. Some of the matter in this stage, now more actively poisonous, being taken up by absorbents, affects the neighboring glands. If both nostrils are discharging, the glands within the under jaw will be enlarged on both sides; if from one nostril, only the gland on that side. As other diseases will produce these swelled glands, as catarrh, for instance, it becomes necessary to look for some peculiarity in order to determine certainly as to the existence of glanders.

At first the enlargement may be spread over so much surface as not to make any distinctly marked lumps; but this season changes, and one or two small swellings remain, and these are not in the center of the channel, but adhere close to the jaw on the affected side.

The absorbents become more and more involved; it seems now that general ulceration has set in, and the additional symptoms are henceforth those of farcy.

To prevent its being mistaken in its earlier stages for strangles, or distemper, which is sometimes done, the following directions will suffice: The first positive indication of glanders, is ulceration of the membrane lining the nostrils. Unless this is present, there need be no fears; but if this is present, accompanied with discharge and matter streaked with blood and smells bad, the worst may be expected. Strangles is peculiar to young horses, and at the outset resembles cold with some fever and sore throat, accompanied generally by distressing cough and some wheezing. The enlargement which sometimes appears beneath the jaw in strangles is not a single small gland, but a swelling of the whole substance between the jaws, growing harder toward the center, and at length, if the disease runs on, breaking. In strangles the membranes of the nose will be very red, and the discharge from the nostrils profuse and mattery almost from the first. When the tumor has burst, the fever will abate and the horse will speedily get well.

To distinguish it from catarrh or cold, for which also it is sometimes mistaken, observe that fever, loss of appetite, coughing, and sore throat all accompany catarrh, whereas these symptoms are rarely if ever found together in glanders. In catarrh, the horse quids his food (drops it from his mouth partially chewed), and gulps his water. The discharge from the nose is profuse and sometimes mattery; the glands under the jaw, if swollen, are movable, while there is a thickening around them, and they are hot and tender.

Treatment. The contagious character of glanders renders it dangerous, as has been said, not only to all of the horse kind, but to man. Therefore, on its discovery, no time should be lost in removing the affected animal from the possibility of communicating the disorder to another. If stabled, there should be no connection whatever between his stall and those of other animals, as the discharge from the nostril (in which lies the danger) may be communicated through any opening sufficient to allow any horses to bite or nibble at each other. If placed to pasture, it should be known that no other horse is at all likely either to be turned in with him or to approach the inclosure. Remember that a glandered condition may long exist, and minute ulcers, in the hidden recesses of the nose, discharge a limpid or clear fluid, without any of the active and violent symptoms being manifest; but that all this time the horse may be able to communicate the disease to others; and that these may die of it while he is yet in reasonably fair condition.

Meanwhile, swab out the nose every day with a solution of pyroligneous acid, using warm water, as warm as the horse can well bear, and putting in sufficient of the acid at first to make the solution of medium strength. It should be increased a little from day to day; but care must be taken not to make it too strong, as violent acid injections or swabbing solutions are calculated to do harm rather than good. A good

mop for this purpose may be made by attaching soft rags (old cotton cloth is best) to a light stick, two feet in length, so arranging the cloth as to have it project beyond the end of the stick to be inserted, to prevent any roughness that might abrade or scratch the membrane, and fastening very securely to prevent its slipping off.

If this instrument is found not to be efficacious, or if the disease has already developed into the second stage, the discharge more mucous, sticky and stringy, with glands swollen and the membrane of the nose of a dark purple or leaden color, adopt the following treatment and carry it out energetically and persistently. Make a gallon of very strong decoction or tea of tobacco leaves, which keep ready for use. Put enough of this into warm water, as warm as the horse can well bear, and swab out his nostrils with it, as high up as possible, using the mop as just directed. Then put a gill of this same strong tobacco tea into a pint of warm water, and drench him with the solution. There must be no uneasiness on account of the dreadful sickness which this will produce. The tobacco is necessary thoroughly to relax the system and overcome fixed or chronic tendencies, and to counteract the influence of the glanderous poison. Swab out the nose every day for eight or ten days, and drench every third day for from two to four weeks, or until the discharge has ceased and the ulcers are perceptibly healing. Some veterinarians recommend bleeding in this case, but nothing could be more ignorant when the vital energies are already depressed. So for the two first stages. If all these directions, those as to food and care as well as for the administering of medicines are faithfully carried out, they will cure the majority of cases in the early or middle stages of the disease.

If disease has passed into the third stage, however, no treatment can confidently be recommended. So doubtful is it as to whether any remedial agencies will avail, that most veterinarians in the United States confidently declare that the best thing to do is to kill the sufferer in the quickest and most humane way, and bury him deep in the ground beyond the possibility of his contaminating the atmosphere with his decaying and poisonous carcass. A horse affected with this disease in any stage is dangerous to the man who handles him, but he is doubly so, perhaps, when he has become a loathsome object in limbs and body as well as in head; and under ordinary circumstances it is doubtless best to destroy him as quickly as possible. In case treatment is determined upon, nothing better than that prescribed for the second stage can be recommended. It remains now but to suggest some precautionary measures to prevent contagion in addition to those which have already been given. If a stable is known to have been used by a glandered horse, no other animal should be allowed to occupy it until the trough, the rack and the walls have been thoroughly scraped and scoured with strong soap and warm water. Then take 1 pint of chloride of lime and dissolve it in two gallons of water, with which thoroughly saturate every part that the horse's nose may have touched. Next, whitewash the walls inside. Then burn bridles, halters, buckets out of which he has drunk, whatever may have been about his head; and if any blanketing has been used have it carefully washed, or burn it up.

GLEET, NASAL. This term is used to denote a thin transparent discharge from the nose. It sometimes follows distemper, or strangles, and is one of the attendants on glanders, sometimes running into it, but is generally the result of neglected catarrh. It is in one of its forms a suppuration of the mucous membrane lining in the facial sinuses, producing distortion and a terribly offensive discharge, which may have been produced by a blow on the face.

Symptoms. Discharge is not always present, neither is it uniform. Sometimes during fair weather it will be almost discontinued. The discharge is a thick, yellow mucus tinged with green, if the food be grass, or with the color of the food. If it becomes purulent (from pus, matter) and tinged with blood, it may end with ulceration of the cartilages of the nose, and in glanders. If the discharge is confined to the left nostril, is tenacious, elastic, accumulates around the edges of the nose, if there is enlargement of the lymphatic submaxillary gland, under and on the side of the jaw, it is cheaper to kill the horse, or else call in a surgeon, since for the proper treatment of the disease the trephine should be used, by which a circular piece of the bone may be taken out to facilitate treatment.

Treatment. In mild cases look for decayed molar (grinding) teeth; if found, remove them. Look for swelling of the frontal bone, produced by bruises. Put the horse where he may be comfortable; let his diet be light, but soft; fresh grass in summer, with good food. Inject the nasal passages thoroughly with the following: 1 drachm blue vitriol 1 pint water.

Prepare the following:

1 fluid drachm carbolic acid,
1 pint water,
1 drachm copperas,
2 drachms gentian,
½ ounce poplar bark,
3 drachms hyposulphite soda.

Give three times a day in bran or feed.

GOITRE, ENLARGED GLANDS. There are various glands in the throat that are subject to enlargement from disease, and which remain permanent after the disease is passed. This is generally more unsightly as a blemish than as a real disability. In some portions of the East it is quite prevalent. For all enlargements of glands, tincture of iodine and iodide of potassium, added to eight parts of hog lard, will disperse the swelling if it may be possible.

In bronchocele, or goitre, rain-water only should be given to the patient to drink; iodine in doses of 10 grains daily may be given on an empty stomach, and the swelling may be painted with the tincture. This is to be persisted in for months.

GREASE, OR CRACKED HEEL, consists in a morbid

condition of the sebaceous glands of the horse's heels and fetlocks. It occurs in various degrees of intensity; sometimes as a mere scurfy itchiness of the skin about the fetlocks, more commonly of the hind extremities; sometimes attended with much inflammation, causing great heat, pain and swelling, and an ichorous, fetid discharge; sometimes causing falling

Fig. 71.—*First Stage of Confirmed Grease Cracks.*

Fig. 72.—*Second Stage of Confirmed Grease Cracks.*

off of the hair about the heels, and the formation of deep cracks and fissures, and sometimes becoming so violent and inveterate as to cause eversion to the sebaceous glands, formation of granulations and secretion of pus, constituting the loathsome complaint termed the grease.

Cause. Grease is generally the result of filth. Horses are worked all day in muddy weather, and at night turned into a filthy stable. The animal's food may be attended to, but he is forced to lie upon a filthy bed and breathe the contaminated air of the stable. The legs covered with mud become cold from evaporation. The subcutaneous glands are inflamed and grease is established. To save trouble in grooming, lazy people often clip off the hair with which nature has so beautifully adorned the horse's heels, thereby exposing the tender parts to the action of cold and wet. These parts being the farthest from the center of circulation, where the blood vessels have to form several angles to reach them, it is evident that the blood flows most tardily. Then is it any wonder that sudden exposure would engender disease?

Frequently, however, it may be regarded as most probably a secondary disease, originating in some other, which has resulted from carelessness or inhuman treatment, or from constitutional weakness.

It is contagious, but filth and want of attention will produce it in nearly all horses similarly subjected to their influences.

Symptoms. It manifests nearly the very same symptoms as thrush, as given on a subsequent page; but there is one striking peculiarity which distinguishes it from thrush, foot-evil and other disorders of the kind: the heel cracks open. In a healthy state the heel of the horse is moistened, and so kept from becoming dry and hard, by constant secretion and discharge of an oily fluid from the cellular tissues under the skin. When this is obstructed, the skin becomes dry and feverish, and looks scurfy and hot. It soon after cracks, and the pent-up oily secretion, now turned to a foul, yellowish water, flows out. As the flow of water increases, it becomes more and more thick, and sticky, and stinking; and if not attended to the heel and sides of the foot become an ulcerated mass.

It sometimes manifests itself by oozing out a thin matter through the pores of the skin from some deep-seated disease of either the coffin-bone or the navicular joint—most frequently the latter. The more effective treatment in this case would of course be that directed to the healing of the primary disorder.

Treatment. The treatment necessary is similar to that for scratches. In the first place, see to it that the causes which have induced it shall no longer operate. If the disease is secondary, it must be somewhat difficult to manage; and the animal should be allowed to rest, taking only such exercise as nature prompts, in an open pasture, except in bad weather. When it is necessary to confine him give him a good stable, dry litter and pure air. Remember that rest is one of the first conditions of success, while constant driving or any other labor will most probably defeat the ends of the physician.

If the disease is not discovered in its early stage, and the general health of the animal has not suffered, cleanse the parts well with tepid water and castile soap, and make occasional applications of the treatment recommended for scratches. A few applications will generally be found sufficient. Sprinkle the parts well after application with pulverized charcoal.

If the horse is thin in flesh and in a low state of health from the effects of this disease, mix sulphur and rosin, in the proportion of two parts of the former to one of the latter, and give him a quarter of a pound of this every third day until he has taken three or four doses. Meanwhile, thoroughly apply to the parts the treatment for scratches, till the disease is thoroughly conquered. If the liniment forms a scab upon the heel, so hard and dry that the remedial effects seem to cease, omit the liniment for several days and keep the heel well greased. The scab will come off, and then the application of the liniment may be resumed. This course must be persevered in till a cure is effected.

The liniment should be applied at night, and the horse should not be turned into pasture when the grass is wet with dew or rain,—at any rate not till six hours after the application has been made.

In summer, pasture will in general afford sufficient food; but in winter it should be more nourishing, yet green and succulent as far as possible. Roots and good bran mashes ought to be given in reasonable quantity. Grain, as a regular diet in this case, is objectionable, on account of its tendency to produce inflammation.

After three doses of the sulphur and rosin have been given, as directed, the following mixture, given every night until all traces of the active disease have

disappeared, will be found an excellent tonic or strengthening medicine, and having the effect, too, of giving healthy tone to the skin:

½ ounce liquor arsenicalis,
1 ounce of muriate of iron,
¾ pint of water.

This constitutes a dose; mix and give as a drench. The following may be used for the feet:

8 ounces tar,
1 ounce beeswax,
1 ounce rosin,
1 ounce alum,
1 ounce tallow,
1 ounce sulphate of iron,
1 drachm carbolic acid.

Mix and boil over a slow fire, stirring as long as dirty scum appears, and then add two ounces of scrapings of sweet elder.

HAIR, FALLING OFF OF THE. For that unwholesome state of the skin and hair glands known by the learned terms of humid exanthema and dry exanthema, that causes the falling off of the hair, the following is an excellent local remedy when the animal is not under general treatment for some disease primary to the state now under consideration:

1 ounce pulverized charcoal,
1 pint olive oil,
5 ounces pyroligneous acid,
1 ounce common salt.

Mix, and rub upon the parts daily with a sponge or a soft rag.

HEAD, BIG: see page 745.

HEART, DROPSY OF THE. The pericardium or membranous covering of the heart is subject to inflammation; by this inflammation and consequent obstructed circulation in the minute vessels that supply it, an effusion takes place and either thickens the walls of the pericardium itself, and thus contracts or compresses the heart, or it is deposited in the cavity of the pericardium in quantities varying from a pint to a gallon. This diseased condition is generally found in connection with dropsy of the chest or abdomen.

Symptoms. In the early stages of the disease there is a quickened and irregular respiration, with a bounding action of the heart. As the fluid increases the action of this organ becomes feeble and fluttering. There is a peculiar expression of anxiety and alarm on the countenance of the animal. If he does not die of the disease before the pericardium is filled, violent palpitations and throbbings characterize the advanced stage. The breathing becomes difficult, and when the head is raised there is a tendency to faint.

Treatment. If it is observed while there is yet a painful state of the pericardium by reason of inflammation, profuse effusion not having taken place, the first thing is to reduce the inflammation and allay the pain, and thus forestall the further accumulation of the fluid. For this purpose relieve constipation, which is usually found as an accompaniment, by moderate doses of salts or of oil. Then give the following draught three times a day:

20 grains iodide potassium,
1 ounce nitrate potash,
15 drops tincture aconite,
1 pint water.

The animal must be kept comfortable, according to the season, and have a plentiful supply of fresh air and cold water. If there are no indications of relief within two days, give the following draught:

20 grains iodide potassium,
4 ounces solution acetate ammonia,
10 drops tincture of aconite,
12 ounces water,
1 drachm cream tartar.

Repeat this after eight hours and then leave off the aconite, but continue to give, at intervals, the acetate of ammonia and water. If the disease has reached an advanced stage and the cavity of the pericardium is largely filled with water, it is scarcely to be hoped that the animal may be saved; but even in that case the course here prescribed should be adopted, unless there is some more general disorder under such treatment as will render it unnecessary or objectionable.

HEART, ENLARGEMENT OF THE, is an increase of its muscular substance and may be confined to one side or one ventricle. Sometimes disease of the valves leads to enlargement much beyond its usual size. It also accompanies broken wind and other impediments to the free action of the lungs and breathing tubes.

Causes. Long continued hard work; chronic indigestion, or some obstruction to the circulation.

Treatment. Keep the animal quiet, and at only slow, moderate labor; never overload or put him to speed. Let the diet be of easily digested food; never allow the stomach to become overloaded. Give twice a day from 20 to 30 drops tincture aconite root, as the case may need. If there is broken wind or other serious impediment to breathing, 3 to 4 grains of arsenic in the food has been found useful. If the case, however, be of long standing or due to permanent obstruction, treatment must be simply alleviation. The case will end in death.

HEART, FATTY DEGENERATION OF THE, is occasioned by a change of the muscular substance of the heart to a fatty state, by which the organ is weakened, at length leading to the rupture of its tissues. It is not uncommon in high-bred stock, including cattle and swine.

High feeding, inactivity, want of exercise and the result of such diseases as purpura, scarlet fever and diseases which are the result of profound alteration of blood, are the causes of this disease.

Symptoms. Debility in the circulation, irregularity and weakness in the pulse, lessening of the heart sounds, swelling of the legs and sometimes a general dropsical condition, dilatation, a want of correspondence between the heart beats and the stroke of the pulse, appetite irregular and capricious, and the membranes of the mouth and nose a rusty red color.

Treatment. Humor the appetite with sound, easily digestible food. There is no remedy. Attention to the general health, and an ounce of chlorate of potash twice a day in the food may mitigate symptoms when more violent than usual. In all heart or arterial diseases give rest, and in fattening stock, do so as quickly as possible.

HEAVES OR BROKEN WIND. This sad affliction is often brought about by the ill usage which man imposes upon the most obedient of servants. The animal is often compelled to eat food containing so little nutriment that the stomach has to be crammed to its greatest capacity in order to sustain life. The distended stomach presses upon the diaphragm; by this the expanding capacity of the lungs is lessened and disease is provoked. Again musty hay and oats are fed, the animal is imprisoned within walls that prevent him from breathing the pure atmosphere. The dust from the unhealthy provender is inhaled into the bronchial tubes, the tissues of the lungs become deranged and broken wind is the consequence. Other causes, however, aggravate the disease, such as violent exercise, while the animal's stomach is distended with food or water, etc. The affected animal heaves at the flanks, or, rather, performs what is known as abdominal respiration.

To detect heaves when they are covered, the reader should make himself acquainted with the natural sound of the lungs when in health. On applying the ear to the front of the chest of a broken-winded horse (see Fig. 73) an irregular crepitating sound can be heard, which may easily be distinguished from the gentle murmur of the healthy lung. Catch hold of the halter on the left side with the left hand, and pull the head a little around toward that side, then with a stick about two feet in length make a sudden movement, as if going to strike the animal under the belly. This will elicit a painful groan, which proves that the wind is affected.

FIG. 73.—*How to Hear the Sound Made in the Horse's Windpipe.*

Treatment. There is no permanent cure for this disability. Food of the most nutritious quality should be given, such as corn, oats, beans, etc. The quantity of hay should be lessened, about six pounds per day being sufficient, and it should always be wet; and if sprinkled with a little resin and blood-root it would be better. Water should be given in small quantities, from four to six times each day. With each drink mingle ½ a drachm of sulphuric acid. The oats and hay should be well sifted and damped. A lump of rock-salt should be placed in the manger. The animal should be allowed to hold his head in the easiest possible position, and not as we often see, as indicated by Fig. 74. With this usage and moderate work, a broken-winded horse can be made serviceable for a long time.

FIG. 74.—*Bit Bearing upon the Jaw.*

HEMORRHAGE, INTERNAL. Internal bleeding or hemorrhage is rare unless made by puncture of some of the deep-seated blood-vessels. The orifice leading to the surface being obscure and high, will of course occasion internal bleeding. When they can be got at the remedy is of course tying. Punctured wounds do not bleed much, the clot usually closing the orifice, assisted by the contraction of the vessel. In transverse or oblique clean cuts of an animal, causing wounds to the important arteries, death must follow unless they can be cut down upon and tied.

Rupture of the blood vessels of the lungs sometimes occurs from over-exertion, and is also common from the nose. Or hemorrhage of the lungs may arise from any pulmonary complaint involving the blood vessels. In this case it must be determined. If the blood comes from both nostrils and is frothy, it is from the lungs. If the horse has no specific disease of the lungs, and is in full flesh, bleeding from the neck vein, a full stream, may check the hemorrhage. Digitalis in 15-grain doses may be given. It may give present relief; but probably there is no permanent cure.

If the bleeding is from the blood vessels of the nose, a strong solution of alum may be syringed up the nostrils. If this fails pour ½ pint of boiling water on a drachm of matico leaves, and when cool strain and inject it up the nostril.

FIG. 75.—*Internal Hemorrhage.*

Chronic hepatitis (congestion and inflammation of the liver) often results in hemorrhage internally. The symptoms confirming this state of things are, the mouth cold, nasal membranes pallid, the eye ghastly. The horse will look for the seat of pain in the right side, and usually lies on the left side when down. The head is depressed. As the disease progresses there is increased weakness with staggering. The pupils of the eyes are dilated; the sight is bad, and if the head is attempted to be raised high the animal instantly shows signs of failing.

Treatment. Put the animal in a roomy stall, or loose box. Keep the bowels regulated by grass and bran mashes, only with nutritious food and as much gentle exercise as the animal can take. Prepare the following:

1 ounce tincture muriate of iron,
1 ounce iodide of potassium,
1 quart liquor potassæ.

Mix, and give two tablespoonsfuls twice a day in 1 pint of water.

HERNIA. This is a name given to rupture, which see in this article.

HIDE-BOUND. This is a common term among farmers and horsemen, though, strictly speaking, it is not a disease, but the result of a diseased condition of the general system or of derangement of some specific vital function. Anything that will debilitate the

system will cause it. Poverty and cruel usage—the food being deficient in quantity or quality, and the labor onerous—bring on impaired digestion; the blood becomes thick, dark, and feverish, because the secretive processes are sluggishly performed; the skin sympathizes with these internal disorders, and the lubricating fluid through the pores is suspended; and then, instead of remaining soft and pliant, it becomes dry and adheres to the body. A disordered state of the stomach, bowels, and urinary and respiratory organs may be considered as having produced it when no specific form of disease can be discovered as existing; but it is an almost invariable accompaniment, in a greater or less degree of intensity, of big head, glanders, consumption, and chronic dysentery. The fever in these dries up the watery secretions and shrinks the hide.

Formerly it was supposed to be caused by worms in the stomach and alimentary canal; but this is erroneous. Worms may of course exist while the horse is in this state, but they are rather a consequence than a cause—the result of imperfect digestion and excretion. The skin, as has been elsewhere stated, sympathizes readily with the vital internal organs, and in all obscure cases hide-bound should be considered a symptom of disorder in these, and treated accordingly.

FIG. 76.—*One of the Causes of Hide-bound in the Horse.*

Symptoms. The skin is dry and hard, and the hair is rough and rusty. Adhering almost immovably to the ribs, legs, neck—almost every part of the body—the skin cannot be caught up in folds with the hand. At times it appears scurfy, and the exhalants (having the quality of giving out or evaporating) pour forth unusual quantities of matter, the more solid portions of which form scales and give the horse a filthy appearance. The excrement or dung is hard and black.

Treatment. Especial pains must be taken to discover, if possible, what specific disease has given rise to this state of the skin. If the cause is obscure, direct the treatment to restoring a healthy condition of the digestive organs. Begin by bettering his treatment in every way. Instead of allowing the skin to grow clogged, torpid, and dead for want of cleanliness and friction, he should have regular daily currying and brisk rubbing with a good brush or coarse cloth, which will materially aid in restoring healthy action of the skin. If it is pasture season, give him a run at good grass during the day, but stable at night in a clean stable, furnished with dry litter, and give him a generous feed of bran and oats or moistened bran and chopped hay. Mix with the food the following alterative:

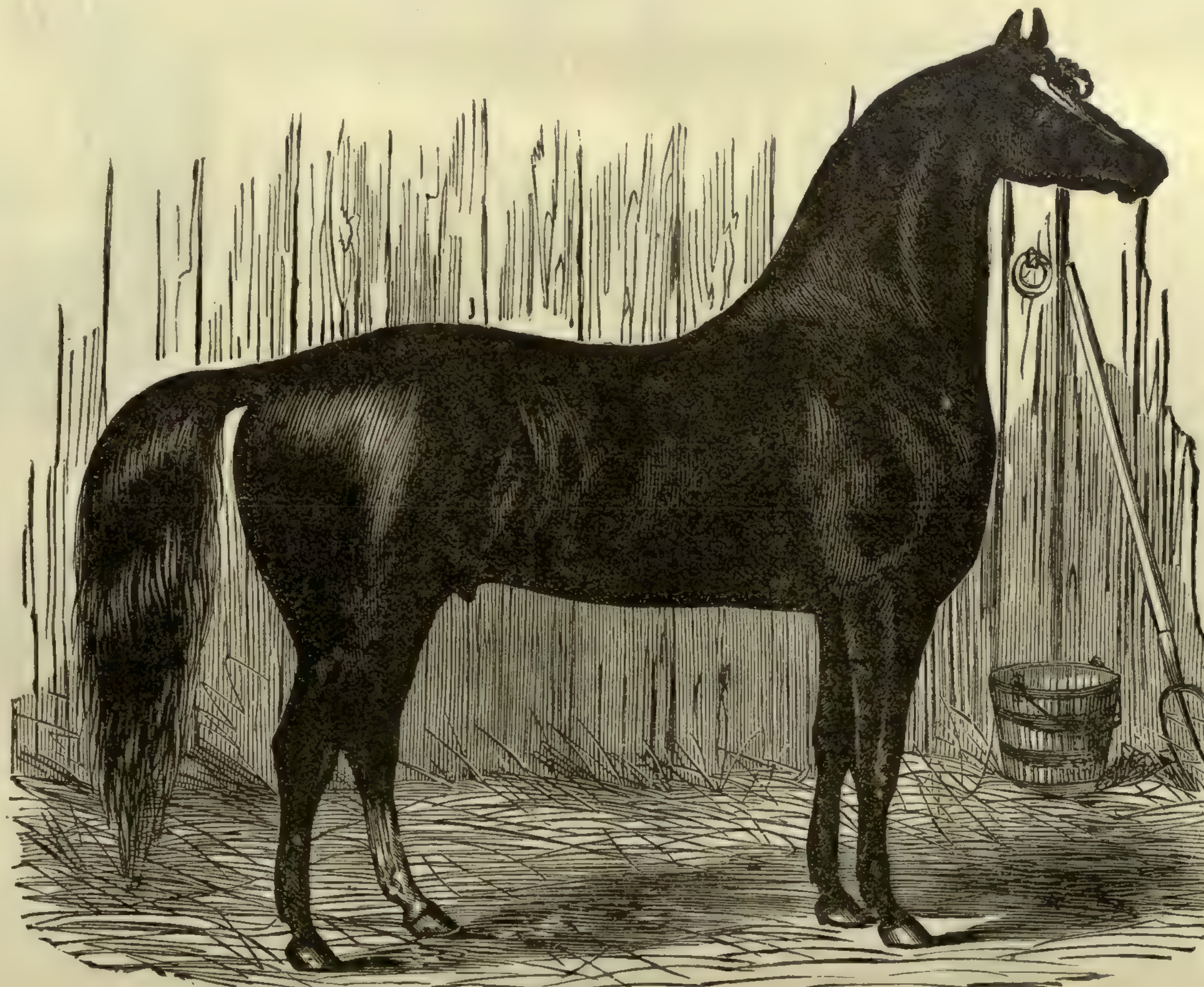
3 ounces golden seal;
3 ounces poplar bark;
3 ounces powdered sassafras bark;
3 ounces sulphur;
3 ounces salt;
8 ounces blood-root;
1 ounce balmony;
1 pound oatmeal.

Mix and divide into twelve doses; give one three times a day. A good and sufficient tonic may be furnished, of which the horse may be allowed to partake as much as the system requires, by placing a poplar pole in the stable, upon which he can conveniently gnaw. Should it be during the winter, it will generally be found necessary to begin the course of treatment by giving a purgative, say two ounces of Epsom salts, which may be repeated within seven hours if it fails to produce the desired action; and to feed him on laxative food until constipation is overcome and a healthful action of the bowels restored.

Remember that one of the very first objects is to establish regular action of the bowels; and then generous diet (let it be green and succulent if possible, but at any rate nutritious without being inflammatory), with cleanliness and daily, regular friction of the hide will do more than medicine. Do not expect to effect a speedy cure; in any event, the very existence of hide-bound indicates chronic disorder, and all chronic diseases require time.

If it is known to be the result of a well-defined disease, as big-head, glanders, etc., the treatment must of course be directed to the removal of that, according to directions elsewhere given in this work; and the hide-bound will disappear as its immediate cause is removed.

HOCK, BROKEN. The hock is an important joint or part of the horse, and is the seat of many diseases, causing lameness. In most cases of lameness of the hind leg, the hock is the true situation of the trouble. Broken hock is a term applied to breaking the cap of the hock. The only treatment is absolute rest, the application of sedative lotions, as laudanum, equal parts, with water, to remove pain, and astringents, as white-oak bark. It is sometimes necessary to blister near the part to get up counter-irritation, or put in a



AMERICAN ROADSTER.

seton below the hurt. The mode of using a fixed seton needle, to bring a wound together, in sewing, where a proper crooked, flat needle is not at hand, is

FIG. 78.—*Manner of Using a Seton Needle.*

here shown. It will also serve to show the manner of using a needle for a seton, to be threaded with white tape.

HOCK, CAPPED. This is an enlargement at the point of the hock, caused by blows or injuries to the part. It sometimes assumes large proportions, and is at first hot and tender. The common practice is to blister or to insert a seton. This, however, is wrong. To blister or seton an already inflamed part is still aggravating the injury. Cooling embrocations should at first be applied until the heat and pain be removed. For this use the following:

1 ounce sal ammoniac,
1 ounce nitrate of potash,
1 pint of water.

Should the enlargement become hard, the best way is to dissect the callus out carefully. Dress the wound with a solution of chloride of zinc, 1 grain to an ounce of soft water.

HOCK, ENLARGEMENT OF THE. Inflammation may ensue from various bruises or strains. Rest and fomentations will generally set this right if taken early. Sometimes, however, the enlargement will continue to grow in spite of all efforts to the contrary, and until the joint is involved.

Symptoms. There are two forms of this disease. In one, the tendons and cartilages only are affected. This will generally yield to fomentations and a few applications of oleate of mercury. If not, blister. Another form is more serious. From a severe blow or other cause there is a bruise of the bone, by which the investing membrane, called the periosteum, is either severely strained or torn loose, giving rise to inflammation and formation and deposit of bony matter on the surface of the bone, sometimes to such a degree that the parts are of excessive size and the legs so lame that it is only with great difficulty the animal can walk. The animal may, indeed, as in cases of bog spavin, be capable of doing farm work, but is unfit for driving on the road.

Treatment. Precisely the same treatment must be pursued as in cases of bone spavin.

HOOF, CONTRACTION OF THE, or NARROW HEEL. In a healthy condition the hoof of a horse should be nearly round. Whatever shape the hoof may assume it is not a disease in itself, but the result of disease or of some disability. It is generally the result of fever in the feet from injury to bones, ligaments or frog, or the effects of founder, etc. Contraction of the hoof exists in nearly all diseases of the feet, and may occur from standing idle in the stable. So it may result from undue paring of the heels, the bars on the frog, or from a shoe remaining on so long that the foot is prevented from taking its natural growth.

Treatment. The only thing is to remove the shoes and round the edges of the hoofs to prevent their being broken or split. Anoint the external wall of the hoof daily with equal parts of coal oil and honey or fish oil. In shoeing, let the shoe be without bevel on its upper side, and let the bearing be equal on all parts of the wall of the hoof. Fill the bottom of the foot every night with moist clay or white lead.

HOOF, CRACKED. This is not a rare ailment of horses. It generally arises from weak and brittle hoofs, produced by a dry state of the hoof, whatever may be the cause, whether fever or other causes of degeneration. The prolific causes are drying of the wall of the hoof, uneven bearing of the shoe, calking, or other wounds or injuries of the coronet. This crack may be extended down from the coronet according to the time it may be allowed to run.

FIG. 79.—*Closing Crack.*

Treatment. If taken early, a bar shoe having an even bearing all around will generally relieve the difficulty. In connection with this, apply a plaster of pitch over the injury.

If the crack becomes determined, as in the cut given, it must be kept closed together by clinching a thin nail with the instrument shown by Fig. 80, on each side of the gap near the bottom and top, or else with thin wire as shown in Fig. 79. Also burn a

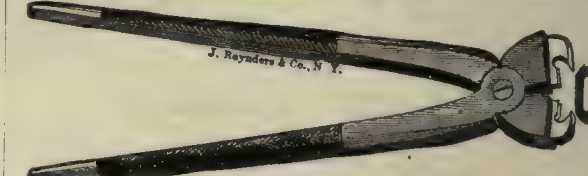


FIG. 80.—*Instrument for Closing Cracks in Hoofs.*

groove just below the crack about an inch long nearly down to the quick. It is also well to slightly blister the coronet at the top of the crack. Apply to the parts Venice turpentine.

HOOF ROT. This difficulty, sometimes called tender feet, arises from diseases of various kinds, spavin, ring bone, chronic founder, navicular disease. There is a dry, feverish state of all the parts, and the hoof, and especially the sole, becomes decayed and sometimes perishes entirely.

Symptoms. The bottom of the hoof is dry and chalk-like, so that it may easily be dug away with the point of a knife, or even easily scraped away. The frog of the foot diminishes in size, and the ankle-joints are apt to swell. The horse steps short and goes lame, if in one foot, or if in both, cripples in his gait. The affected foot will be pointed forward to enable the animal to rest on the sound foot.

Treatment. Remove the shoe, pare away all the unsound portions of the hoof until all the pumiced parts are got rid of; also the frog and the sides of the hoof. Stimulate the bottom of the hoof by washing it with corrosive liniment, used in navicular diseases, once a day for three days, heating it in with a hot iron. Then omit for two or three days, and commence again. During the treatment the animal must be kept in the stable, and the feet should be kept dry. When hoof rot is due to other diseases, as ulceration of the navicular joints, it will do no good to follow the rule laid down until the cause of the difficulty is removed.

HYDROPHOBIA, OR RABIES. There can be but one reason for describing this disease, which is entirely beyond the reach of help, and that is, that the horse attacked with it be destroyed immediately on its discovery.

It generally arises from the bite of a dog, though wolves, foxes and cats are subject to it by spontaneous generation, and this bite is as fatal to another animal and to man as that of the dog. The horse need not be absolutely bitten. The licking of his bridle-bit sores at the corner of his mouth by a mad dog is sufficient to introduce the poison by absorption; and if the horse by any means chances to take into his mouth and stomach, with his food, the saliva or spittle of a mad animal, he will very probably be attacked, and especially if the animal so dropping the spittle is suffering with the disease in its violent stage. The poison is known to reside in both the spittle and the blood of its victim. When once the virus has been generated in or communicated to any animal, hot weather, abuse, want of water, want of food, will produce that feverish state which is so favorable to its development, and the greater or less time in which it manifests itself, decidedly in horses, after inoculation, is probably due to the then conditions or the absence of such. The poison remains in the system without producing the positive symptoms, from three to eight weeks.

Since several of the most formidable diseases have recently been traced by the microscope to the presence of peculiar organisms, it is reasonable to presume that rabies also is either due to the presence of microscopic organisms or actually consists of them.

Symptoms. Blood on the lips or elsewhere, with marks of violence, are of course to be regarded as symptoms of dog bite, if any known occasion for such a thing has existed; and for a few days these will be the only indications. If the horse is high fed and full of blood, and the weather is hot, the poison may begin to produce outward effects in from five to ten days by a swelling of the bitten parts, and by a difficulty manifested in swallowing. In from twelve to fifteen days there is perceptibly increased pulsation, inflamed throat, with thickening of the membrane which lines it; from the fifteenth to the twentieth day the stomach inflames and perhaps rejects food; but nothing certainly can be stated as to this point, since here the symptoms vary greatly with different animals; in some cases the appetite is voracious, and so morbid that the sufferer will devour his own excrement and urine. Sometimes he will exhibit burning thirst and drink freely, while again water will cause spasmodic movements and be avoided with horror. But in general the appetite is destroyed, and that dread of water which characterizes the disease in man is present in the horse.

FIG. 81.—*Countenance of Horse with Rabies.*

In a very short time the indications increase, and usually (as we have said, with full-blooded, feverishly disposed horses, at a time of high temperature) before the twentieth day, absolute madness sets in. He now

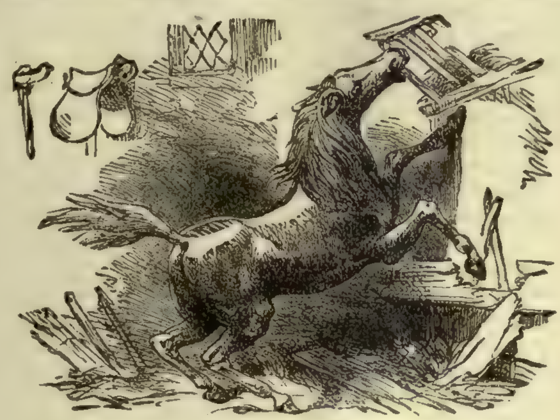


FIG. 82.—*Destructive Impulse of Hydrophobia.*

rubs the bitten parts against anything convenient with increased violence; sometimes, instead of rubbing, he will bite and tear the wound; the eye assumes a wilder and more unnatural appearance; some patients neigh speakingly, shove out the tongue or gnash the teeth. The progress of the disease is now very rapid; generally there is profuse sweating, suppression of the urine, and inflammation of the parts of generation. His countenance changes from a look of anxiety to one of cunning and a sort of grinning ferocity, and there is an irrepressible desire to bite man or animal—whatever living thing may be had within reach. He gazes sometimes at an imaginary object and springs

and snaps madly at vacancy; his propensity to destroy grows with his pain, and at last he wreaks his fury upon inanimate objects; the manger or trough, the rack, whatever is seizable in his stall is torn to pieces with his teeth or smashed with his feet. If not confined he darts ferociously at whatever object of attack may present itself; has a peculiar dread of water; plunges about like a demon of destruction, snorts, foams, sometimes uttering a kind of crying neigh, and perhaps beats himself to death before the last and comparatively helpless stage comes on.

If not destroyed before the disease has run its course, paralysis, usually confined to the loins and the hinder extremities, sets in, and involves with it all those organs which depend for their nervous influence upon the posterior portion of the spinal cord. Unable to stand upon the hind legs, the animal will sit upon his haunches, and strike and paw with his fore feet. The suffering is sometimes rendered more terrible by tenesmus or inaction of the bowels, which seem dreadfully oppressed but have lost the power to act, while the kidneys are fevered and torpid, and the urine cannot be voided.

It sometimes happens that the disease is developed by exertion and heat, when no previous indications have been manifest, and shows itself in a peculiar manner. The horse stops all at once in his work, heaves, paws nervously, trembles, staggers and falls. In a moment he will be up, and may, if put to it, proceed a few moments, when he will stop, stare about and lie down again. This stage is sometimes mistaken for blind staggers, but it may be distinguished by observing that in blind staggers the horse loses his senses, while in hydrophobia he is always conscious, often actually intelligent and observing.

Treatment. This is a disorder of so dreadful and dangerous a character that some of the ablest veterinarians do not hesitate to advise the instant killing of the sufferer; and they refuse to give any directions for attempting a cure. When the furious stage has come on there seems to be a sort of demoniac maliciousness and treachery, with a watchful cunning, that makes it hazardous for friend or stranger to trust himself anywhere within reach. It is extremely doubtful, too, whether recovery ever takes place after the madness is developed. When the animal is bitten, cauterize the part bitten with caustic or a red-hot iron. Then if the animal shows unmistakable signs of rabies the safest and best plan is to destroy him.

INFLAMMATION OF THE ABSORBENTS. Inflammation of the absorbents (*Lymphangitis*) has a variety of names, among which are "weed," and "shot of grease," and may be a constitutional case or a mere local affection. In its constitutional form it is found in heavy, lymphatic, fleshy-legged horses that, hard-worked on heavy feed, are left in the stable for days together.

In its local form it is the result of wounds, bruises, injuries of various kinds, putrefying matter in and around the stable. It may occur from the specific poison of glanders, etc., and in the constitutional form may go on to abscess, sloughing and unhealthy sores, and death; or the horse may be left with the limb permanently thickened. In the local form there may be abscess, diffuse suppuration, induration of the glands, and even the vessels and surrounding parts.

Symptoms. There will be more or less shivering; in bad cases, severe, quickened breathing; rapid, hard pulse; a general feverish state, and fever in one or both hind limbs. Enlargements may be detected high up in the groin, by the side of the sheath in the horse or udder in the mare, and great tenderness of the inguinal glands. The shivering fits will be succeeded by fever, with burning sweats, swelled limbs, exudation and filling, sometimes to the body.

Treatment. In mild cases give moderate and daily exercise, pay attention to diet, ventilation, and cleanliness. If the case is more severe, give from 4 to 6 drachms of aloes, apply warm fomentations continually to the limb, with walking exercise. The bowels having been thoroughly moved, give diuretics, an ounce of saltpeter in a gallon of water two or three times daily; or 10 grains of iodine. For "thick leg," a chronic thickening of the limb, bandage from the foot up when the animal is in the stable, and apply tincture of iodine for four days, giving daily exercise; or rub the limb with iodine ointment and give the following once a day:

½ ounce powdered resin,
½ ounce nitre,
10 drops oil of juniper,
1 drachm cream tartar.

Mix into a ball with liquorice powder and molasses.

If abscesses form, open them with a sharp knife and dress with the following: 1 ounce carbolic acid, 1 pint distilled water. In the local form there will be slight swelling of the cords and redness in white skins. The lymphatic glands will be enlarged along their course, and become nodular or knotty. There will be pasty swellings of the parts and even erysipelas.

Treatment. Give rest and a purge of aloes, as recommended for the chronic stage. Wash the diseased limb with the following:

½ drachm opium,
1 drachm acetate lead,
1 drachm carbolic acid,
1 quart rain-water.

In case of excessive inflammation poultice with flax-seed or bread and milk; open the suppurating parts to let out the matter and dress with carbolic solution, as in the other form of the disease.

INFLAMMATION OF PAROTID GLAND, PERITONEUM, KNEE-JOINT, BLEEDING OF RECTUM, STOMACH AND TONGUE. See the respective subjects in this article.

INFLUENZA, PINK-EYE, EPIZOOTIC, CONTAGIOUS CATARRHAL FEVER, ETC. This disease, which is known by the several names above given, is constitutional, and is characterized by great muscular debility, loss of appetite, heavy throbbing or beating of the pulse at the region of the heart; easily worried; in the last stage the hind legs swell, the skin cracks, and water runs out, etc. It is sometimes so mild as to require very little treatment beyond ordinary good nursing, freedom from work, comfort, cleanliness,

NORMAN HORSE.

plenty of ventilation, and a laxative, nutritious diet. The cause of the disease is supposed to be due to a poison—an atmospheric germ, the true nature of which is as yet but little known. It is an infectious disease, and is regarded by some as being contagious; but investigations have not yet proven its communicability. The disease is one which attacks all solipeds, and the degree of its intensity is greater in the ass than in the horse or mule.

The peculiar characteristic of "pink eye" is that of great emaciation, in some cases the animals being reduced to mere skeletons; and in these cases, of course, convalescence is retarded, and the appetite is slow in returning. "Pink eye," as a rule, is not very fatal, but as it is a disease which is liable to attack any of the tissues of the body, it may in some outbreaks prove very disastrous.

A frequent sequel to "pink eye" is one commonly called dropsy. Most of the cases prove fatal. Owing to the debilitated condition of the heart's action, there may be anæmia of the brain, which is also very fatal.

Symptoms. The period of incubation of influenza, as it is generally called, varies from a few hours to a few days, and in the majority of cases there are no premonitory symptoms shown. Probably the first symptom shown is a staggering gait, and in some cases the debility is so great that after an animal has fallen down assistance is necessary to get the animal on its feet again. One of the first symptoms also is sneezing, and in some cases there is an inflammation of the sub-

FIG. 83.—*A Case of Influenza.*

maxillary lymphatic glands. After the first symptoms, or in common with them, there is an inflamed condition of the conjunctival mucous membrane lining the eyelids, and tears are observed coursing down the sides of the face. Owing to the inflamed condition of the conjunctiva it takes an unusually red or pink color, and hence the name of "pink eye." Shortly after these symptoms a nasal dischaige is seen, which at first is thin and watery, but as the disease progresses it assumes a viscid, thick and yellowish character. As a rule, there is a short, frequent, feeble and painful cough, due to the inflamed condition of the respiratory mucous membrane, especially that of the throat. On pressure over the region of the larynx the animal will evince pain, and a severe spell of coughing ensues. The head is carried low, and in some instances there are indications of severe headache and more or less stupor, and in some cases there are manifestations of frenzy. The throat may be so severely inflamed that fluids given the animal will return through the nostrils, and solid food is taken with great difficulty. There are febrile symptoms, as elevation of temperature and increased number of respirations and pulsations per minute. The crisis is reached at from four to six days, and the termination in from two to three weeks or more. As a rule, however, convalescence is tedious, and the animal may continue with a cough, and be "off his feed" for months. In common with the symptoms already described, there may be lung trouble, colic, and in fact, inflammation of any internal organ.

Treatment. There are no preventive methods of treatment known. As the disease is a depletive, we should not resort to any exhausting remedies, such as bleeding, purgatives, etc. The disease is a limited one, and we should endeavor to keep up the strength of the animal by diffusible stimulants, and afterwards tonics. For a good tonic and stimulant give the following:

2 ounces golden seal;
1 ounce gentian;
2 ounces carbonate ammonia;
1 ounce blood-root.

Form in eight doses and give one night and morning.

Place the animal in a well littered stall, free from drafts of air. Do not depend upon strong physic. The cure must be effected by watching the symptoms and combating them. If there is costiveness keep the bowels open by injections, of two wine glasses full of linseed oil. Good nursing must be constant, with clothing enough to keep the animal warm. If the cough is distressing prepare the following:

¼ ounce extract belladonna;
2 drachms powdered opium;
3 drachms camphor;
2 ounces liquorice;
½ pint molasses.
Mix thoroughly and spread a tablespoonful on the tongue twice a day.

Sometimes recovery is complicated by various disabilities. If there is dropsy or swelling of the legs or sheath, prepare the following:

1 ounce iodide of potassium
1 ounce carbonate ammonia;
1 ounce powdered gentian;
Form into eight balls, and give one morning and evening.

As recovery ensues, the food should be nourishing and easily digested. The animal should be induced to take food during the disease, especially in the form of nourishing gruel. When the pulse changes, and especially when it loses its wiry character; when the discharge from the nose becomes steady and copious, golden seal and capsicum in equal parts should be given, in two-drachm doses, three times a day. Steaming with hot water and vinegar is very good, and also the application of some counter-irritant around the throat. The animal should have constantly before him a bucketful of warm gruel, in which a couple of tablespoonfuls of nitre have been placed He

should also be warmly sheltered and clothed, and no work whatever imposed upon him.

INTESTINES, PARASITES WHICH INFEST THE. The general symptoms for intestinal worms, in large quantity, are general ill health. The animal will lose condition; the skin will be scurfy, dry and often itching;

FIG. 84.—*Colt Picking Hair from its Legs, Giving Proof of Worms.*

the animal will become hide-bound and pot-bellied; the appetite will be irregular but voracious; there will be fetid breath, diarrhœa, passing of mucus with the dung, colicky pains, swelling, itching and puffy anus, and especially the passage of the worms or their eggs will be certain proof. The horse will raise the upper lip and rub it against anything near. Colts will pick and bite the hair from their body and limbs. The above cut will give a good general idea of an animal suffering from worms.

Besides the bot, already treated of, which inhabits the stomach, there are those of the intestines proper. These are the tape-worm, round-headed and flat-headed, and five species of round worms.

Treatment. Vermifuges are without number, some general in their nature and others specific for particular classes. When worms are suspected, and the owner or the animal is not sure of the reality, it is safe to give a purge and watch the droppings. The following is a good vermifuge drench:

1 drachm copperas,
1 ounce oil turpentine,
4 drachms aloes,
1 ounce powdered male fern,
20 drops oil of wormseed.

Give this in a pint of linseed oil an hour before feeding in the morning.

For worms lodging in the gut near the rectum, give an injection of a strong decoction of wormwood or tansy. The prevention of worms is to pay attention to the water the animal drinks, and to give sound grain and hay as food, since liberal feeding and good general care will often extirpate the parasites.

For other vermifuges, see article on Worms.

IRRITATION OR HARDENING OF THE SKIN: see SKIN.

ITCH. See Mange.

JAUNDICE, OR YELLOWS, a functional derangement of the liver. In almost all cases of liver disease the visible mucous membranes, the skin, the urine and the tissues are stained yellow by the re-absorption of bile already secreted.

Causes. Indigestion, obstruction of the bile duct from any cause, obstruction of the bowels hindering the proper discharge of the bile, and undue secretion of the bile in cases of congestion of the liver. In solid-hoofed animals the blood is easily dissolved.

Symptoms. There will be a general discoloration of the tissues. The mucous membrane will be yellow; the urine high-colored. In obstruction of the bile duct the dung will be fetid, and of a clay color, from being devoid of bile.

Treatment. No general rule can be laid down. The following is a good remedy for torpidity of the liver, when there is general dullness and biliousness:

2 ounces mandrake,
1 pound Glauber salts,
1 pound common salt,
1 ounce essence of ginger,
1 gallon warm water.

Mix and give a pint from one to three times a day until a gentle but full purgation is produced. Follow this up with daily doses of one scruple of podophyllin.

JAW, BONY TUMOR OF THE LOWER. That unnatural enlargement or bony excrescence of the lower jaw, known by the above name, is generally caused by a tight curb-chain used with a curb-bit of such leverage as to enable the rider to inflict injury by violent jerking. The jaw-bone is bruised and soon enlarges. The injured portion must exfoliate or scale, and the presence of the unnatural substance under the flesh and tendons give rise to a foul ulcer unless steps are taken to give relief while the hurt is comparatively recent.

Nature makes a constant effort to heal, however, and unless the tumor is irritated by passing particles of bone, it partially heals, so that an obstacle is interposed from time to time to the escape of the scales, and in this way an unnatural bony structure is formed and matured before the bony tumor is entirely healed. To prevent this, open with a knife as soon as the bone is found to be injured, and keep the wound open by using the elastic syringe and warm water until the discharge has assumed an offensive odor; then syringe into it several times daily the following:

FIG. 85.—*Tumor Caused by Curb-Chain.*

1 scruple chloride zinc,
4 drachms essence of anise seed,
1 pint water.

Remove with a sharp knife all fungous flesh and cauterize with nitrate silver.

When once the bony excrescence has established

itself no one but a skillful veterinarian should be intrusted with its removal.

Kidneys, Inflammation of the. Nephritis, or inflammation of the kidneys, is produced by a variety of causes, as blows on or sprains in the region of the loin, calculi, the excessive use of diuretics to which some stable-men are prone, musty fodder, or that which contains irritant plants.

Symptoms. There will be more or less fever, sometimes a high fever; colicky pains; looking at the abdomen, the horse will lie down with extreme caution; frequent passages of urine in small quantities, but very high-colored, sometimes containing blood and even pus; the legs swell uniformly from the hoofs up; the pulse is rapid, the bowels costive and the breathing excited; the horse straddles in his gait; this, however, is a general characteristic of all diseases of the urinary organs, but in severe inflammation it amounts almost to helplessness.

There is, however, one test that is constant; there is extreme tenderness of the bony process about six inches from the spine in the loins; pressure over the kidneys will show the terrible pain from the crouching attitude the horse assumes.

Fig. 86.—*Test for Inflammation of the Kidneys.*

If the urine is examined under a microscope, the fibrinous casts of the kidney tubes will be found. In chronic cases, stocking of the legs, casts in the urine, more or less tenderness upon pressure of the loins, and general ill health, may be all that will be observed.

Treatment. In acute cases, if there is a strong pulse and the animal is full of blood, for a day give 25 drops aconite every 2 hours. Give an active cathartic, as follows:

2 drachms mandrake,
4 drachms powdered aloes,
1 ounce gum arabic.

Make into a ball with linseed meal and molasses. Wrap the loins in woolen blankets and foment thoroughly with an infusion of a handful of digitalis leaves in a pail of boiling water, putting it on as warm as the hand will bear it; or wring a sheep-skin out of hot water and apply the flesh side, changing as often as may be necessary. Give 1 drachm cream tartar in a little water 3 times a day. After the disease becomes chronic, blister over the kidneys. To assist the evacuation and ease the pain, give injections of linseed tea, 1 quart, to which 1 ounce of laudanum is added. Get up a good sweat if possible. This will relieve the kidneys. Keep the bowels gently open with laxatives and relieve the pains with anodynes, and as the animal improves, give bitter tonics, 3 drachms golden seal daily in 3 doses; or an ounce of gentian in 2-drachm doses three times a day.

Knees, Broken. This is a common disability of stumbling horses, and of saddle horses kept for riding, leaping or hunting. A horse with the scars of broken knees, should never be used as a saddle horse, unless it can be clearly shown the hurt was done accidentally in leaping upon a foul landing place.

Symptoms. The first thing to do is to find the extent of the injury. It may be that it is only a slight bruise with or without abrasion of the skin. In this case, using the tincture of arnica two or three times a day, and a cold-water bandage if there is heat, should insure recovery. Sometimes, however, there is an ugly lacerated wound filled with dirt and gravel.

In this case the parts must be well washed by repeatedly filling a large sponge with clean, warm water and squeezing it dry against the limb above the hurt. Never under any circumstances put it against the hurt. If there is a sac below the cut, containing dirt, it must be carefully probed and opened from the bottom with a keen, sharp-pointed knife. The object is that no grit may remain in the wound to prevent its healing. A stone should be tied so the sac may be emptied of its contents in the process of suppuration. In three days after the establishment of suppuration the seton may be withdrawn. The wounded parts must be kept wet with cold arnica water, the proper proportions being 1 ounce tincture of arnica to each pint of water used. Copious suppuration having been fairly established, discontinue the use of arnica, and use instead, a solution made by equal parts of oil of tar and tincture of arnica. Use no bandages. Cleanliness of the parts is necessary. These means should carry the knee to a favorable issue. Sometimes, however, the injury is so severe that the ligaments and even the joints are injured. It then becomes a most serious case. In this event the animal must be put into the slings, the joint brought together, after being thoroughly cleansed as before stated, the parts must be bandaged and astringent washes used to promote the uniting of the parts, while the same general treatment is pursued with the laceration as advised before. In case the injury be so severe as to involve the joint, if a veterinary surgeon cannot be had, the horse had better be killed.

Knee-joint, Inflammation of the. Inflammation of the knee or other joints may occur in all stages, from the most simple form to those most violent, with ulceration and the formation of destructive abscesses.

Jarring on hard roads, various injuries, such as bruises, strains, etc., may cause this ailment.

Symptoms. In light cases the horse in starting forward will do so from the knee and with pain. There will be excessive flinching if the knee is extended by force. The animal stands square on his feet, and without inclination to raise the heel. In walking he takes a fair step, but carries the knee-joint as much without bending as possible, and in putting down his foot exerts the greatest pressure on the heel.

Treatment. Take off the shoes. Treat the inflammation as directed in other cases; first by hot-water embrocations perseveringly applied, using laudanum as directed, if necessary to relieve pain. There must be perfect rest, and if the animal will use the limb put him in slings and apply splints and bandages to the knee. The inflammation having been cured, blister the parts to procure absorption of the fluids; when the animal is better let him have the run of a quiet pasture until entirely sound, or keep him in the stable with gentle walking exercise every day.

LAMPAS. This is a name given to a slight enlargement, swelling or fullness of the bars of the mouth of young horses, caused from the changes of teething,

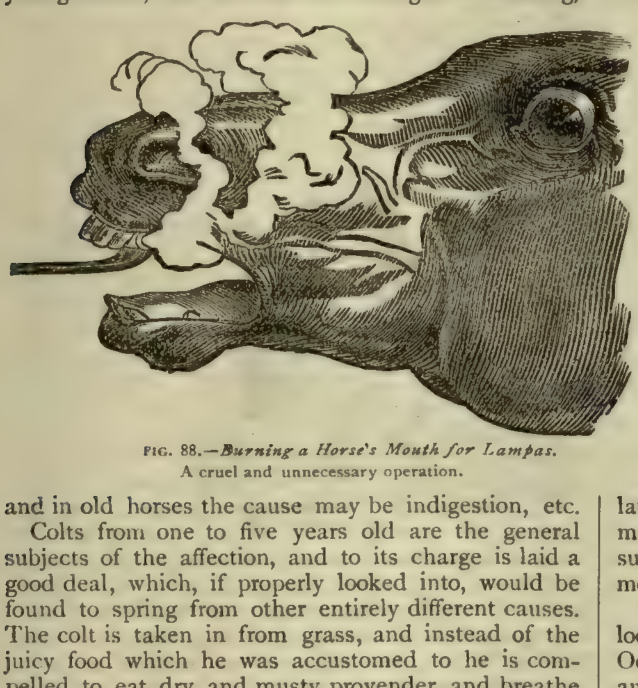


FIG. 88.—*Burning a Horse's Mouth for Lampas.* A cruel and unnecessary operation.

and in old horses the cause may be indigestion, etc.

Colts from one to five years old are the general subjects of the affection, and to its charge is laid a good deal, which, if properly looked into, would be found to spring from other entirely different causes. The colt is taken in from grass, and instead of the juicy food which he was accustomed to he is compelled to eat dry and musty provender, and breathe the contaminated air of the stable. Should we wonder if such a change would derange the digestion before the system becomes adapted to its new situation? Is it to be wondered at if, during the period of dentition, the gums should swell or the appetite become impaired under such a change?

Treatment. If in young horses the means advised in dentition, with slight cutting (scarifying) of the roof of the mouth with a sharp knife or lancet, will suffice. In old horses scarification, with a general attention to the health of the animal, will be indicated. In scarifying, cut only about an inch back of the teeth, and never deep. Just behind the third bar an artery lies near the surface, difficult to manage if cut through. Should, by accident, the artery be severed, put a strong cord around the upper front teeth close to the gums, and strain it as tightly as possible. This will generally close the orifice and stop the bleeding. As a wash for the gums, the following will be good: 1 ounce chlorate of potash, 2 ounces soft water.

It is a sad fact that many who handle and treat this noble animal resort to the barbarous practice of burning the bars of the mouth for lampas. Never, under any circumstances, burn the mouth. The animal never recovers from the effects, nor does he ever forget or forgive the inhuman act, as is evinced afterwards by any attempt to do anything about his head. A change to more cooling or solid food, and pure air in the stable, together with moderate exercise, will often effect a cure.

LEGS, SWELLED. This is a dropsical affection of the limbs. It may be the result of an undue deposit of serum or watery particles of blood, or of inflammation of the cellular tissue lying between the skin and bones in those parts of the legs most destitute of muscles.

A poor condition of the blood, or feebleness from great loss of it, may cause the legs to swell, since the fluids conveyed to the extremities by the capillaries accumulate there, because, in the absence of muscular activity, the veins have no power to return them. Diseased kidneys have a tendency to produce this disorder of the legs.

The inflammatory type may result from blows upon the lower leg; from concussion, or, in general, from anything that may arrest the action of the cellular tissue referred to, causing it to become dry and at length actually inflamed. It may also arise from the shifting of inflammation from other parts, as from the lungs, kidneys, etc.

Horses of coarse fiber and full habit, accustomed to exercise, if allowed to stand idle several days, will have swelled legs from the accumulation of watery fluid; and, if unattended to, the parts may soon be attacked by inflammation, when the tissues become involved and the disease assumes its more serious type.

Symptoms. The leg becomes greatly swollen and looks as though it was stretched to its utmost tension. Occasionally the swelling appears almost suddenly, and then as suddenly subsides, in which case the cause may be considered as having but just begun to operate, and if then treated it is easily managed. Again, it is sometimes sudden in its attack, and violent; the skin is hot, dry, and extremely tender, the pulse is quick and hard, while a peculiar lameness speedily sets in. In the more advanced stage of the disease small cracks appear in the skin, and from these exudes a watery matter of whitish-yellow color, similar to that which is seen in cracked heels. In this case it must be taken for granted that no treat-

ment, however skillful, can speedily remove it; that the improvement must be slow, and consequently much time required.

Treatment. If the disease seems to be merely undue deposit of serum, owing to confinement, nothing more may be necessary than to give the animal a dose or two of niter, daily, to act upon the kidneys, and to exercise him regularly to induce absorption.

When there is a tendency to swelled legs, which manifests itself in the morning, but disappears during the exercise of the day, an excellent preventive is to stand the horse in cold water to his knees half an hour just before night, or use the apparatus illustrated by Fig. 89, which produces numerous and constant streams or jets of cold water (or hot for fomentation) supplying itself upon the syphon principle from a pail in the manger. It is fastened to the limb by means of a strap and buckle. Care must be taken to dry the legs thoroughly, or the plan is plainly objectionable. If it should be found not to yield to this, administer the niter in moderation, as previously directed, and exercise the horse regularly, causing him to sweat, both of which have a tendency to diminish the accumulated fluid and to assist the veins and absorbents in their functions.

Fig. 89.—*Blackwell's Apparatus for Swelled Legs.*

In case the horse is in a debilitated condition, and the swelling is manifestly owing to the sluggishness of the circulation, he should be well fed on nutritious diet, and the leg or legs should be firmly, but not tightly, bandaged. Then prepare the following—a tonic and somewhat stimulating medicine:

8 drachms pulverized assafœtida,
1 ounce cream tartar,
2 ounces powdered gentian,
2 ounces African ginger,
4 ounces finely pulverized poplar bark.

Rub these ingredients together in a mortar until thoroughly mixed. Divide this into six doses and give one in the food every night till exhausted. The bandage should be removed from time to time and the limb subjected to a brisk hand-rubbing, or rubbing with medium coarse cloth.

If the disease has become chronic and the animal is much debilitated, the following more stimulating medicine should be used:

1 ounce powdered golden seal,
1 ounce gentian,
1 ounce balmony, or snakehead,
8 ounces flax-seed.

Mix well and divide into six doses, of which give one night and morning in the food. Bandage and rub alternately, as previously directed. If the disease does not speedily show signs of yielding to this treatment, apply every night, omitting the bandage, the following liniment:

2 ounces essence of cedar,
1 ounce tincture of capsicum,
1 pint new rum.

When eruption of the skin has taken place, so that matter exudes, and there is much fever, the following course has been found eminently successful and and must be at once adopted: Mix finely pulverized sulphur and rosin, in the proportion of two of the former to one of the latter, and give daily for three or four days six ounces of this mixture. It should be put into meal or bran, and the horse should be allowed no other food until he readily takes this. Bathe the parts with the following, rubbing well three times a day:

1 pint alcohol,
2 ounces capsicum,
2 ounces spirits camphor,
2 ounces spirits turpentine.

In these chronic cases it is best not to feed on very nutritious, or at least stimulating, food, unless the horse is in low general condition. Ordinarily pasturing will be best, when the season admits of it.

Liver, Functional Diseases of the. The liver is the largest secreting gland of the body, though not subject to many diseases. Without it digestion and animal heat cannot be maintained, and the waste or effete matter cannot be removed from the blood. So, therefore, when the liver is disturbed there can be no health in the rest of the system. This disease may be known by the yellow hue of the whites of the eyes.

Symptoms. In active congestions of the liver, which is the disease most usually prevalent, and this principally in the South, there may be sluggishness, irregular bowels, abundant liquid discharges of deep yellow or orange-colored dung. There will be extreme and painful prostration, the eyes will be sunken, the pulse excited, and the limbs will tremble. There may be colicky pains. If the last ribs are struck with some force, extreme pain will be shown. If the horse faints and there is a pallid mucous membrane, with quick and weak pulse, it may be conjectured that rupture of the liver has taken place. In this case, the end is death. The illustration we give will show the test, alike for ruptured liver and spleen.

Fig. 90.—*Test of Hemorrhage from the Liver.*

Inflammation of the liver is rare (see Jaundice). If congestion has proceeded to inflammation, the region of the last rib will be very tender. There will be quickening of the pulse; the mouth will be hot and clammy, the bowels may be at first loose, yellow and bilious, but soon become costive. The heat of the body is raised, patches may appear on the mucous membranes, and the limbs, especially the hind ones, will swell.

Treatment. In this case all bleeding should be avoided. Give as a purge a pound of sulphate of soda, aided by injections of warm water. After the bowels are opened, keep them so with small doses of Glauber salts, 6 ounces, or cream of tartar, 4 ounces, daily. If the horse eat anything it must be very light mashes or fresh grass. As the horse improves, give twice a day 2 ounces Peruvian bark, or 2 drachms twice a day of gentian. Apply mustard poultices to the limbs. Give 1 pound of sulphate of soda dissolved in a quart of water, to deplete the portal system and liver. Apply a blister over the region of the liver. Continue the sulphate of soda in doses of 1 to 4 ounces daily. Give three times daily:

2 drachms pulverized mandrake,
1 drachm blood-root,
10 grains leptandrin,
2 drachms golden seal,
1 drachm cream tartar.

LOCK-JAW, OR TETANUS. This terrible and painful affliction may be defined as a spasmodic contraction of the muscles of the body, often confined to one set of muscles alone. It is so called because the first symptoms of the violent spasmodic affection are detected in the jaw.

The case is generally caused by wounds or other injuries. Often a wound in the leg or foot, seemingly of the most trivial character, as the prick of a nail, will cause it. It is also produced by castration; nicking and docking; by hard riding or driving, and leaving the animal shivering in the night air. When it proceeds from a wound, it is called traumatic; when from no apparent cause, it is called idiopathic. It rarely occurs from wounds until they are well advanced toward being healed, though it may display its symptoms immediately upon or a month after the hurt, but generally from the sixth to the fourteenth day.

Symptoms. When brought on by a wound, as it generally is, the animal shows symptoms of nervousness. It fidgets in the stall, it does not rest, it becomes excited upon the approach of any person. Then the legs become stiffened and the animal can scarcely be made to move, the nose is extended forward, the tail is erect and quivering, the ears are pointed forward, the body feels hard, the membrana nictitans is stretched across the eye, the food is not eaten, the jaws are tightly shut. Any noise or bustle, or any attempt to operate upon or administer medicine to the animal, aggravates the case. Quietude is worth more than medicine. The torture is rendered worse by being compelled to move; every pain is felt. The frame is pressed together by the contracted muscles as if in a vise. Hunger prevails, but the jaws are tightly locked, and the animal cannot eat. In the earliest stages there will be stiffness and rigidity of the muscles near the injury, and the limb will be moved with difficulty. There will be excitement, the ears will be pointed forward, the head elevated, the legs stiff and stretched out; the horse will seem excited and yet obstinate to move; the tail will quiver and the skin and flesh will feel hard like a board. The lower jaw being taken in the hand and the head raised, if the haw projects over the eye, you have a case of lock-jaw.

Treatment. Give the animal a loose or box stall, and in the most quiet place possible, and where it will see no one except the attendant. Place slings beneath him so he can stand clear of them or rest in them at will. Remove all straw, litter or other sources of excitement, and avoid all noise or unusual movement. Keep the stable darkened and without other animals present. If the disease is produced by a wound examine it, and if contracted or containing pus (matter) widen it, and cover with a bread-and-milk poultice containing laudanum and belladonna, and give the following, which may be claimed as almost a specific for this often fatal disease:

1 drachm pulverized assafœtida,
1 drachm Indian hemp,
1 drachm opium,
1 drachm powdered capsicum,
1 drachm podophyllin.

Put all into a large tablespoon, take the tongue in the left hand and draw it well out, run the spoon well back over the root of the tongue, turn it over, let go the tongue and draw out the spoon. Repeat this dose every four hours for two days, then three times a day. If the animal can bear it, a thorough sweat with a blanket wrung out of hot water and covered with other blankets will do good. Feed with nourishing gruels if the animal can swallow; if not, give nourishments as shown in the engraving. Blister the spine early in the disease, and bathe the jaws well with equal parts spirits of turpentine, beef's gall, laudanum, oil of cedar, tincture of lobelia and sulphuric ether.

Attach a horse catheter to a stomach pump, pass the end carefully up the nostril and into the gullet as shown. If coughing is produced, withdraw the catheter and commence anew. If two feet are inserted without alarming symptoms, pump in only a quart of linseed oil. If the horse has fasted for some

FIG. 91.—*Mode of Feeding Horse Having Chronic Tetanus.*

time, and as the stomach can bear it, give more. This, however, must not be attempted while the disease is in its acute form, but after the disease has assumed a chronic form, it may be resorted to by a veterinary surgeon. Feed a gruel of boiled oats, corn meal and wheat bran.

LUNGS, DROPSY OF THE, results from valvular and other diseases of the heart. When the ear is placed to the chest, and the horse struck on the other side with the open palm, the sound is nearly the same as that heard in pneumonia; but it may be distinguished from pneumonia by the entire absence of fever, which characterizes this. It is usually beyond medical reach.

MAD STAGGERS: see Staggers, in this article.

MALLENDERS. This is a term used by many "horse doctors," and contained in the old books to designate a scaly condition of the skin back of the leg and opposite to the knee. It has a vague, uncertain meaning, and therefore should never be used to designate a certain disease. Another term equally indefinite is sallenders. This means the scurvy patches which appear in front of the hock. Though not serious, these are unsightly, and may result in scratches.

Symptoms. They first begin as a moist tetter, apt to escape observation until they appear in a roughened state of hair about the parts mentioned, under which the skin is scurfy, feverish and somewhat tender. Itching of much severity often attends them.

Treatment. Attend to the cleanliness of the horse, give moderate exercise, and twice daily,

¼ ounce hyposulphite of soda
1 drachm cream tartar
½ bucket water.

Rub the parts affected two or three times a day with the following ointment:

4 ounces glycerine,
1 fluid drachm carbolic acid,
2 ounces olive oil.

If the scurfy places have developed into suppurating sores, use, instead of the ointment, the following lotion, saturating them well twice a day:

½ pint animal glycerine,
½ ounce chloride of zinc,
6 quarts water.

MANGE AND ITCH. Itch, mange, and scabies are essentially local affections of the skin, occasioned by a small mite, or parasite, called "Sarcoptes equi," of which we present by Fig. 92, a largely magnified view of one. These breed and burrow in the skin. These parasites may appear in horses subjected to dirt and filth, and debilitated by hard living and ill usage, or by total neglect and lack of food. The acarus produces mange in the horse in the same manner as the human parasite produces itch in man; but it is of a different species and frequently so large as to be visible to the naked eye.

FIG. 92.—*Itch Parasite.* (Sarcoptes, or Acarus Equi.)

The eruptions ensuing on the skin of the horse, when subject to this affection, are also similar to that of man, and probably just as annoying. There are many instances where the itch from the horse has been transmitted to man, and when thus taken, it is quite impossible to distinguish it from the human itch.

The disease may be communicated to even sound animals, in good condition; in fact, the great majority of cases are thus contracted, as comparatively few animals are so utterly neglected or exposed to filthy influence as to become in themselves the generators of these mange-breeding insects. Yet, "it is well known," says Prof. Dadd, "that a healthy and clean horse may stand for weeks near a mangy one without taking the disease, showing very conclusively that the best preventive measures are those which promote health and cleanliness."

This is regarded as one of the most contagious diseases to which the horse is subject, and may be imparted not only to the horse, but to cattle, hogs and dogs, though it is asserted by good authority that none of these can in turn communicate it to the horse. The curry-comb, brush, collar or blanket which has been used on the mangy horse will produce infection in another; and to lie in the same stall or to rub where a mangy horse has rubbed himself, is almost certain to communicate it unless the animal exposed is exceedingly healthy and in active condition of body.

Symptoms. A horse affected with this disease in either of its forms will attract the attention of his attendants by rubbing himself whenever an opportunity is afforded.. The hair comes off, and the outer skin becomes broken into little scale-like pieces. These fall off or are rubbed off, and leave the parts raw and sore. The general appearance of the skin where the raw spots are not too numerous, is a dirty brown, and it is loose, flabby and puckered.

Usually, where the disease is engendered in the animal itself, it appears first in the neck, just at the edge of the mane, and on the inside of the quarter near the root of the tail. From these parts the eruption extends along the back and down the side, seldom involving the extremities, except in the very worst cases. Sometimes, though rarely, the ears and eyebrows are attacked and left bare. When it is the result of contagion, the horse may at first be in health; but the constant irritation makes him feverish, the hair falls off as in the first case described, leaving the skin in those places almost bare; and little red pimples appear here and there. Each of these contains a parasite, and the pimples are connected by furrows along which the parasites have worked their way. In time they increase in number and size, and from them exudes a matter which hardens into a scab. Under these scabs the parasites may be found, upon removing them and carefully examining in the sunlight. In the early stage of the disease, where it may be suspected, but is not yet fully manifest, it may be detected by placing the fingers among the roots of the mane and tickling the skin with the nails. The horse is so sensitive to titillation when in this condition that he will thereupon stretch out his neck and evince the most unmistakable pleasure as long as the tickling continues.

Treatment. The most effectual preventive, it will be readily inferred from the preceding statement of

causes, is cleanliness. In no case should a healthy animal be allowed to occupy a stable where a mangy one has been kept until it has previously been washed with water strongly impregnated with sulphur and chloride of lime—say half a pound of powdered sulphur and one pint of chloride of lime to each gallon of water. If the stable is thoroughly cleansed of loose litter and dirt, and all parts that may have been rubbed against by a mangy horse perfectly saturated with this solution two or three times, on as many consecutive days, there can be no danger in using it. Clothing, curry-comb, brush, etc., that may have come in contact with such animal, should be burned up.

If starvation, weakness, and general ill condition have caused the mange, a patent means for its removal will be found in giving him clean quarters and good nourishing food, which, however, should not be at first of a heating nature. Generous pasturage, unless the weather is damp, will be sufficient; otherwise, a full supply of oats and chop food should be given. It canot be too much insisted upon that especially while treating a horse for disease his stable should be dry, well ventilated and properly supplied with litter.

In cases of full habit of body, where the disease is the result of contact, and the presence of high fever is noted, do not bleed at all, but give him 20 drops tincture aconite in a little water, three times a day. The best medicine is that which most quickly destroys the life of the itch parasite.

Have the horse as thoroughly cleansed of scab and dirt as possible, with a wisp of hay, and by softly and lightly using a curry-comb. Then prepare a liniment of the following ingredients and in the proportion here given for greater or less quantities:

2 ounces of pyroligneous acid
1 quart animal glycerine;
¼ pound of sulphur;
1 ounce creosote;
1 pint turpentine;
1 ounce oil of juniper;
1 pint linseed oil.

Mix all together and shake well; and with this saturate the whole skin, as nearly as possible, rubbing in well with a soft cloth. Care must be taken to rub it in thoroughly. A little well rubbed in is better than much merely smeared on.

Leave him in this condition two days; then wash him well with warm water and soft soap; stand him in the sunshine if the weather admits, and rub with a wisp of hay or with suitable cloths until he is dry; after which, anoint him pretty well all over with the mixture described, and rub it in. This course should be pursued until a cure is effected. Two to four applications will generally be found sufficient, even in obstinate cases, if care is taken as to food and drink. The alterative will be found beneficial. Give three times a day,

1 ounce sulphur,
½ ounce gentian,
½ ounce blood-root,
½ ounce niter.

Care must be taken that the patient be not exposed to rain or heavy dews while under this course of treatment.

Megrims, a disease of the brain, occurring periodically, especially in hot weather, on exposure to the sun's rays. Megrims differs from epilepsy only in the absence of spasm; so for symptoms and treatment see that disease, page 761.

Mouth, Inflammation in and Around the. Irritation from wounds, bruises, poisonous or acrid plants, savage bites, injuries from the bit, twitch or rope around the under jaw and tongue, the use of calomel and other drugs, specific fevers, etc., may cause inflammation in the mouth or around it.

Symptoms. Difficulty in feeding and drinking, swelling and rigidity of the lips, blisters or sores in the mouth, swelling of the glands, etc.

Treatment. First find the cause whether from mechanical injury, irritating food or irritant drugs. If injured by alkalies, wash with vinegar and water, equal parts; if by acids, use lime water, or a weak solution of bicarbonate of soda; if from venomous bites, apply ammonia and give one-half ounce of liquid ammonia internally to the horse. For bite of venomous snakes, tarantula, etc., cauterize the wound, and in addition give whisky in full doses with a strong decoction of plantain. If there is simple inflammation, open the bowels with a gentle laxative, two ounce doses of magnesia, and wash with vinegar and honey. Give plenty of water and soft food. If there are ulcers, touch them with a feather dipped in one drachm carbolic acid mixed with one pint of water.

If there is much swelling keep the head tied up. If tumors resolving into matter (pus) appear, open with a lancet or knife. If there is sloughing of the parts (separation of dead flesh) wash with the following: one drachm permanganate of potassa; one pint of water.

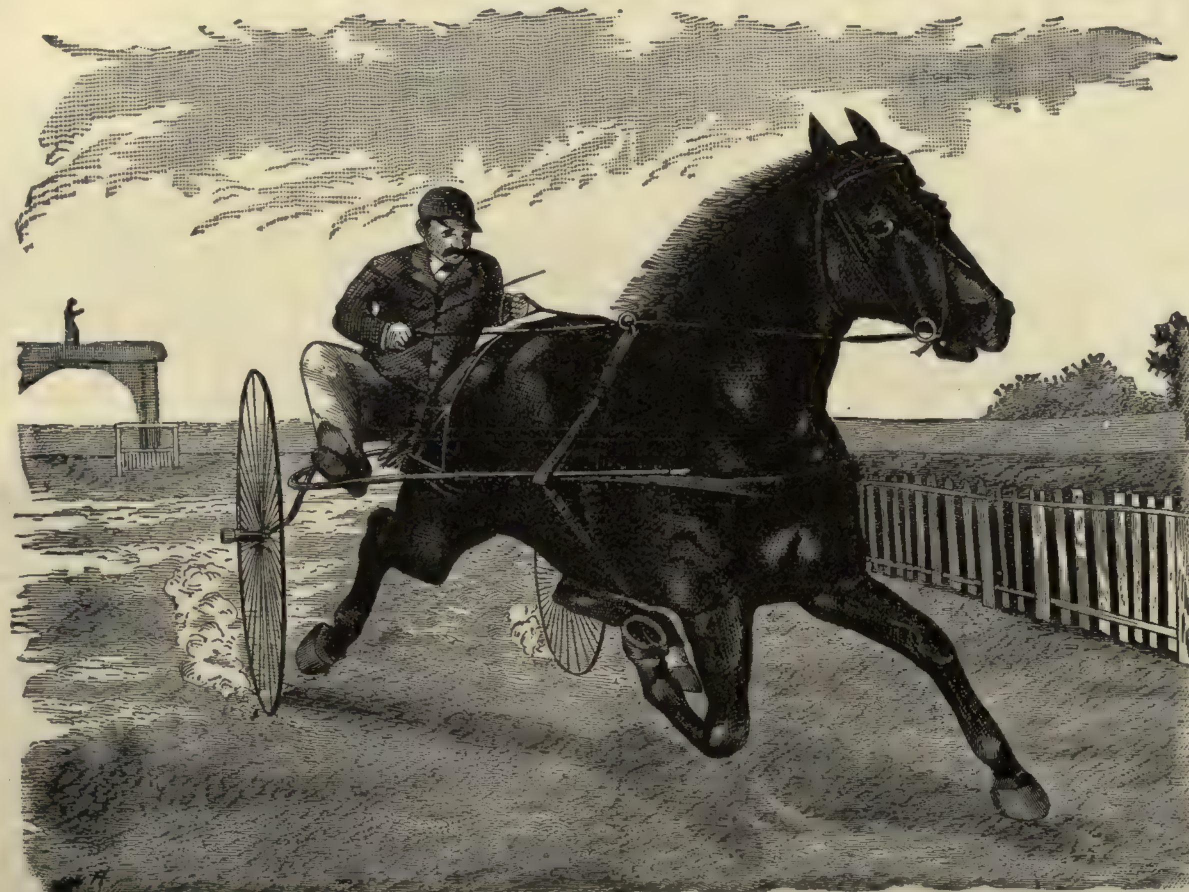
Mouth, Scald. This is a simple affection characterized by the horse slobbering or frothing at the mouth, as if salivated. Ignorant use of acid drenches or corrosive drugs by careless or ignorant persons, is the most common cause of this ailment.

Symptoms. Mouth red, often raw, lips in constant motion, moving up and down; saliva flows continually. showing the pain the animal endures.

Treatment. Give well-made gruel, either of corn or oat meal, and soft food if the horse can take it. Boiled carrots are excellent, if the animal will eat them. Prepare the following lotion:

3 ounces glycerine,
5 ounces powdered borax
2 pounds of honey,
1 gallon of boiling water.

Mix, let it become cold; hold up the horse's head moderately and pour half a pint into the mouth. At the expiration of half a minute allow the head to gradually drop so the fluid may flow over the inflamed surfaces. This should be repeated several times a day. Allow the horse to have a bucket of cold water suspended or placed before him, to cool his mouth in. Beyond this nothing can be done except to attend to



Chapman Bros., Chicago.

RECORD 2:11¾.

LITTLE BROWN JUG.

the general health of the animal, which should do no work until entirely recovered.

Nail Pricking. The prick of a nail in shoeing, or from having a nail enter the foot in traveling, often leads to the most serious consequences if allowed to proceed, such as ulceration, ending in quittor and other disabilities. An animal being lame without swelling, inflammation or other indication of strain or bruise, the feet should be carefully examined, and the nail or other substance cut out, at whatever pains it may take. Then drop in the orifice muriatic acid, and fill up with Venice turpentine, cover with tow and give the animal rest for a few days.

Fig. 93.—*A Good Subject for Bronchitis or Founder.*

Nasal Gleet. See page 774.

Nasal Polypus. See Polypus in this article.

Navicular Joint Lameness. This is commonly known as coffin-joint lameness and is of frequent occurrence. It is confined to the inferior surface of the navicular bone, over which the perforans tendon runs. The seat of the disease is confined to a small place, but by the frequency of the parts being brought into action, it causes great inconvenience to the animal. The navicular (boat-shaped) bone is at the navicular joint, which is below the fetlock and in the foot. Sometimes this bone becomes diseased, ulcerates and finally becomes fractured; at other times it becomes the seat of incrustations, or roughing, and thus irritates the flexor tendon. These affections always cause pain and lameness.

Navicularthritis is simple inflammation of this joint, resembling laminitis, and is very painful.

Symptoms. The horse thus affected will sometimes show lameness at the beginning of a journey. Sometimes for several miles the animal is lame, and sometimes the lameness is always present. A horse may show symptoms of navicular disease and recover from the first attack, but it soon returns and the animal is lame for life. In the early stages of the disease no heat or swelling can be discovered. Pressure being made upon the heel, the foot is quickly raised from the ground but gently put down, the toe always touching first. The shoe is always worn away at the toe and very little worn at the heels. The horse affected with navicular disease always stands upon the unaffected foot, in order to take the weight of the diseased member. Ultimately the sound foot becomes impaired and the disease is presented in both feet. In this case the action of the horse becomes changed. He steps short, scarcely bending the knees, and the heels scarcely touch the ground.

Treatment. The treatment of this disorder is seldom attended with success. In the early stages a blister applied to the posterior portion of the foot is sometimes of benefit:

2 drachms powdered cantharides,
½ ounce oil of turpentine,
1 drachm powdered euphorbium,
½ ounce oil of origanum,
2 ounces of lard; mix.

Two days after the application of this blister, the parts should be greased with hog's lard or olive oil. Setons put through the frog is often of service. Neurotomy, or division of the nerve which conveys sensation to the foot, when adopted in time, is often followed with good results,—in fact, it is the only means of relief which can be relied upon. This operation, however, should be entrusted only to the skill of a practical veterinarian.

Nose, Sore. The nose sometimes becomes sore from long-continued purulent discharges from any irritating substance introduced; but generally from grazing near some irritating weed or vine. Jamestown weed will often poison the noses of horses, yet the leaves, buds and pods are eaten with impunity. So-called "sneeze-weed" will also irritate the nose and cause it to become sore. As a rule, rubbing the nose with mercurial ointment, in which equal parts of sulphur and lard have been intimately mixed, or a weak solution of acetate of lead, will effect a cure. Apply with a mop.

Ossified Cartilages, or False Ring-bone, is a disease to which many horses are sometimes subject, and often exists in connection with ring-bone and side-bones. The chief causes are jarring, by hard driving over rough roads, or pounding on hard pavements, or any of the causes producing ring-bone or inflammation of the parts.

Symptoms. When the difficulty is new, there may be fever in the parts. Later there will be more or less enlargement of the back of the coronet and the heel, the parts feeling hard, irregular or lumpy. The horse is not always lame, but if driven over hard roads, the horse will show soreness and travel short after cooling off.

Treatment. In old standing cases but little can be done; rubbing the parts with oleate of mercury will reduce so much as is not already bony substance. In more recent cases, if there is heat, bleeding from the

foot will give relief. Then apply cloths dipped in cold water, to every quart of which has been added a half-pint of tincture of arnica. The inflammation being reduced, apply repeated dressings of biniodide of mercury. This will promote absorption, but a complete cure may not be expected.

OVER-REACH. This is the result of driving faster than the horse should go. Sometimes the horse fails to lift the fore feet quick enough, and the consequence is the inner portion of the hind-foot strikes the outer side of the coronet of the fore-foot, or higher, often producing a severely lacerated or contused wound.

Treatment. The only remedy is to clip the torn portions away and keep the parts washed with chloride of zinc, first cleansing the parts with water. Treads from calking may be treated by applying oil of tar and arnica.

PAROTID GLAND, INFLAMMATION OF THE. The parotid gland, which lies in the hollow that extends from the root of the ear to the angle of the lower jaw, sympathizes with inflammation of the upper part of the throat, and becomes hot, tender and swollen in almost every case of cold. It is liable to inflammation also from mechanical injury, and from obstruction of its duct. In bad cases of strangles or distemper, it will sometimes swell to great size and will break, a fistulous sore being the termination.

Symptoms. When the gland has become swollen it is easily discernible by sight or feeling. There is a hard and painful lump beneath the ear, with a softer feeling about its edges. The horse carries his head stiffly, chews slowly and with difficulty, and has some general fever.

Treatment. Place the animal in comfortable surroundings, attend to the state of his bowels, giving 3 ounces Glauber's or Epsom salts, in case of constipation, and a few warm mashes. Meanwhile, cover the affected gland with good poultice until the inflammation is subdued. If it results from mechanical obstruction, that obstruction must be removed before any permanent relief can be obtained; and this may require the removal of a calculus or stone from the parotid duct, which can be safely done only by an experienced surgeon.

If attention is not directed to the swelling until matter is forming, allow it to approach the surface and come to a head before attempting to open, to avoid cutting any of the ducts, which might result in a fistula. If the tumor becomes hard use iodine, almost to the extent of blistering.

Any wound inflicted mechanically, as a cut into the gland, or a prick with a stable-fork, must be treated externally according to its nature—the main point being to close it so effectually that the salivary fluid, which it is the office of this gland to secrete, cannot escape through the wound.

PARALYSIS. Loss of power of moving in some parts of the body. Paralysis may be confined to one or two legs. In such case it is called partial paralysis. When the horse has lost the power of standing, and the four legs are affected, then it is complete. Usually, however, it is confined to the hind parts, the haunches and legs, although it is sometimes present in both limbs of one side. The disease creeps on insidiously. Something wrong is at first noticed in the horse's manner of progressing; but with the hope that the evil will remedy itself, the proprietor waits until the disease is thoroughly established. The power to move with speed is entirely lost; the animal moves with a rolling or unsteady walk; sometimes one foot gets in the way of the other and threatens to throw the animal down. The horse which has paralysis is really an object of pity,—more so, when we know that its exertions in trying to please its master has brought upon

FIG. 95.—*Horse Suffering from Partial Paralysis of the Hind Leg.*

it an injury which is likely to remain with it through life. How sad it is to contemplate the horse once powerful and proud, possessed of fleetness that would outstrip the birds in their flight, reduced to a pace which the tortoise could leave behind! Surely such an obedient and affectionate creature is worthy of better usage than that which destroys its future happiness and deprives it of the power to serve its superior.

Palsy is principally confined to fast horses, or those used to extreme exertion. It is also occasioned by ergot in the hay or grain, and is then known as ergotism. An injury to the brain may cause paralysis of the opposite side of the body; and paralysis of the face, body or limbs may arise from pressure on the brain. Paralysis of one side of the body may result from disordered brain or spinal cord; and paralysis of the face, ear, eyelid, lip, tongue, larynx and tail may arise from local causes,—a current of cold air continually striking a part, bad-fitting bridles, collars or other parts of the harness.

Paralysis of the hind limbs may result from injury to the loin or back, from indigestion, from tumors, parasites, inflammation or softening of the spinal cord, from eating freshly ripened seeds of some of the grasses, as Lolium or darnel, flax, rye grass, perennial rye grass.

Treatment. The treatment of paralysis is not generally attended with satisfactory results, rest, good grooming and nourishing food being the best mode of treatment.

If the paralysis proceeds from an incurable disease it is to be treated by cold-water shocks and subsequent friction by rubbing. Among the best means is a current of electricity daily.

The folllowing ball has resulted in relieving the difficulty when it was partial paralysis of the hind-legs:

½ ounce poplar bark,
½ grain strychnine,
½ grain iodine,
1 drachm golden seal.

Work this up into a ball with powdered quassia and molasses, and give daily, gradually increasing the strychnine according to its effects, so that at the end of three weeks one grain will be given daily, and, if good effects are produced, a grain and a half may be given daily at the end of five or six weeks.

In the giving of nerve stimulants, as strychnine, when increasing the doses gradually, if twitching or slight cramps of the muscles are observed, cease giving for a few days, and then begin again with the smallest dose.

Where paralysis is confined to the hind extremities quite a number of cases have been cured by the following treatment: Take

3 grains pulverized nux vomica,
¼ ounce poplar bark,
½ drachm gentian,
1 drachm golden seal,
1 drachm blood-root.

Give three times a day in bran or cut feed. Blister the spine well, keep the bowels loose and feed good, nutritious food.

Peritoneum, Inflammation of the. This is characterized by great pain, and is the result of accidents and injuries, and at times surgical operations.

Symptoms. There may be colic, or steady pain. This will be acute when the affected parts are pressed. There may be chill and fever and loss of appetite. The pulse will be rapid and hard, and the breath quick and catching, but when effusion takes place the breathing will be deep and easier; the pulse will soften, the belly will be pendent, and there will be fluctuations when handled, from the water contained.

Treatment. In the early stages give full doses of laudanum; 40 drops fluid extract gelsemium every two hours, as may be needed to allay pain, and keep the bowels active. Apply mustard poultices to the abdomen. Frequent injections of thoroughly cooked gruel may be thrown into the rectum, but until the worst symptoms are passed the animal should take no food except gruel into the stomach.

In case absorption of the effusion of water in the cavity does not take place, which may be known by regular and ample staling, give 6 drachms nitrate potassa, daily, until the kidneys act. If tonics seem to be demanded, give daily doses of ½-drachm oxide of iron, and 2-drachm doses twice a day of Indian hemp.

Pleurisy. This is among the most painful diseases the horse is subject to. It is inflammation of the fine, glistening membrane covering the lungs and lining the chest. The pleura becomes swollen and rough, inflammation stops the secretion that during health smoothed and lubricated the surface of the membrane, and at every inhalation and exhalation those rough substancs are grated upon each other. The disease develops itself quickly; the violence of the attack is sometimes so severe as to be mistaken for spasmodic colic. This error, if made, will probably prove fatal to the affected animal. A little care, however, will guard against such an error. In colic the pulse is natural or nearly so, the legs and ears of a natural temperature, and the fits are of short duration. In pleurisy the pulse is full and strong, the agony never remits, the pain is continuous, the feet are icy cold, the body is hot, the muscles corrugate frequently and partial sweat breaks forth upon the body. A dry cough is often, but not invariably, present. By placing the ear against the side a grating sound is heard, which may easily be detected from the natural murmur of the lungs. Pressure made on the interspaces between the ribs produces the most agonizing pain. The animal paws with the front foot, expressive of acute pain, the breathing is short and imperfect.

Treatment. The same general care as in bronchitis and inflammation of the lungs is to be observed. If there is a chill, wrap the horse completely in blankets wrung out of hot water, and cover with dry ones. When removed, do so a little at a time, rubbing dry, and re-clothe warmly. If taken in its early stage, give ½ ounce laudanum, ½ pint linseed oil. This will often prove effective. If the symptoms increase, apply a strong mustard plaster to the chest. The bowels should be kept moderately open. The following will be found excellent in place of the last named remedy, if there is weakness and a rapid pulse, 70 to 80, and scanty urine: ½ ounce tincture chloride iron; ¾ pail water. Give as a drink twice a day. The effusion of water not yielding, the chest may be tapped with a trocar. Divide the skin with a lancet, between the eighth and ninth rib and near the lower end. Be careful the air does not enter. Draw off only a part of the water if it produces a shock. In this, one should have the advice of a veterinarian. Repeat in 24 to 48 hours. The animal should be kept up with sulphate of iron, 2 drachms, twice a day, in water, with stimulants and easily digestible and nutritious food. It is absolutely necessary, after effusion of water has taken place, that the urine should be passed freely to assist absorption. To this end the

following very valuable diuretic may be indicated:

1 drachm iodide potassium;
1 drachm carbonate ammonia;
½ ounce powdered gentian.

Give twice a day as a drench in a quart of water, or as a ball mixed with linseed meal and molasses.

Do not be persuaded to give any active purgative, as it would be poison during pleurisy. A yellow discharge from the nostril, occasionally streaked with blood, an imploring and anxious cast of countenance, seeming to appeal to human sympathy, is seen, the breathing is quickened, the pulse grows fast and feeble, with a leaden color of the nasal membrane. All indicate approaching death. Pleurisy, however, terminates in hydrothorax or dropsy of the chest. The causes of pleurisy are over-exertion, colds aggravated by change of temperature, external injuries, broken ribs, etc.

PNEUMONIA, OR INFLAMMATION OF THE LUNGS. This painful malady is brought on by crowding, a bad system of ventilation, and sudden changes from heat to cold. The horse, being driven far and fast, is left standing facing a cold wind, or perhaps in a pelting rain storm. The disease is ushered in by a shivering fit; scarcely any pulse is felt at the jaw, but as the disease develops itself the pulse is fast and thready, the mouth hot, the legs and ears deadly cold, the head hangs under the manger, and on applying the ear to the side a sound is heard similar to that made by a bellows, and the horse is made with difficulty to move. It may follow acute congestion of the lungs, this being really its first stage, though often not noticed by the ordinary observer as such. But congestion may occur in its sudden and fatal form from overtaxing a fat horse, or one otherwise out of condition. Suppose from hard driving or hard riding he hangs heavily on the bit; droops and staggers; if not pulled up he may fall; or getting to the stable he stands with dilated

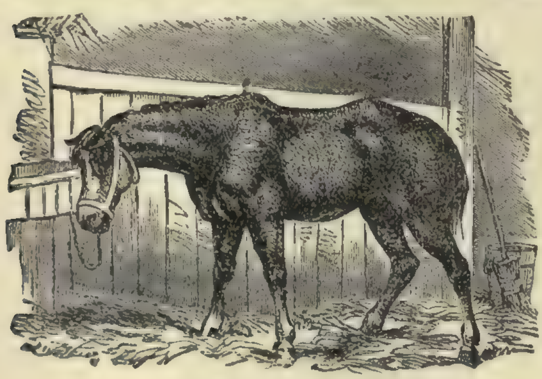


FIG. 96.—*Congestion.*

nostrils, extended head, quick, convulsive or labored breathing, eyes staring and blood-shot, his nasal membrane deep-red or blue, and pulse rapid and weak.

If such be the case there is no time to lose. Give 20 drops aconite every four hours in a little water; remove everything from the animal that may impede breathing, and allow him plenty of fresh air. Give an active stimulant, the easiest to be had,—whisky, four or five ounces, or a tumblerful in a half pint of water. Give, also, warm-water injections to relieve the bowels, and also active hand-rubbing of the legs, to promote circulation to the surface, while the body is enveloped in blankets wrung out of hot water and covered with dry ones. If the patient does not soon recover under this treatment, the case will be one of pneumonia.

Symptoms. If the disease does not succeed to the symptoms we have just described, those of acute con-

FIG. 97.—*The Position Assumed by the Horse During an Attack of Pneumonia.*

gestion, there will be a chill with shivering, and generally a dry cough, but deep, as though from the chest. There will be a hot skin, indicating fever; a full but oppressed pulse. The membranes of the eyes, nose and mouth will be red, and as the disease advances a yellowish or whitish matter will come from the nostrils. The horse will always stand with the legs wide apart. By striking the affected parts there will be flinching and even groaning, but, except at the seat of the disease, the chest will retain its healthy sound, while the diseased parts will sound dull and solid.

Treatment. Never bleed in this case. Bandage the limbs to keep them warm and give the body such clothing as the necessities of the case seem to require. Let the food be simple, laxative and cooling,—bran mashes, boiled carrots, linseed meal and soft, sweet hay. Do not check diarrhœa or profuse staling: it is an effort of nature to relieve the system. If there is fever, give plenty of water; if there is swift pulse and oppression of the lungs, give 20 to 30 drops tincture of aconite in half a pint of water, or 1 to 2 drachms of tincture of veratrum, in water, every two hours. If the pulse falls—if there is trembling sweats and a peculiar anxious expression in the eyes, discontinue. If there is great exhaustion, give moderate doses of

1 drachm golden seal,
20 grains carbonate ammonia,
10 grains capsicum;

but discontinue it unless good effects are seen. If there is much weakness, give 2 drachms each of camphor and carbonate ammonia, made into a ball with molasses and linseed meal, twice a day. In the

case of considerable congestion, strong mustard poultices will be indicated to be applied to the chest, or, in extreme cases, blister.

In this disease symptoms must be watched. Good nursing is of especial value, and as the animal begins to recover, give soft and easily digestible food, and assist the system with golden seal and carbonate of ammonia.

POISONING, INTERNAL. The cases of internal poisoning are more frequent, especially with horses, than is generally supposed. Among the most common are those arising from drastic or powerful drugs blindly given by the ignorant, either in disease or from some effect sought to be produced upon the general health. Of these, strong purgatives, diuretics and arsenic are the most common.

We wish to take this opportunity to again caution our readers about giving strong medicines. Do not rely too much on art and medicine for the cure of disease. Medicine, when properly given, undoubtedly aids nature in restoring the system, but as too often administered it is only a curse. In the hands of the ignorant it becomes a most dangerous weapon. Let your practice harmonize with the laws of nature; aid her in all her ways, but never attempt to force her to adopt our system for that of her own: she will never do it.

FIG. 98.—*Horse Suffering from Drastic Poison.*

Other causes of internal poisoning, besides those above mentioned, are from eating poisonous plants, either in the hay or in the pasture, the ergot of rye and other grain. Ergot sometimes attacks the grasses; thus, smutty grain, castor beans, hellebore or poke root, etc., may be mentioned as common. Among minerals, sulphuric, nitric and muriatic acids; and all the concentrated vegetable acids are caustic and irritant poisons. They are never taken unless forced down. The antidote to these is large doses of powdered chalk, whiting or lime water. In the absence of these give weak lye until relief is obtained, and follow with a full dose of linseed oil.

Alkalies destroy the tissues. If quick-lime, caustic potash, strong lye or washing soda has been taken, give vinegar and water to neutralize it and follow with a dose of oil.

Horses that are dosed with whisky "to give them strength" sometimes show alcoholic poisoning. Never give it except as a stimulant, as advised for disease.

Forty grains of arsenic will kill a horse. The symptoms are intense thirst, quick, feeble pulse, great pain in the bowels, with purging sometimes, irregular breathing, faintness, paralysis, convulsions and death. Give full doses of oil, in which is mixed two, three or four spoonfuls of carbonate of iron, as the case may seem to demand.

Corrosive sublimate is a fatal poison; a quarter of an ounce will kill a horse. The symptoms are violent pain, intense thirst, effusion and blood discharges from the bowels, trembling, salivation, ending in stupor and death. Give the whites of a dozen eggs stirred in a little warm water. Follow this with linseed tea or with mucilage of slippery elm.

Litharge and sugar of lead are poisonous. The symptoms are protruding tongue and foaming at the mouth, staggering and sometimes dashing wildly to and fro. Give large doses of purgatives, to be followed by from one to two ounces of iodide of potash daily for seven or eight days.

Keep the animal quiet and in a dark place, and give a quart of sweet or linseed oil. Follow with powdered charcoal mixed with mucilage. Move the bowels by means of injections as quickly as possible, and if exhaustion ensues, give stimulants (whisky) freely. Tartar emetic in doses of 2 to 4 ounces will sometimes kill a horse. The symptoms are thirst, vomiting and purging, staggering, colic, salivation, convulsions and paralysis. Give strong tea, followed as soon as you can get it, with a decoction of white-oak bark. For the vomiting and purging, if they continue, give ounce doses of landanum in a little water.

Poisoning from aloes, castor oil or croton beans, is known by excessive bloody purging and straining, cold ears and legs, hot, dry mouth, and bloating. Give 2 ounces of laudanum in a quart of linseed tea, and if necessary give a like dose by injection.

In poisoning from ergot or other diseased and injured foods, give full doses of linseed oil, both by the mouth and as injections, with stimulants afterwards; and tonics, say 8 grains of quinine three times a day, during recovery.

For poisoning by white hellebore or Indian poke, give whisky in pint doses. The same means may be used in poisoning by laurel, followed by injections of salt and water, and also by linseed oil given as a purge.

In case of poisoning by opium or laudanum, pour cold water on the head from a considerable height,

and keep the animal in constant motion. For poisoning with Jamestown weed (jimson), known by faintness, giddiness, followed by convulsions, paralysis and stupor, give a quart of linseed oil with 2 ounces of laudanum. Give also an injection and subsequently stimulate with pint doses of whisky.

Tobacco poisoning is shown by purging, offensive dung, colic pains, weak pulse, prostration, convulsions, and stupor. Give a purge of oil, and follow with pint doses of whisky in slippery-elm or linseed tea.

POISONED SKIN. There are many weeds and plants that sometimes cause irritation and poisoning of the skin. The means of cure is to move the bowels and apply some soothing wash to the irritated parts. For injury from poison, wash with a decoction of golden seal three times a day, oiling the surface at night. In the morning wash away the oil with soap and warm water, and use the golden seal again. A solution of sugar of lead is also a specific for vegetable poisoning of the skin.

POISONING FROM STINGS. It is not infrequent that animals are badly stung, or bitten by venomous serpents or insects.

For the stings of insects, as wasps, hornets and bees, wash the stings repeatedly with onion juice or ammonia, 3 parts to 1 part of oil. Washing with salt and water is also an excellent remedy.

In some portions of the West, and especially in the South, gnats and certain species of venomous flies come in summer. The remedy against them is to use petroleum. When these insects are very bad, it is usual to smear the unprotected part of the animal's body with a mixture composed of 1 part of tar to 2 parts of lard. We prefer equal parts of petroleum, lard oil and tar; or, smear the sting with equal parts of aloes, strong decoction of walnut leaves, lobelia and capsicum.

For the sting of centipedes, scorpions, tarantulas and other venomous spiders, give the following:

½ pint decoction of plantain,
1 teaspoonful of ammonia,
1 pint of whisky,
1 pint warm water.

Wash the bitten part with ammonia frequently and keep it soaked therewith by means of a sponge. Bites by venomous serpents are to be treated in the same way. The wound should be well cauterized, when first discovered, with an iron at a white heat.

POLL-EVIL. This affection consists of a deep-seated abscess or fistula, with numerous sinuses, situated on the back part of the head, or uppermost portion of the neck, immediately behind the ears, and gets its name from its location about the poll. If not attended to in its early stages, the surface of the first bone from the head, or that of the joint between the first two bones, becomes inflamed, and the joint or joints involved.

The most frequent causes of poll-evil are, the horse throwing up his head and hitting the beams of the upper floor of his stable; low doors; a blow upon the poll by a brutal driver may very readily produce it; and much slighter causes, often repeated, result in this affection; as, forcing on of a tight collar day after day; hanging back and so bruising the poll with bridle or halter. In fact, any sprain or bruise of the parts may bring it on, and it is frequently the result of bad blood.

Symptoms. The first symptoms are shown by a reluctance on the part of the affected animal to move his head; the nose is pointed forward; the hay cannot be taken from the bottom of the manger, from the inability of the horse to bend his neck; a dull appearance about the eyes; a sluggishness of movement. All these are sometimes observed before any symptoms of the disease may be discovered about the head.

Sometimes no notice is taken of its existence until considerable swelling and even an unwholesome discharge have set in; but more frequently an oval tumor is discovered, hot, tender, situated directly in the region of the nape of the neck, but generally inclining to one side. In the milder form this tumor is evidently superficial, and the horse moves his head with comparative ease and freedom; whereas, in the more advanced stage, he carries it stiffly, and every movement of it or the neck causes great pain. Sometimes the disorder is so deeply-seated that the tumor is not developed sufficiently to make much outward show. It is much likelier to discover itself plainly as a well-developed swelling when the hurt is superficial. In any case, it must be examined with the fingers to determine this point. Place the fingers gently upon it, and give the animal time to recover from the little scare into which this touching of a sore at first gives him; then gradually press upon the part. If the hurt is near the surface, he will flinch quickly; if deeply seated, he will be correspondingly slow in showing evidences of pain. If suppuration has already set in, it can readily be known when near the surface by a sort of fluctuating feeling; but this fluctuation can scarcely be felt at all if the matter is deep-seated.

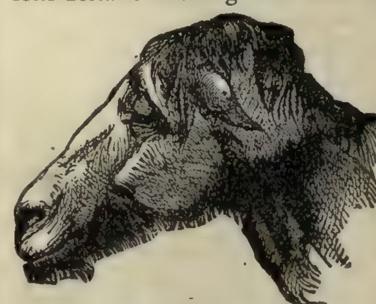


FIG. 99.—*Poll-Evil During First Stage.*

Treatment. If discovered when there is nothing more than a swelling, no matter having yet been found, remove all tendency to general feverishness by giving purgative medicine according to evident fullness of condition. Allow the horse to rest and put him on moderately light diet. Then apply three times a day the following absorbent lotion:

1 ounce spirits turpentine,
2 ounces tincture iodine,
2 ounces oil cedar,
2 ounces sulphuric ether,
2 ounces spirits camphor.

As soon as matter can be felt, have ready a large and very sharp knife; twitch the nose to prevent struggling; then open with a quick, steady and strong

ROYAL GEORGE.

Owned by Ira A. Hill, Chicago, Ill.

Record 2:26½

sweep of the blade through the tumor, being careful to have the wound open at the lower point of the tumor, so as to provide for more easily draining it of matter that may thereafter form. Be careful not to cut the tendinous ligament that runs along the neck under the mane. If the matter appears to be on both sides, open the places separately, so as to leave this ligament undivided. It may, if absolutely necessary, be severed between the second bone and the head, and the head be not materially weakened, since the stress is on the second bone, and the divided ligament, if healthy, will soon heal again; but it is best to avoid all risks; and if at all convenient, the aid of an experienced veterinary surgeon should be had when it becomes necessary to use the knife.

The wound must now be cleansed by being syringed daily with a stimulating wash (one-half dram chloride of zinc in one quart of water), until a healthy discharge sets in, and evidences of healing begin to manifest themselves. Nothing further will then be necessary than to keep the parts clean by daily sponging with warm soapsuds.

Fig. 100.—*Scalpel.*

It sometimes occurs that before remedial measures are resorted to, not alone the fleshy, but the tendinous, ligamentary and bony structures have become involved, and the disease has assumed a desperate character. If further neglected, the spinal cord is likely to become diseased, and the case hopeless. If, upon opening a tumor, the matter is found to flow in great quantities, resembling melted glue, with something of an oily consistence, it may be known that the disease is deep-seated and dangerous; and the probe should be employed to find whatever cavities may exist. If any are found, the knife should again be employed, and another cut made, smooth down, and in the same direction as the first, to prevent all rough and hacked walls, till the lowest depths are reached. Then cleanse the wounds with warm soapsuds, using a good gum compress syringe; and dress with a mixture of equal parts of spirits of turpentine, linseed oil, and pyroligenous acid.

In the more desperate cases, numerous openings are formed, and these discharge a matter resembling the white of an egg, which adheres to the surrounding parts, and gives to the animal a most repulsive appearance. In this case the knife should be used so as to take in at one sweep the greatest number of openings, and then the other openings should be connected by cuts with this main channel; after which the wound should be cleansed as previously directed, and dressed with the mixture prescribed—spirits of turpentine, honey, and tincture of myrrh.

After matter has formed, the knife is the last means of curing the horse; and, in the hands of the skillful man, it is a merciful means. The operation is brief; and the relief is more speedy than can otherwise be obtained. Let no one attempt it who is not acquainted with the anatomy of the parts.

A horse that has once had the poll-evil should never afterward have a collar thrust over his head, or be hauled around with a halter or any other head-gear pressing upon the part. The poll will long remain tender, and a return of the disorder is likely.

Polypus. If this excrescence can be made visible by causing the horse to cough, it may be removed by a ligature or a pair of polypus scissors by any physician, if no veterinary surgeon is at hand.

When the polypus is entirely concealed from view, tracheotomy may have to be employed before an examination can be made, since the polypus may have gone so far as to oppress the breathing. Thus, in all cases of polypus, unless it be so low that a ligature can be employed to strangulate it at the neck, it is altogether better to call on the aid of a veterinary surgeon.

Profuse Staling. See Diabetes, page 759.

Pumice Foot. This is usually the result of neglected founder. Sometimes it arises from bruises upon the inner sole. From injuries to the foot blood is secreted between the outer and inner, or sensible sole. Suppuration takes place and the outer sole drops off. Little can be done in the way of treatment. Careful shoeing affords the best means of relief. See Hoof Rot, page 780.

Quarter, False. This difficulty differs materially from sand crack, inasmuch as it is a deficiency in the growth of the horn of the hoof extending from the coronet to the sole. It is a gap in the wall of the hoof rather than a crack. It is produced from a deficient secretion of the horn-making power, owing to previous quittor, frost-bite or other injury to the coronet.

Treatment. The principal means to be used is careful shoeing with a bar shoe. If the injury has been recent, stimulate the coronet with a mild blister, or if there is a wound, cut the edges with a knife and dress with weak carbolic acid water, to induce a healthy growth of horn. In old cases, all that can be done is to fill the fissures with gutta percha, and protect the weak hoof with a bar shoe.

Quittor. This is caused by wounds upon the sole or parts of the sensible laminæ. It is accompanied by great pain and lameness. The inner portion of the foot is chiefly composed of cartilage. Cartilage is a non-vascular substance, which, during health, is without sensation, but in disease renders the most acute anguish. The outer portion or horn is strictly inorganic, and is incapable of action. Therefore any pus or other foreign matter, which may be deposited beneath it, cannot penetrate even the thinnest layer. Knowing this, the reader may conjecture the suffering imposed, when suppuration takes place at the sole of the foot, and being confined within the horny wall has to work its way upwards until it breaks out upon the coronet.

Symptoms. Quittor will be known by a large tumor being formed upon the coronet. The slightest pressure upon the part calls forth the most energetic resistance on the part of the horse. A recent wound or ordinary abscess of the coronet may be mistaken by the inexperienced for quittor, especially if any lameness attends it; but a little examination will readily disclose the true nature of the case. From a simple wound there is not apt to be a fetid discharge of so unwholesome a character as that which oozes from the sinuses of the quittor, and the parts must be more or less swollen, and yielding to pressure; whereas, in quittor the surrounding tissue is hard, though it has taken on a peculiarly unhealthy action, and probing will discover the presence of a sinus or of sinuses of more or less depth. There is almost always lameness; the coronet is somewhat swelled into a ridge around the top of the hoof, and about the center of which one or more small orifices are found, that discharge in small quantities offensive matter—sometimes rather thin and watery, again thick and having a curdled appearance.

Treatment. The first step is to discover, if possible, the cause; and if this is still operating, to make every effort in your power to remove it. Sometimes there is such swelling around the hoof and such excessive tenderness that the animal cannot bear to have the foot handled except in the gentlest manner. In this case, apply a good softening and cooling poultice, and keep him as still as possible—renewing the poultice as often as it begins to grow dry and hot—until the inflammation is something reduced, and the extreme tenderness overcome. Then remove the shoe and withdraw every nail if it can be done. If the trouble has been caused by a nail, and the nail can be removed, there is already something of a dependent opening made by which the accumulated pus may escape, and this opening must be enlarged by farther paring away the hoof, so as to reach the softer part, that can be more readily cut with a keen knife.

A small probe, or bougie, should be inserted from above, and worked to the lowest depths of the sinus. If this extends far towards the base of the foot, the prime object should be to get an opening from below to meet it, no matter what may have been the cause —whether a prick, a bruise, or irritation caused by other foot diseases. This dependent opening established and kept open, the pus will in time be evacuated, and the foot will return to its healthy state, unless the joints have been attacked, which seldom happens, when a cure is scarcely to be hoped for

If the disease is of long standing, the internal surface of the sinus or sinuses has become more or less callous, and a stimulating lotion must be injected with a syringe every day, composed of one drachm chloride of zinc to one pint of water—increasing the chloride gradually to two drachms.

This treatment will suffice. The main trouble, however, is to make the dependent outlet. In case this cannot be done owing to the shallowness of the sinuses from above, reduce the inflammation by poulticing, as previously directed, and then inject this somewhat caustic solution into each channel or pipe:

5 grains bichloride of mercury,
1 ounce spirits of turpentine,
20 drops muriatic acid.

Sometimes the trouble rises from a gravel having insinuated itself between the shoe and the sole, and creating a bruise or corn. This may be ascertained by removing the shoe and seeking for a spot unnatural in appearance, hot and tender on the sole. If found it ought to be pared down so as to reach the more sensitive part of the foot, and, if possible, to discover and liberate matter.

In any event, a complete cure requires much time and a more than ordinary exercise of patience and care.

If the general health of the animal is scrupulously attended to, it will materially assist in the management of the local disorder.

RABIES: see Hydrophobia, page 781.

RAT TAILS: see Surfeit.

RECTUM, INFLAMMATION AND BLEEDING OF THE, is a difficulty that often accompanies or follows inflammation of the bowels. There will be heat and swelling, with or without protrusion and bleeding of the rectum. Wash the parts with a weak solution of salt and water, and also use injections of the same as often as may seem necessary. If this does not give relief add a slight infusion of chlorate of potash and golden seal.

RHEUMATISM. Perhaps in no disease of this faithful servant of man are there so many mistakes made as in rheumatism, both in the nature of the affection and mode of treatment. Rheumatism and founder, whether acute or chronic, are often treated as the same. The chief difference between acute or inflammatory rheumatism and acute founder is this: In the former there is fever, severe pain and great excitement, and it is located in the joints of the legs; while in founder there is pain, but no fever, and the disease is confined to the feet alone. In chronic rheumatism such mistakes may have some excuse, as in it there is no fever; there is, however, an inability to move, as if the animal was sprained over the loins. Rheumatism is a peculiar form of inflammation attacking the fibrous structures of the body, such as the joints, tendons, ligaments and muscles, and is accompanied by stiffness, pain, shifting from place to place. Exposure to cold, wet or drafts, especially when the system is overworked, are the causes of this painful affection.

Symptoms. In its acute form there is dullness, followed by extreme lameness in one or more of the limbs. There is tenderness and then swelling of the joints, tendons or muscles, at first soft, then hard. There may be fluctuations from excess of synovia (joint fluid). With the inflammation there is fever. The pulse is full and hard; the mouth is dry and clammy; there is hurried breathing, scanty urine and costiveness.

In the chronic form the symptoms are the same as in the acute, but not so pronounced, and in this form

it is unattended with fever. It may appear only upon undue exposure, or in damp, lowery weather, and disappear again upon the recurrence of fine weather. Chronic rheumatism is also less inclined to shift from place to place.

Treatment. For rheumatism in its early acute stage relieve the bowels by laxative medicines, say 4 ounces of aloes. Put the animal in slings, as for lock-jaw, and clothe him from the hoofs to the ears in flannel. If practicable the first thing is to fill the box in which the horse is kept with steam, keeping it up for an hour. If the pain is extreme lessen it with ounce doses of laudanum.

Give the following three or four times a day as a drench in a pint of gruel:

20 drops extract gelsemium,
1 ounce bicarbonate soda,
1 ounce salicylic acid.

If this cannot be obtained, give the following, at a dose, night and morning:

½ ounce powdered saltpeter,
1 drachm powdered colchicum
1 ounce oil of turpentine,
Mix in ½ pint linseed oil.

For rheumatism in its chronic form the following will be found to be valuable, used internally:

1 drachm tincture colchicum,
1 ounce powdered carbonate of potash,
1 ounce powdered saltpeter,
2 drachms iodide of potash.

Give in one and a half pints of water.

As a liniment for the joints and other affected parts, to be afterwards wrapped in flannel, the following is excellent:

1 pound compound soap liniment,
2 ounces liquid ammonia,
2 ounces laudanum,
2 ounces tincture capsicum.

Rub in with as much friction as the horse can bear.

A soothing and stimulating embrocation, when so severe measures as the foregoing are not considered necessary, may be made as follows:

1 part tincture capsicum,
1 part spirits camphor,
1 part solution of ammonia,
1 part olive oil.

Mix and apply by rubbing in.

Ring-Bone. Ring-bone is similar in character to bone spavin: in fact it is the same disease, except differently situated. It is the ossification of the periosteum on the front part of the foot, midway between the pastern joint and the hoof. It will first be discovered by a slight enlargement, accompanied with lameness. If not arrested in the early stage of the disease, it will not only produce anchylosis but the osseous deposit will become very large, producing a bad eye sore. In such cases, to stop the bony growth and remove a portion of the enlargement and also the lameness, take 1 drachm finely pulverized corrosive sublimate, add this to 3 drachms of Venice turpentine, mixed well together. Apply a teaspoonful to the enlargement, rubbing it in well. Two applications are sufficient. Grease well with hog's lard two days after the application. This will destroy the roots of the hair and leave a bare spot, but it is a positive cure.

Ringworm. There are two kinds of ringworm,—one simple, of spontaneous origin, and non-contagious; the other contagious. The first is usually the result of indigestion or confinement in close and foul apartments, as in filthy and ill-aired stables, railroad cars or ship holds. The latter, or contagious kind, is found on horses of good condition, as well as on diseased and neglected ones, and is produced by vegetable parasites in the hairs and hair-glands. It may be communicated from man to animals and from animals to man.

Symptoms. It appears on the face, neck, shoulders, sides, and sometimes elsewhere. When non-contagious, it may usually be known by its appearing as an eruption of small blisters, about the size of a wheat grain, on inflamed patches of skin. These assume a circular form; and if not seasonably attended to, the circle enlarges and covers fresh portions of skin.

The contagious type appears in round, bald spots, covered with white scales, and surrounded by a ring of bristly, broken or split hairs, with scabs around the roots, and some eruption on the skin. These broken hairs soon drop out, and a wider ring is formed. The most marked characteristics of the contagious or parasitical ringworm is the splitting of the hairs in the ring, and the perfect baldness of the central part.

Occasionally the patches, in either form of the disease, assumes an irregular rather than a really circular form.

Any attack of this sort is usually marked also by the horse's rubbing and scratching himself against the sides of his stable, or convenient objects outside; but this is not to be depended upon as a marked symptom, since it likewise indicates surfeit and mange.

Treatment. If a simple, non-contagious case, shave the hairs as closely as possible from the affected part, and paint with tincture of iodine; or, if scratches or little ulcers have appeared on the patch, rub it with the following stimulating and healing ointment: 10 grains nitrate of silver; 1 ounce lard.

If it is a case of the contagious or scaly variety, wash the patches thoroughly with soft soap, and then rub every day with the ointment recommended for mange.

Roaring, Whistling, etc. This is when a horse emits any unnatural noise in traveling, whether he be simply thick-winded or emits the peculiar noise when hard urged, or the sharp sound denominated whistling and piping similar to roaring, but a more confirmed type, occasioned by a strong closing of the rima glottidis. Whistlers are simply chronic or confirmed roarers, as roaring precedes whistling. Both impediments to breathing are produced by atrophy or wasting or degeneration of the muscles whose office it is to dilate the larynx.

Thick wind is from an inflamed and thickened condition of the smaller and lower branches of the breathing tubes, whistling from a narrowing or constriction of the windpipe. Roaring, again, is of two kinds, acute and chronic. The first is, in comparison with the chronic and confirmed state, light and trivial. Fortunately it is comparatively rare in the United

States, but quite common in England, and essentially a disease of high or well-bred horses.

Causes. Any and all of these impediments are produced by various affections, and some of them, as thick wind and roaring, are considered by some as hereditary. Laryngitis, distemper, bronchitis, pneumonia, tumors, diseases of the nasal membranes, and tight reining are the chief causes of this affection. Roaring and whistling are decided unsoundness. So also should thick wind be considered, if the horse is to be used for any other than slow work.

Symptoms. There are many differences of opinion respecting wind, particularly as to whether some horses are or are not roarers and whistlers. Generally the examination of horses in regard to the condition of their wind is conducted in a careless way, and all that is thought necessary in that respect is to make the animal take a sudden inspiration, generally by holding him short and striking him suddenly, or threatening to do so, when it is thought, if he is a roarer, he will give a prolonged grunt characteristic of the disease. Animals that do this, from the peculiarity of the noise they make, are called, in the language of some horsemen, "bulls." However, this test is a most fallacious one. There are many horses inveterate roarers that make no grunting noise in being held and suddenly struck, and that yet, on being ridden or driven at such a pace as to accelerate the breathing, will be found inveterate roarers. In the majority of instances those horses which are called whistlers, from the character of the sound they make in hurried breathing, emit it not on being held still and struck; to detect their defect, locomotion, more or less rapid, being necessary. The only reliable test to ascertain whether, in obscure cases, a horse is either a roarer or a whistler, is to have him galloped to such an extent as to distress the breathing.

Treatment. Remedies are of but little avail. In slight cases and during the earlier stages, swabbing the larynx with a decoction of tobacco, may be done by means of a small, soft sponge fixed on the end of a piece of whalebone, the sponge having a chord attached and longer than the handle, so as to be recovered if it comes off. Pads have been attached to the nose-band of the bridle, so as to lie on and compress the false membrane of the nose. These have given relief if the horse is not required to make extra exertion.

When roaring is caused by paralysis of the muscles of the larynx, hypodermic injections of strychnine every two or three days in half-grain doses have given relief. (See figure on page 230.) Relief is also sometimes given by rubbing on daily, or once in two days, the following:

1 drachm iodine,
2 drachms iodide potash,
2 ounces lard.

Mix at a heat little more than to melt the lard by placing in a vessel of hot water. In all of the diseases mentioned, good, easily-digested food should be given, and sufficient water to satisfy the demands of the system, and the animal should not be put to work within an hour of eating his food.

Rupture, or Hernia. Mechanical violence is done to the stomach and bowels in various ways, but in every case the symptoms will be those of severe inflammation of the serous coat, speedily followed by death, if not relieved when relief is possible.

The rupture most commonly seen is of the bowels and omentum. The omentum is the membranous covering of the bowels or the caul. The bowels may pass through the caul by rupture, or the bowels and involved caul may, it is possible, pass through the mesentery, the membrane retaining the intestines in their proper position.

If the rupture is into the chest, it is called diaphragmatic, and may occur from a violent shock, as in leaping or in "bucking," as jumping stiff-legged is called. In bad cases death is sudden from suffocation. In the slight forms there may be only difficulty of breathing. with lifting of the flanks, as observed in heaves. The only remedial means to be used are to give anodynes and rest.

Hernia, or injury to the scrotum, can always be cured in the male by castration. The most simple manner of operating on a colt for successfully reducing umbilical hernia, is as follows: It is not necessary to cut the colt or have him submitted to any restraint beyond that of having his head held. The hernial tumor is emptied by forcing its contents into the belly; the loose integuments forming the pouch is gathered into the left hand, while the right surrounds it by a ligature placed as closely as possible to the abdominal parietes, and drawn sufficiently tight to interrupt the circulation. On the second day there is considerable swelling; around the parts below the ligature it feels cold, and often clammy and moist; when the ligature has not been sufficiently tight, or the pouch so large as to require strong compression for arresting the circulation, it is hot and tender. In all cases more than one ligature is necessary. Generally, on the third day, the first cord is loose, the circle it embraces has been reduced partly by absorption and partly by incision, and there is no longer any compression. If neglected after this, the tumor increases rapidly in size and is attached by a neck whose diameter is limited by the ligature. It is necessary, therefore, to renew the ligature twice or thrice a week. The second, third and fourth, should so many be required, must be placed above that which preceded and close to the abdomen. The whole will drop off in from ten to twelve days, leaving a flat granulating surface, which readily heals. No further treatment is required.

Ventral hernia is known by the contents being movable and gurgling and easily pressed back to their place. If recent, the animal should be thrown on its back, using ether or chloral to keep it quiet, returning the protrusion, padding the orifice, and covering with strong factory muslin wound round the abdomen and laced along the back, the bandage being kept in place by bands fastened in front and carried to a collar worn on the neck. Except in case of very valuable

animals treatment scarcely pays, unless a veterinarian can be employed who understands anatomy.

SALIVATION. This is an increased flow of siliva, the result of mercury and other medicines. The second crop of white clover, late in the fall, or after slight frost, is a frequent cause. It occurs as a free discharge of saliva in frothy masses or in stringy filaments, with frequent swallowing, thirst and indigestion.

Treatment. Remove the cause. If it be from alkalies, wash the mouth with weak vinegar; if from acids, use lime-water; if from caustic salts, use white of egg or tea of slippery-elm bark. If there is inflammation with costiveness, open the bowels with injections of warm water or soapsuds, and wash the mouth frequently with vinegar and honey. If this does not effect a cure, wash the mouth with alum water. If there are ulcers, touch them with a feather wet with the following: 1 grain lunar caustic, 1 ounce distilled water. If there are tumors with pus, lance them; if there is sloughing, wash with the following: Strong decoction of golden seal, or 1 drachm carbolic acid, to 1 pint of water. Give plenty of cool water, so the animal may take it at will, and feed with soft or boiled food, and if there is much swelling, keep the head tied up.

SALLENDERS: see Mallenders, page 790.

SAND CRACK. Sand crack is a fissure in the hoof, which begins at the coronet, the thin edge first breaking away. These are of two kinds, quarter crack, occurring in the inner quarter of the fore foot, and toe crack, occurring in the toe of the hind foot. It usually occurs in the former. Some claim that the whole difficulty is produced by bad shoeing. Low condition, impure state of the blood and lack of care, are, however, predisposing causes.

Symptoms. When the horse leans his weight on the hoof the crack will open, when the foot is lifted the crack will close. Sand and dirt work into the parts, causing excessive pain and lameness, often fever and the formation of matter.

Treatment. In recent cases, before there is much inflammation, all that is necessary is to remove the shoe, cleanse the crack thoroughly, cutting into it if there is dirt or sand lodged inside, drawing the hoof together closely again by the means of two thin, clinch horse-shoe nails, one at the top and one at the bottom, and filling with the following composition:

1 ounce oil of tar,
½ ounce tallow,
2 ounces resin,
1 ounce turpentine,
4 ounces beeswax.

Mix together, and fill the crack with it quite warm, and let it cool. The foot should be protected so no dirt can enter, and the horse turned to pasture until a new hoof has grown, placing a bar shoe on the injured hoof.

If the crack is an old one and there is inflammation, the edges must be pared and the fissures sufficiently laid bare so it may be thoroughly cleansed of all dirt. The crack must then be thoroughly fomented to reduce the inflammation, and poulticed until it assumes a healthy appearance. The parts must then be brought firmly together by means of clinch nails, covered with the same ointment, a bar shoe put on, and a new hoof allowed to grow.

SCARLATINA. This is a modern disease in veterinary practice. It is an eruptive fever, running a fixed and difficult course, and is closely allied to influenza. It generally attacks light-colored horses. It is attended by sore throat, slight fever and dry skin; the glands of the neck are slightly swollen, and within a day or two the lining membranes within the nose and lips become spotted with scarlet the size of a pea. These soon run together. Great thirst, with a failing appetite, breath hot and stinking, are prominent symptoms. It is not considered contagious in its milder forms, but in a malignant stage it would doubtless be as much so as the same disease in the human family. It is sometimes regarded as a mild form of acute anasarca, and not entitled to be treated as a distinct affection.

Treatment. Remove the animal from its fellows. Give an occasional watery bran mash to keep the bowels open, and if it is not found a sufficient laxative, give a dose of Epsom salts or linseed oil. Guard against too active and violent purgatives. Mix 3 ounces liquor acetate of ammonia with 3 ounces of cold water, and drench with this once or twice a day, according to the violence of the fever, for three days. Meanwhile, sponge the elevated spots on the skin with a tincture of muriate of iron mixed with warm water; or, put 2 ounces of hartshorn (aqua ammonia) into a quart of soft water, and use that.

There is a tendency in this disease to dropsical effusions, and the limbs become very much swollen, even during the treatment prescribed; by the third or fourth day a whitish mucus will begin to run slightly from both nostrils; the scarlet spots will have spread and become redder. Give now, night and morning, ½ fluid ounce sweet spirits of niter, for four or five days. Discontinue to sponge the elevated spots, but rub the limbs closely and often; and blanket the animal if necessary to keep him comfortable. The niter acts as a diuretic, and the dose and length of time it is given must be regulated by the effect upon the kidneys. If urine is voided too often and too freely, lessen the dose, or discontinue it altogether. Follow this up with a daily dose of 20 grains of sulphate of quinine for from three to six days, and continue to rub the limbs. When there are signs of returning appetite, give him, in addition to the bran mashes, a few oats and a daily small allowance of hay; and place him in a small inclosure, where he may have such moderate exercise as he may be prompted to take. Do not fail to supply him from the first with all the pure water that he will drink.

SCRATCHES: see Grease, page 774.

SCROFULA. The horse is not subject to this disease as is man and the lower farm animals, yet, that he has the germs of the disease in his system, would seem to be indicated by ulcers on the liver, tumors

in the glands, and tubercles of the lungs. Indeed, the scrofulous predisposition is very marked in certain breeds of horses. Such animals are unusually prone to glanders.

SHINS, SORE. This is an inflammation of the membrane covering the shank bones, and is not confined to any particular classes of horses, though racing or other fast-worked horses are more subject to the affection than are draft horses, the difficulty generally occurring before the animal becomes mature. The cause is undoubtedly over-working and abuse before the bones and integuments become fully developed.

Symptoms. The lameness resembles that of splint. There is swelling over the shin bone, which is tense as though stretched, elastic, and doughy to the touch. There is heat and tenderness, and sometimes the swelling becomes excessive, and breaks, but always preserves its elastic feeling. Or the swelling may not be extensive, but gradually hardens through the formation of bony matter, until at length the pain disappears.

In these slight cases, the matter thrown out between the bone and membrane is generally converted into a bony formation and the skin remains permanently thickened. In severe cases the throwing out of matter may separate the membrane and the bone, and eventuate in necrosis, or death of the bone.

Treatment. If the difficulty is not severe, cold water faithfully applied during the inflammatory stage, and later, blisters, will be all that will be necessary. In fact, treat it precisely as is recommended for splint.

SIDE-BONES are a species of ring-bone. The only difference is that in side-bone the side cartilages of the foot are converted into bone, and do not, as in ring-bone, extend around the coronet, or portion immediately about the hoof. The cause and treatment are identical with those of ring-bone, which see on page 824.

SIT-FASTS, OR WARBLES. When the saddle has galled the skin beneath it the inflammation resulting is called a "warble," and if this is neglected, so as to cause a troublesome sore, the term "sit-fast' is applied. The effect produced is similar to a harness gall, and there is not the slightest necessity for inventing names to distinguish each stage of cruelty in the rider, for if attention is paid to the warble no sit-fast will ever make its appearance.

Treatment. The first and most essential thing is, that the animal shall be allowed to rest, or at any rate be subjected to such labor only as will not require the same chafing, abrading saddle or harness which has produced the trouble. Then, if it is merely a gall or scald—a heated, tender swelling, without either suppuration or hardness, bathe with cold salt and water two or three times daily. When the heat and tenderness are sensibly reduced, anoint occasionally, until the lump has entirely disappeared, with a mixture of equal parts of spirits of turpentine, spirits of camphor, aqua ammonia and oil of cedar. If it has assumed the character of a sit-fast, do not use the knife, or try to tear the dry skin away, but bathe with warm soft water, and then apply a poultice. This must be repeated if necessary until the callous skin is easily removed, and then anoint frequently until the sore is healed, with the following:

1 drachm tincture of iodine,
1 drachm iodide of potassium,
6 drachms simple ointment,
2 drachms glycerine.

SKIN, HARDENING OF THE. For that hardening of the skin which takes place in consequence of the pressure of some portion of the harness, from cutting the integuments and sub-cellular tissue from the calking of the shoes, from cauterized fungi, etc., use the following:

5 ounces water,
1 ounce acetic acid,
1 ounce pulverized cantharides.

Mix and let the mixture stand 14 days to soften. Then filter through linen or blotting paper, and add one ounce of spirits of wine. Apply occasionally with a sponge; or use equal parts of oil of turpentine and olive oil, applied in the same way.

SPASMODIC COLIC: see Colic, page 755.

SPAVIN, BLOOD. This may be defined as a distension or enlargement (dilatation) of the veins of the hock joint, and overlying the seat of bone and bog spavin; a local venous congestion, caused generally by swelling, impeding the flow of the blood, and often connected with bog or bone spavin. It is harmless; in fact it may be considered as accompanying, or the result of, other disease of the joint.

Treatment. In the early stage cold water perseveringly applied, followed by cooling lotions, equal parts of alcohol and rain-water, or one pint of brandy to one-half pint of water, applied as a lotion. If this does not relieve the difficulty, use a strong infusion of bayberry bark, and considerable friction by the hand, rubbing with either of the remedies named.

At last use truss as represented by Fig. 102.

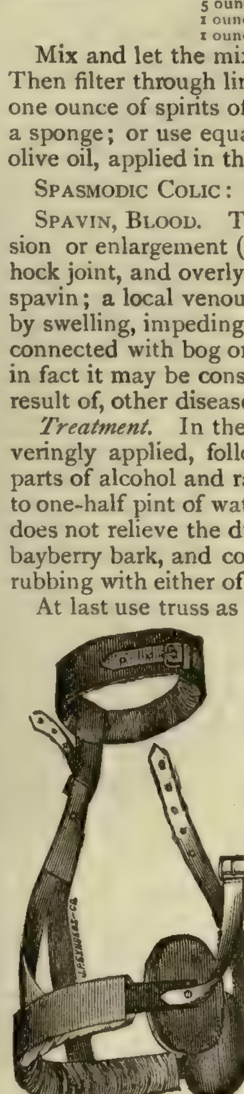


FIG. 102.—*Spavin Truss.*

SPAVIN, BOG. This is caused by over-exertion. Man loves to boast of exploits in the management of their mute servants. Thus the animal which is made up of timidity and affection is chronicled as vicious, fierce or fiery. He talks largely of applying whip and spur to the brute, and in his ignorance he thinks he has achieved miracles, by abusing a creature which, had he courted with kindness, would have been subdued in less time and the subjection would have a more lasting effect. Of all parts of the body, the hock-joints are most exposed to injury when any undue exertion is required of the animal. Bog spavin is a soft, puffy enlargement in the front and inferior portion of the

hock. Overwork, sprains, injuries either from punctured wounds, fractures or bruises are the common causes.

Symptoms. In its acute, early form there is a tense, puffy, fluctuating swelling of the front and inside portion of the hock at the upper or principal point just where usually there is a depression. There is also a swelling behind, where thorough-pin occurs, but it can be pressed forward, the front swelling filling up; but there is no swelling below and behind the hock as in thorough-pin.

Treatment. Absolute rest and the use of the high-heeled shoe. Continued pressure on the swollen parts, by means of a truss, Fig. 102, or compress, with cold water applications or brandy and salt. In case there is much inflammation, reduce it by means of fomentations of water, and if there is pain let the fomentations be an infusion of hops. In the latter stages use tincture of arnica diluted with water. If the case is a bad one, when the extreme heat and tenderness has subsided, a blister may be applied, since it sometimes goes on to ulceration of the joint, and even to bony deposit, destroying all movement of the joint.

Spavin, Bone. When it consists in the deposit of bony matter about the hock joint, and the consequent cementing together of the tarsal bones, or the destruction of the tarso-metatarsal joint, this disease is similar to bog spavin, having essentially the same causes. This form of disease may exist in every degree, from a slight exostosis near the joint to such an amount as will entirely destroy the joint, and so invade the soft tissues that the slightest movement is productive of great suffering.

Cure or alleviation is possible only in the first stages of the disease, so that on the occurrence of lameness for which the cause is not obvious, careful search should be made in the localities in which splint, ringbone, or spavin may occur.

The attack of spavin is sometimes so slow and blind that jockeys are often enabled to put off a spavined horse on the unwary, the horse afterward going dead lame. Nevertheless it will show itself if the horse is allowed to cool, or ridden into water and allowed to stand awhile; but in the end the horse becomes permanently lame, until the deposit about the bone called anchylosis becomes solidified, when the joint is stiff and the lameness ceases.

Symptoms. Lameness does not always attend this ailment. When there is swelling, it may be found in front and on the inside and lower part of the joint, and may best be seen by standing about midway of the body so as to get a side view of the front of the hock; but when the enlargement is on one side it may best be seen by standing in front of the horse and looking back between his legs. When the swelling is in front of the hock it is most to be feared. The animal if turned from side to side in the stall moves stiff and on the toe. The horse will sometimes jerk up the limb as though he had string-halt. By turning him quickly in a small circle he will carry the limb more or less stiff, or rest on the toe only.

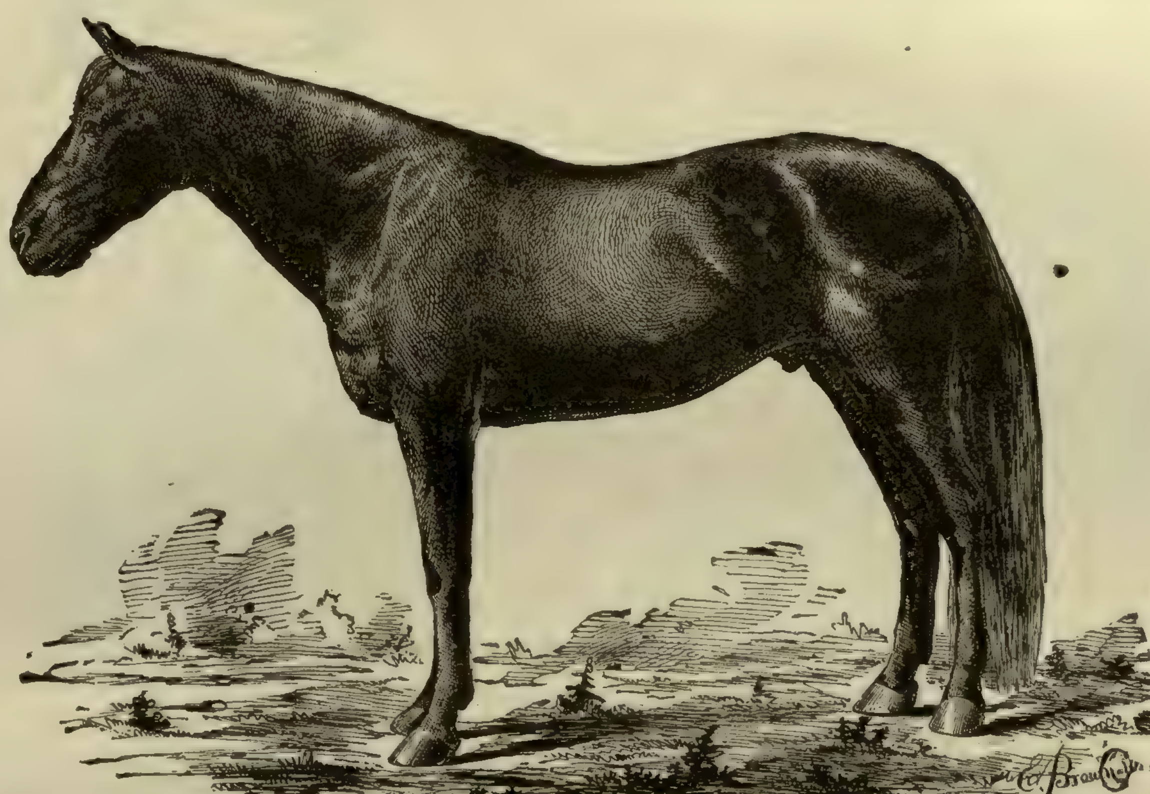
Treatment. In all cases, rest and a high-heel shoe should be allowed. Foment thoroughly with hot water in which an ounce of tincture of arnica is mixed to each two quarts of water. Give four drachms of aloes if the bowels are costive, and give half an ounce to an ounce of saltpeter in water, morning and night, until free flow of urine is had. When the inflammation has subsided blister. The following will be effectual: one part red biniodide mercury, eight parts hog's lard. Apply twice a week and grease between times with olive oil or lard. In no event, however, should resort be made to cutting away the bony parts which have formed, with mallet and chisel, as we have seen them. It is barbarous, inhuman, and can do no good whatever. In young horses, if treatment be given in time, a cure may generally be effected. With old horses the cure is different.

Spleen, Enlargement of. The pancreas and the spleen are subject to a variety of diseases, very difficult to determine. The pancreas is a gland which secretes the pancreatic juice, by which emulsion takes place with the fatty aliments by means of a duct leading into the intestines. The presence of fatty matter in the dung will imply a suppression of these juices. If there are sharp, colicky pains without fever, obstruction of the duct by calculi may be suspected. If there is general fever, with pain and tenderness behind the last rib on the right side, inflammation may be suspected.

For calculi use fomentations of hot water over the parts affected, and give anti-spasmodics, as hyoscyamus extract, 2-drachm doses; belladonna, 2-drachm doses, or tincture of lobelia, 1-ounce doses. If there is inflammation, give laxative medicines—1½ ounces dandelion. Blister the right side and confine the animal to light diet.

Splint. The name is given to a peculiar enlargement generally found on the outside of the small bones of the fore leg, and inside the leg. These enlargements seldom cause lameness, except while the tumor is growing and the periosteum is inflamed by the pressure, or, when the deposit is situated so as to interfere with the action of the joint. Splint is caused by kicks or other external injuries. The same treatment as for bone-spavin is called for.

Staggers, Blind or Stomach. Horses that are great feeders are the subjects of this disease. The stomach being over-gorged with food a determination of blood to the brain is caused. The animal is dull and sleepy, and presses his head against the wall, the thirst is excessive, the eyes are dull and snoring is heard at each respiration. Sometimes the legs are put into motion as if the animal was trotting, without the head being taken from the wall. At other times the sleepy stage passes off, the breathing is quickened, the eyes brighten, the body becomes warm, perspiration bedews the body, the sufferer gives expression to his agony by the most energetic action. The struct-



OWNED BY A. H. CUTTER, PARMA. MICH

RECORD—2:17¼.

BLACK CLOUD.

ures surrounding him are destroyed, and nothing can quiet him until he falls exhausted.

At other times he will rear up or stagger like a drunken man, and then fall. He often becomes stubborn, and will go only his own way, evidently unconscious, and then come convulsions, followed by insensibility. When down, it occasionally happens that he lies down in this insensible state at first, but he usually struggles violently, then becomes quiet; gradually recovers himself and gets up, ready to proceed on his way, being yet dull, however, and evidently affected by what has happened.

FIG. 104.—*Expression Characteristic of Blind Staggers.*

Treatment. When it is discovered in time that he is suffering with disordered digestion and is constipated, relieve him from work if possible, and lessen the quantity of dry food. Turn him out at night, at any rate, even if found necessary to have his services during the day. If he can have some continued rest and the run of a good pasture, or else be well fed with food suitable to his condition, and well watered, while occupying a roomy, dry and well ventilated stable, his chances for restoration to health and escaping violent attacks altogether, will be greatly increased. Of course he should have sufficient exercise, but in moderation. If the animal is young and of full habit, yet fallen into this disordered state, restrict his diet, increase his exercise by degrees or turn him out to pasture until his normal condition of stomach and bowels has returned. In the beginning of this treatment give him the following:

1 ounce salt,
4 drachms Castile soap,
7 drachms aloes,
6 drops oil of caraway.

Mix with mucilage or syrup sufficient to form a drench. This amount constitutes a dose. It may be repeated after twelve or fifteen hours if the first does not produce proper action. Every chance of even a partial return to usefulness is increased by rest. A horse once affected in this way should really not be driven again, though apparently recovered, for the fit is likely to recur, and the driver may himself be thereby seriously endangered.

STAGGERS, MAD. See Inflammtion of the Brain.

STINGS AND BITES. Not unfrequently do we hear of horses losing their lives from irritation and fever, originating from stings of bees, hornets, etc. To relieve a case of this kind, we use one of the following remedies, with which the coat must be thoroughly saturated: Solution of ammonia; weak carbolic acid wash (1 ounce to a quart of water); 1 pint of lime water, in which one drachm of carbolic acid is dissolved; or oil of lobelia. In ordinary cases, the preceding direction properly carried out will be sufficient; but in more aggravated ones, sponge the whole body with lime water, and then smear with linseed oil. If lime is not accessible, use a weak solution of soda. Spirits of turpentine and laudanum, in equal parts, will give relief. A decoction of plantain is good.

To prevent the stings of gad-flies, make a strong infusion of the green bark of the elder, and wash the flanks before going out. To prevent the bites of buffalo-gnats, cover the parts most likely to be attacked with a mixture of tar and lard, two parts of lard to one of tar.

STOMACH, INFLAMMATION OF THE, OR GASTRITIS. Acute inflammation of the stomach seldom, if ever, occurs among horses as a spontaneous affection. It usually occurs from poisoning by arsenic given in the food by ignorant stable-men, to make the horse carry a shining coat and foam at the bit. It is also produced by the licking of external corrosive applications, thus producing acute gastritis.

When an irritating poison has been received into the stomach, and excites inflammation there, or when acute inflammation arises from any cause, the symptoms which mark that inflammation are pain, distress, and restlessness; a loathing of food; for if anything be given by the mouth, it creates increased pain. The animal breaks out in a cold sweat, lies down and quickly rises again, becomes early and greatly prostrated in strength, and has a pulse usually quick and much oppressed. Sometimes purging sets in: at others, the bowels are constipated. The disease is very apt to run into gastro-enteritis—inflammation of the stomach and bowels.

FIG. 105.—*Horse Suffering from Acute Gastritis.*

Treatment. The first thing, if possible, is to find out what caused the trouble. If this can not be found, give at once—

4 ounces olive oil,
3 ounces sulphuric ether,
3 ounces laudanum,
4 ounces carbonate magnesia,
1 quart cold gruel.

Mix and give as a dose. If the pulse is low, add to the above 1 drachm carbonate of ammonia. As soon as there is evidence of recovery, and in fact whenever the animal will take it, thin starch or gruel of

flour should be freely given to sheathe the mucous surfaces.

STOMACH, GORGED: See Founder, Grain, page 769.

STOMACH, RUPTURE OF THE. When this occurs there is no art which can prevent death. Rupture of the stomach is produced by working or driving a

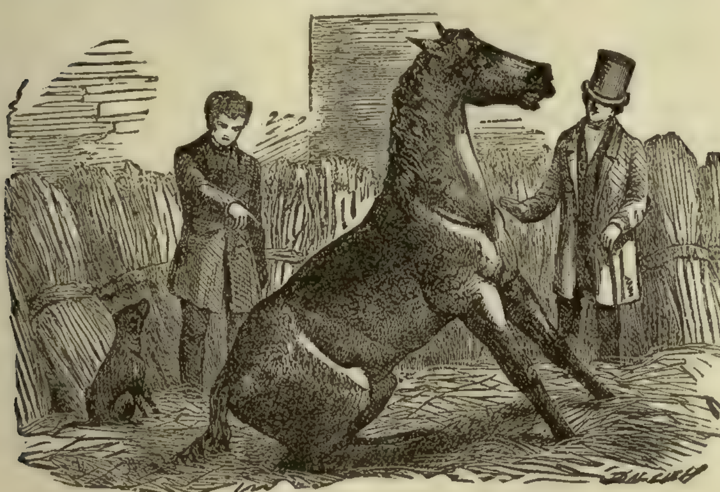


FIG. 106.—*Unnatural Attitude Indicative of Abdominal Injury.*

horse until he is very hungry and then feeding or watering unduly. The only symptoms which show are violent colic and tenseness of tissues. There are many ruptures where animals die, and the owner does not know the difficulty. If the mischief has proceeded to rupture, the animal may as well be killed. One of the positions assumed by the horse suffering from abdominal injuries, is this: he will persistently sit on his haunches, as illustrated above. Animals will assume this position and yet occasionally recover. Another position assumed is, for the animal to kneel and support himself upon his hind legs, as shown by Fig. 67. Still another is, the horse with a ruptured stomach will almost invariably walk in a circle as if hitched to a threshing-machine. Such unnatural positions show the intense pain which leads to such attitudes to get relief. There is no cure.

STOMACH STAGGERS: see Staggers, page 806.

STRANGLES. See Distemper.

STRING-HALT is the sudden jerking up of a hind limb, sometimes both, in succession. Sometimes several efforts will be made before the animal can progress at all. In other cases the spasmodic action of the hind-leg is shown in starting off, and, the animal becoming warm, it will nearly or quite cease. Sometimes the action is so slight as to be almost unnoticed, and again it may be so strong that the hind leg will strike the belly.

Veterinary writers differ in opinion concerning the cause and location of string-halt. Professor Spooner has traced it to a morbid affection of the sacro-sciatic nerve. Percivall pronounces it an affection of the posterior portion of the spinal column. Goodwin and Mayhew favor the opinion of the latter. Dadd thought it may be the result of hock diseases, which irritates the nerves in the vicinity of the part, and thus affects that portion of the nervous system which controls the muscles concerned.

Treatment. There is no remedy known for string-halt. Rest, keeping the bowels open with 2-drachm doses of belladonna daily, will lessen the spasms for a time; but fatigue or nervous excitement is sure to bring on a recurrence of the attack. A careful driver will often prevent the disability being much shown by being careful not to excite or overwork the horse.

SURFEIT. This is a rash which appears suddenly upon the surface of the skin. The spots are round, blunt and slightly elevated. Sometimes during the eruption the pulse is tranquil, the appetite good, and the general health does not seem to suffer. In this case hay should be withheld, the quantity of oats increased, the stable should be well ventilated and the following drink given every day for at least two weeks:

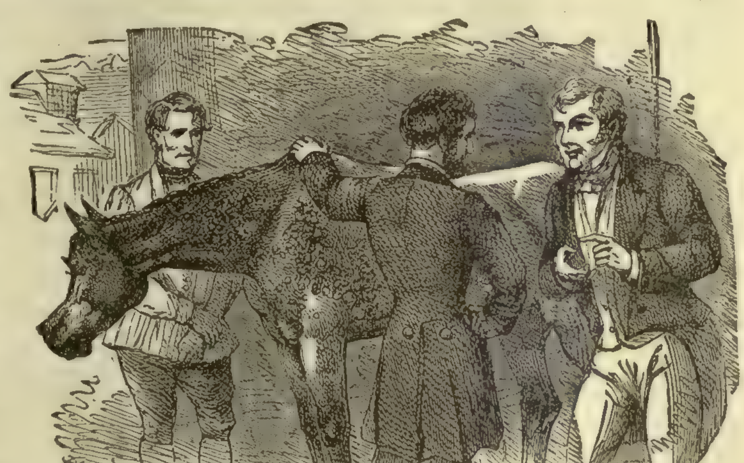


FIG. 107.—*A Horse Affected with Surfeit.*

1 ounce liquor of arsenic,
½ ounce muriated tincture of iron,
1 quart water.

Mix and give one pint at each dose. In other cases the pulse sinks, the legs swell and the animal shows symptoms of general debility. In the latter

case good nursing is required. The cleanliness of the stable should be attended to. The legs should be bandaged and the body warmly clothed. Give the drink recommended above, only give it twice each day, or give

2 ounces nitrate of potash,
6 ounces sulphur,
2 ounces sulphuret of antimony,
2 ounces sulphate of iron.

Divide into sixteen powders and give one night and morning.

Anoint the parts affected with

1 pint of sweet oil or hog's lard,
1 fluid ounce of carbolic acid,
4 ounces of glycerine;

or give 1 drachm cream tartar in one-half bucket water three times a day. Keep him from becoming costive by cooling and laxative food. See that he is comfortably stabled if the weather is at all inclement, and give three times a day—

2 drachms levigated (finely ground) antimony,
3 drachms niter,
4 drachms sulphur,
4 drachms hyposulphite of soda.

The food should be good—if possible, green and succulent; and it will be found advantageous to take the chill from water given him, if the weather is at all cold. If the appetite is bad, place gruel in the manger, so that he may use it in place of water till stronger food is relished. If it is summer, or spring is sufficiently advanced to be mild, he may be turned to pasture; but in any event he should be allowed to rest during treatment.

Sweeny. A horse is said to be sweenied when the muscles of the shoulder appear to have perished and the skin seems to be attached closely to the shoulder blade. These symptoms may arise from chronic lameness of the foot or other part of the limb. In such case, of course it is of no use to apply remedies to the shoulder. Cure the foot, and the shoulder will come right, although stimulants and rubbing will expedite it. But genuine sweeny is quite different from the above, although the appearances are the same. It is caused by hard drawing in a collar that is too large; or where no whiffletree is ever used, but the traces are hitched directly to the thills, as in "jumpers," as they are called; or by jumping fences or the like.

Symptoms. The presence of real sweeny may be discovered by moving the horse in a circle, or causing him to step over bars, when you can generally determine the seat of the lameness.

Treatment. By pressure on the parts, discover the seat of the inflammation by the flinching of the animal. This found, reduce it by application of cold water to the part, if in the earlier stages, and continue until the acute symptoms have subsided. After these have subsided exercise must be given every day. Every effort should be made to increase the circulation over the fallen muscles by active rubbing. If the case does not yield to the treatment, and there is decided wasting, the muscles being hard, use the following: 1 ounce spirits of turpentine, 1 ounce tincture cantharides. This should be rubbed in with considerable friction until nearly the excitement of a blister is produced. If this does not succeed, which will be seldom, put in a seton, wet with tincture of cantharides, from the top of the wasted muscle to the bottom. Light exercise should be given every day.

Sweeny of the Shoulder. The common effect of all lameness and diseases of a limb is a wasting of the muscles connected therewith. Therefore in all sprains entailing inflammation and continued disease of a limb, and in all injuries entailing chronic, long-continued manifestations, there will be wasting or atrophy of the muscles, and in extreme cases, sometimes permanent contraction, even of the cords of the limb. This is sweeny. It is the result of the disease and not the disease itself.

Causes. Overstrain, hard pulling on uneven ground, by stepping into holes, etc., thus causing injury to the muscles of the shoulder, and particularly those supporting the joints.

Treatment. The principal treatment is rest. By proper diet and tonics the horse will gradually become more and more able to work. The affected parts may be bathed morning and evening with the following mixture:

2 ounces fluid extract of wormwood,
2 ounces extract of poppies,
1 pint of proof spirits.

Should the feet be found too hot, bathe them with tepid water or a tepid infusion of hops. There may also be given daily 2 drachms of gelsemium until the febrile symptoms subside.

Teeth Ache. The most frequent cause of this most afflictive ailment is the injury to the tooth by biting on some hard substance, by which the *crusta petrosa* is affected; also the too frequent use of acids, which tend to injure the crystalline enamel. The horse sweats easily while at work, the saliva hangs in tough streams from the mouth. The head is sometimes carried to one side or pressed against the wall or manger. The food is quidded, that is, when half masticated the animal will relax its hold and the morsel will fall from its mouth. Sometimes, however, the horse will show no signs of the ailment. The head is carried gracefully, the lips are compressed, the saliva ceases to flow from them and the food is eaten with a greedy relish. The proprietor is praised for the vigorous movements of his horse, but the duration of this period of happiness over the animal is only temporary, and in a short time the pain will return with all its former tortures. Should nothing be done to relieve the suffering, the animal will soon present a staring coat, a tucked-up belly and the skin will adhere tightly to the ribs. In some cases he will be drowsy, needing the whip to urge him on, while in others he will grasp the bit tightly in his teeth and become almost unmanageable. The only cure is to extract the diseased tooth.

Teeth, Decay of the. The teeth of horses, under an artificial system of management, are quite subject

to decay. Usually this is found in the grinders, although it sometimes, but rarely, occurs in the nippers.

FIG. 108.—*Horse with Toothache.*

Causes. Anything that will destroy the enamel or corrode the teeth, strong mineral medicines, fermentations in the stomach, breaking of the teeth by biting hard substances, or natural causes from increasing age.

Symptoms. The most unmistakable symptoms are sudden jerking up of the head when drinking cold water; sudden dropping of food from the mouth while eating; slavering, exhibition of pain; imperfect chewing of the food and consequent finding of whole grains in the dung; indigestion; unthrifty state of the hair and skin; loss of condition, generally with swelling of the legs; swelling of the jaw-bone about the carious tooth; quidding of the partially chewed hay; accumulation of food around the tooth and between it and the cheek.

FIG. 109.—*Balling Iron.*

Treatment. Put a balling iron (Fig. 109) in the horse's mouth and examine the jaws for broken and decayed teeth. If suspected, tap it gently. If there is inflammation, lance the affected parts, and sponge with the tincture of myrrh. If the tooth is ulcerated it is better to extract it at once; if not it may be cleaned with a pair of dental gouges (Fig. 110) and the cavity filled with gutta percha. If tender from exposure of the nerve, it must be relieved, or deadened, with crystallized carbolic acid and opium, before filling. As a rule in extensive caries, the tooth may be extracted. If so the opposing tooth must be occasionally rasped down. The extracting of teeth, however, should only be undertaken by a veterinary surgeon, except in the case of loose teeth, which may be extracted with a large pair of forceps. A good, strong pair of forceps (see Fig. 111) should be used, and when tightly clasped around the loose tooth, should be pulled with a steady, strong pull, and not a quick jerk, as is commonly the case.

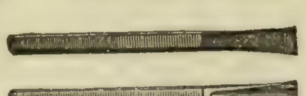


FIG. 110.—*Dental Gouges.*

FIG. 111.—*Dental Forceps.*

TEETH, SCURVY OF THE. Old horses are subject to deposit of calcareous matter, by which the teeth become ridged with a white scurf, extending down the gums, inflaming them and keeping them sore. This is generally confined to the front teeth. Young horses also sometimes suffer from this disability.

Causes. Imperfect digestion and sour stomach, evolving gases, or any cause injuring the enamel of the teeth.

Treatment. First find if the system is in good condition. Put a twitch on the animal's nose, and with proper instruments remove the incrustations. Files, scrapers and fine emery paper are the means to be used; the teeth afterward to be oiled. In ordinary cases a stiff brush and a mixture of tartaric acid and salt will do it, rubbing afterward with clean hard-wood ashes. Keep hard-wood ashes and salt where the horse may take it at will.

TEETH, SHARP AND PROJECTING. The remedy for this disability will be obvious. Secure the animal, put a twitch on the nose, if a horse, and a balling iron in the mouth, and file the teeth until smooth and even, using a rasp made for this purpose, flat and with a slightly crooked handle. See Fig. 113.

TETTER. See Surfeit.

THOROUGH-PIN. An affection of the hock-joint accompanying bog and blood spavin. It is characterized by soft, fluctuating swellings, containing fluid or joint oil in increased quantity and an altered quality.

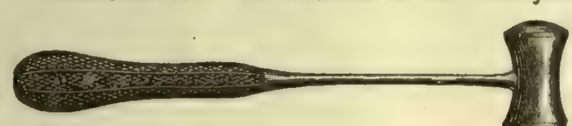


FIG. 112.—*Dental Mallet.*

Symptoms. Pressure on one side will cause bulging on the other, and pressure on both sides will cause fluctuation along the tendon below and behind the hock.

Treatment. Use the same treatment as for curb; cold-water bandages or hot fomentations in the early stages of the disease; also absolute rest and a high-heeled shoe. When tenderness ceases and lameness is gone, apply a spring truss, so the pads will clasp and cover the puff on both sides, and exert a pretty firm and steady pressure.

THROAT, SWELLED. The most common cause of this disorder is foul stables. Few stables are properly drained or ventilated, and the dumb slave is compelled after each day's labor to stand in the narrowest possible limits. The prisoner is only allowed to breathe a limited quantity of the air which nature has supplied in such great abundance and in such purity. The quantity of air contained in a close stable must be frequently respired during the night. The horse being taken from the hot, contaminated atmosphere of the stable, and exposed to the cold, pure air outside, although the latter is much to be preferred, yet the delicate structure of the larynx being weakened by abiding in a morbid medium, when brought into contact with the cold air, is stimulated, inflammation is produced and laryngitis is the result. The symptoms are characterized by dullness, there is a slight enlargement of the larynx, the neck is stiff and the head awkwardly carried, a short cough is heard at almost every respiration, and a hoarse sound may be heard by placing the ear against the trachea, the pulse is full and throbbing, the nasal membrane is of a scarlet color, and any attempt to handle the throat calls forth the most energetic resistance.

FIG. 113.—*Dental File.*

Treatment. Give upon the tongue every two hours ten drops tincture of aconite, until the pulse is rendered soft. Apply the nose-bag and keep it in almost constant use, the application of which is as follows: take a common bag, into which put a pail three parts filled with bran, pour sufficient boiling water upon it to thoroughly scald the bran, and apply it by holding the bag well up around his nose; do not be persuaded to steam a horse's head with burned leather or sulphur, as it is injurious to the bronchi and lungs. Next procure a piece of stout canvas, one yard and a quarter long and nine inches wide, three slits should be made at each end a quarter of a yard in length. The middle part, or the part not slit, should be put under the throat and the tails tied, four in front of the ears and four behind. This is termed an eight-tailed bandage, and is the best appliance for keeping any application on the throat. Poultices of hot boiled roots should be applied as hot as can be borne without scalding, by means of the eight-tailed bandage. Or, ferment the throat with cloths wrung out of hot mustard water. If there is difficulty in swallowing, put a teaspoonful of the following well back on the tongue several times a day:

1 drachm powdered Indian hemp,
1 drachm powdered assafœtida;
1 drachm blood-root;
½ drachm powdered opium.

In case the disease becomes chronic, the following incitant to the throat will be indicated:

1 part pulverized cantharides;
1 part turpentine;
1 part solution of ammonia;
1 part olive oil.
Mix, shake the bottle before using, and rub well in on the throat daily.

If this does not relieve, apply the following blister:

1 drachm Croton oil;
1 drachm sulphuric ether;
10 drachms alcohol
Mix, and apply by rubbing with considerable friction.

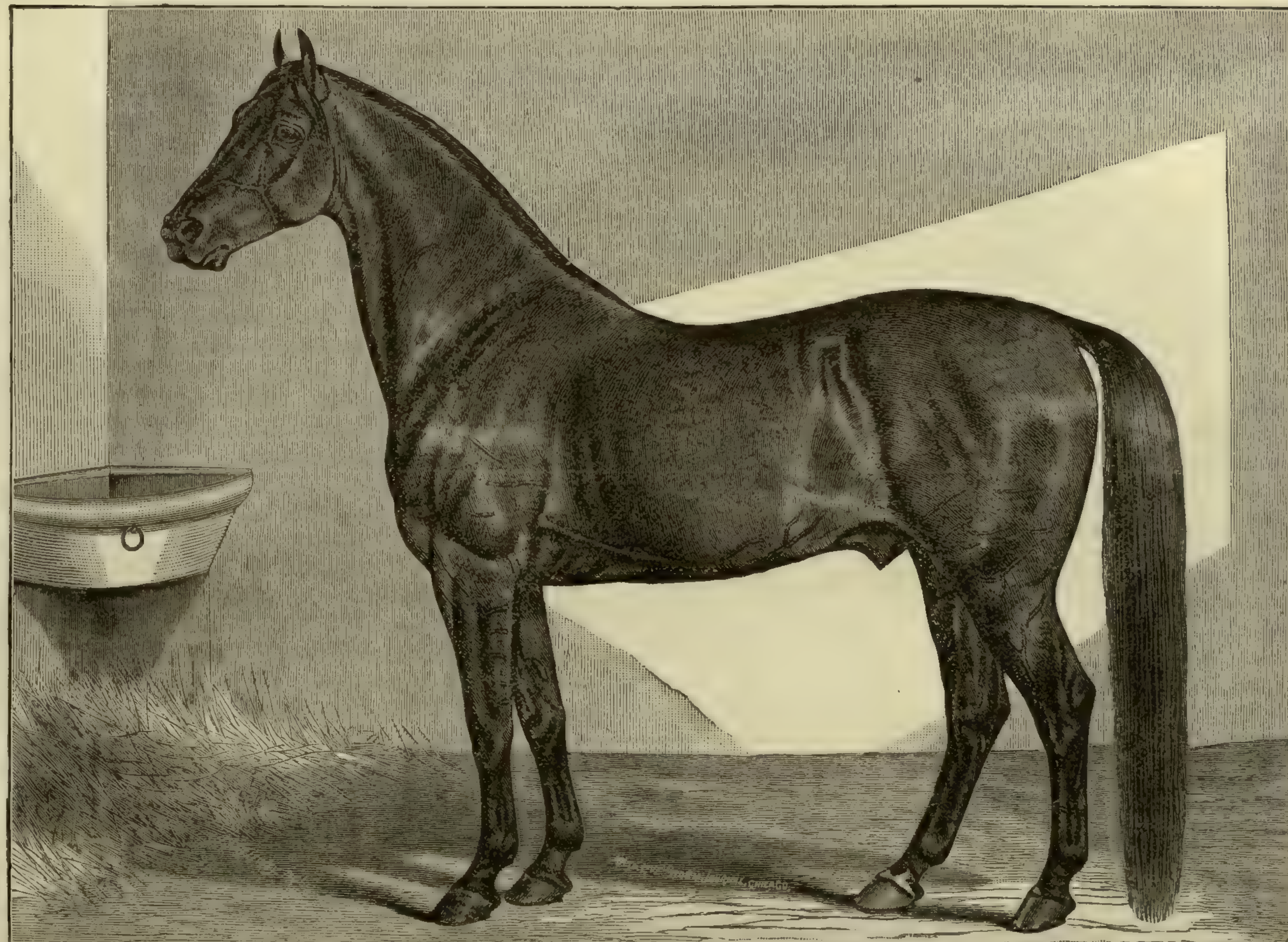
When the symptoms become more favorable, by the membranes of the nose becoming pale or more natural in color, by the cough becoming more free, or louder, easier and with less violent breathing, and by the appearance of a white and thick discharge from the nostrils, put a seton in the throat, and allow nothing but moist and succulent food. Move the seton daily until healthy pus (matter) is formed. Then cut one of the knots and withdraw it, and as the horse recovers allow drier food—hay and grain—but that entirely free from dust.

THRUSH. One of the most common of the diseases of the foot bears the popular name of thrush. Of its exact nature and locality perhaps no two hippopathologists agree. Mayhew, Youatt, Spooner, McClure and others characterize the disease by one of its symptoms, and speak of it as "an offensive discharge from the cleft of the frog," to which is sometimes added, "with disorganization of the horn." Both these are symptoms of the real disease, which is a low form of inflammation in the soft tissues of a tender frog. It exists in feet that have been allowed to stand in damp, ill-cleaned stalls, where they are continually covered with wet manure. Running in a wet yard predisposes to it. Gamgee describes thrush as a "diseased condition of the villous membrane covering the frog," and says that it is, in its usual form, produced by filth and neglect.

The true seat of the disease is, we believe, in the superficial and less fibrous tissues of the sensitive frog. It is doubtful whether true inflammation exists. Pain is usually present in inflamed tissues, and thrush is, to a remarkable degree, a painful disease. One of the properties of the sensitive frog is to secrete the tissue that becomes the horny frog. Now, if, by reason of local or constitutional debility, the secretive action of the part is imperfect—if the secreted matter, lacking vitality instead of producing horn, breaks down into pus, or pus mingled with half-formed or decomposing horn, we should get just the condition we have in thrush.

In a healthy frog the cleft is so perfectly covered over by an arch of horn that fluid could escape only through an artificial opening; but in this diseased condition the horn is in so imperfect a state from defect in its original secretion, and so disintegrated by the direct influence upon it of the diseased secretion, that the offensive pus escapes freely from it.

It has been claimed that contracted feet and too great and long-continued paring of the frog are the main causes of this disease. They undoubtedly predispose to it, as they contribute, by change of the form of the foot, to effect a change in the nutrition of the organ. But thrush is seen, perhaps, in a well-spread, open foot as frequently as in a contracted one. Con-



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stitutional condition has much to do with the local manifestation. An animal poorly nourished and cared for, other things being equal, will be more likely to exhibit the disease.

Any treatment that loses sight of the constitutional condition will fail to do its best work. First of all, the horse should be placed in a stall having a dry floor, or on a short and dry sward, covering a warm, sandy soil. Then he should have a thoroughly nutritious diet, and, if the disease has been of long standing, alterative and tonic medicines may be given. Red bark, sulphuret of antimony and nitre, in the proportion of two parts of the first to one part each of the last two; or a ball, consisting of a quarter of a grain of strychnine, half a drachm of iodide of iron, half a scruple of extract of belladonna, and extract of gentian and powdered quassia sufficient to make it, may be given night and morning. The foot should be put into a bath of warm water and thoroughly cleansed; all dust and pus should be carefully removed from the commissures, and the part dried by the use of dry tow. Then into the crevices should be poured once a day a little of a solution of the chloride of zinc (3 grains to the ounce of water). The foot is to be kept shod with calkins, so that a free space may be left under the foot for the circulation of the air. Cases will yield more readily to simply constitutional than to simply local treatment. A judicious combination of the two will have the happiest results.

THUMPS. This is a spasm of the diaphragm. It is produced by over-driving and oppression, paralyzing the accessory nerve, which causes the flapping of the diaphragm.

Symptoms. The action of the heart will be violent and convulsive; the beatings can be seen, felt and heard. The disorder comes on abruptly, generally from excitement; excited eyes; rapid breathing and a more or less diminution of the palpitation. If signs of temporary excitement are not present; if the attack comes on slowly, is constant with aggravated intervals; if there is a heavy, prolonged, unequal beating, with red mucous membranes and swelling of the limbs, it may be inferred that the difficulty is connected with structural heart disease.

Treatment. Avoid sudden excitement and over-exertion, but give gentle exercise, stimulants and tonics. Give cold water with plenty of common salt. If this fails to give relief in a few hours, then give

20 drops aconite;
1 ounce tincture lobelia;
1 ounce laudanum;
1 ounce sulphuric ether;
½ ounce chloroform;

Repeat every hour until relief is obtained.

TONGUE, INFLAMMATION OF THE. *Symptoms.* There will be difficulty in eating and drinking; the tongue will be swollen and inflamed, sometimes hanging from the mouth. In treating, use the same means recommended for inflammation of the mouth. If the tongue hangs from the mouth, put the end in a bag, supported with tapes extending from the corners of the mouth and tied behind the ears.

TRACHEOTOMY is an operation to open the windpipe in case of closing by tumor or thickening of membrane. It is performed only in desperate cases, where the animal is likely to suffocate for want of breath. The operation should be performed as follows: Have an assistant hold the horse's head high, with the nose extended, so as to best stretch the skin of the neck. Then, feeling along the neck for that part least covered with flesh, make a bold incision with a sharp knife—one with a round point and thin being preferable. Make the incision about four inches long, and along the central line of the windpipe and down to it. Then, with a sharp-pointed knife, pierce one of the upper exposed rings of the windpipe; cut downward along the central line, dividing two or three of them. Run a crooked needle (Fig. 114) through the integuments on each side; tie the lips of the wound to a

FIG. 114.—*Crooked Needle.*

bunch of the mane to keep them from closing the orifice. After the horse can again breathe free, stitch up the place and treat as a common wound.

TUMOR, FUNGOUS COLLAR. This, in its nature, is essentially the same as that described as saddle gall or sit-fast—differing, however, in location and specific cause. It is an inflammation and swelling beneath the large, fat muscle that covers the front of the shoulder, and is caused by the chafing of the collar. It is scarcely necessary to undertake farther description of a well-known visible affection. It is usually found near the point of the shoulder, and the character of the tumor as to simplicity or severity can be readily determined by examination. If of considerable standing, it will be found so hard as to render it almost impossible to detect any fluctuation that would indicate the presence of matter. Where there is much swelling, however, there is almost invariably matter, and no cure can be effected until this is removed. In cases less marked there will be a small, hard or indurated lump without matter. Under similar conditions as those mentioned in the preceding section, it may form a leathery patch in the center and become a real sit-fast.

Treatment. The tumor must, if possible, be so treated as to leave no scar or lump, as this would be easily irritated by the collar upon subsequent use, and prove a source of constant trouble. The first thing in order will be to take the horse from work, if at all practicable. If not, use a breast-strap, so as to prevent all further chafing. If the swelling is recent, apply cold water often, or cover the part with a wet rag hung over the shoulders in such a way as to remain in contact with the swelling. This must be kept constantly wet with water and tincture of arnica.

But if the tumor is large and of long standing—already hardened and containing matter deeply hidden—open with a knife, making a smooth, vertical cut, and of sufficient depth to thoroughly evacuate the pus. Syringe the opening well every day with

the following solution: Equal parts of pyroligneous acid, spirits of turpentine and linseed oil.

If the wound seems inclined to heal and leave a hard lump in doing so, discontinue the injection and rub frequently with the following liniment to promote the absorption of the callous or gristly formation: 1 ounce iodine, 12 ounces soap liniment. In treating this, as in other tumors which suppurate, an aspirator, as shown by Fig. 115, will be found valuable. The advantage of this aspirator is compactness. Its bottle is small, but nevertheless it is as efficient as an apparatus with a bottle of any larger size. This is achieved by the hole in the bottle, at *F*, through which the contents can be emptied most conveniently by opening the stop-cock *C*, and removing the fitting *D*, connected with the pump from the bottle *B*. The stop-cock at *D* controls communication from the bottle with the pump as well as through the needle. To exhaust the bottle of air the stop-cock *C* is closed and the stop-cock at *D* turned, as shown in the figure, and the pump worked. By turning the stop-cock at *D* horizontally, as shown by the dotted lines, communication through the needle to the bottle is established.

Fig. 115.—*Aspirator.*

Urine, Albuminous. This disability in horses, characterized by a thick, ropy, albuminous discharge of urine, is quite common in its milder forms, being an attendant on extensive inflammation of important organs, on rheumatic fevers, and some conditions of blood-poisoning. It is especially attendant on inflammation of the kidneys, both acute and chronic, attended with degeneration and shedding of the epithelium (the layers of cells) lining the kidney tubes.

Fig. 117.—*Position Assumed by Horse Having Albuminous Urine.*

Symptoms. There are two special positions assumed by horses suffering from severe secretion of the albuminous urine. One is the stretched-out position. In the other the back will be roached as seen in Fig. 118. In its mild stages, the urine is thick, ropy, mucilaginous; when it first begins to flow, of a reddish-brown color, but changing to a more natural condition, ending with a whitish milky fluid; sometimes the reverse, commencing white. When the disease is farther advanced the urine is thicker, more deeply tinged and sometimes offensive to the smell. It may degenerate into a number of forms, and finally terminate in Bright's disease of the kidneys.

Treatment. Place the animal where it may be comfortable; clothe warmly. If there is inflammation of the kidneys foment with a sheepskin wrung out of hot water; or better, with an infusion of a handful of digitalis in a pail of scalding water, and use other measures recommended in this article. If it be thought necessary to liquefy the urine, not always beneficial, prepare the following:

1 ounce golden seal,
1 ounce powdered assafœtida,
2 ounces powdered juniper berries,
8 ounces powdered poplar bark,
1 ounce copperas.

Mix, divide in eight parts, and give one night and morning in the food.

The real animus should be to remove the cause, which, as we have stated, is various. Attend to the general health of the animal, keep the bowels open by a free use of bran mashes and other food of an opening nature. Give a laxative if necessary—say, 5 ounces salts, and Peruvian bark 1 to 2 ounces daily at two or three doses.

Urine, Bloody. The causes of this distressing disease, which consists of extravasation of blood from the urinary organs, is often obscure. Sprains or bruising of the loins, stone in the kidneys, urinary passages or bladder, blood-poisoning. Strong diuretics are operative in producing this disease

Fig. 118.—*Horse Suffering from Bloody Urine.*

Symptoms. If from local irritation, the blood being in a healthy state, there will be clots of blood passed and fibrinous casts of the urinary tubes entangling blood globules. These may be seen with a magnifying glass. If there is gravel more or less gritty

matter will be passed. If from blood-poisoning, the tests must be made by a veterinary surgeon from the urine, who can then prescribe.

Treatment. The general practice is to give sound food, good shelter, mucilaginous drinks, as linseed or slippery-elm tea, or marsh-mallow tea; also acid astringents, vinegar, buttermilk, a weak decoction of white-oak bark. If the passages are profuse apply cold water to the loins. If there is inflammation foment with warm water, and follow with a mustard plaster. If the bowels are inactive, give the following: 4 drachms aloes, 1 ounce cream tartar. Mix in one and a half pints of warm water and give when cool, aiding the operation by an injection of one quart of soapsuds and four ounces oil turpentine.

Urine, Suppression of. This is produced by paralysis of the bladder, meningitis, lock-jaw, severe colic, or other acute diseases, or from irritating drugs given by ignorant stablemen, so that the operator must be informed of the nature of the case.

Treatment. If it be caused by paralysis the urine must be drawn off several times a day with a catheter. The following will be indicated to be given internally: ½ drachm nux vomica, 1 pint water. Give as a drench twice a day.

Another remedy: Take a hypodermic syringe, Fig. 119, and throw one half grain of the following under the skin, twice daily:

4 drops sulphuric acid,
2 grains strychnine,
½ ounce alcohol.

If the difficulty is due to general weakness of the bladder, give the following stimulant: 20 grains powdered cantharides, 1 drachm powdered digitalis. Make into a ball with soap. If there is an accumulation of hard fæces in the rectum, it must be removed by full injections of strong soapsuds, and if necessary removal of the partially softened dung with the oiled hand. If there is inflammation of the neck of the bladder, as shown by heat, swelling, tenderness, give injections of 1 drachm extract of belladonna in a quart of warm water, thrown repeatedly into the rectum of horses and into the vagina of mares. To relieve pain give from one-half to two drachms of opium, as may be needed, or one-half ounce of the tincture of lobelia.

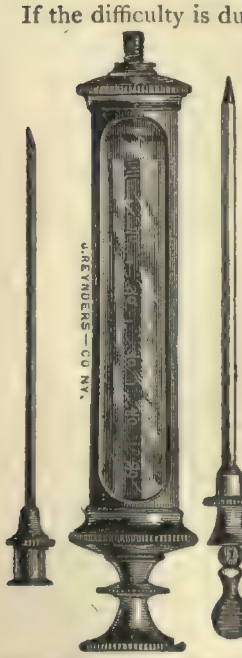


Fig. 119.—*Hypodermic Syringe.*

Veins, Inflammation of the, or Phlebitis. Horses, whose fate it is to belong to men who will bleed for every ailment, are most subject to phlebitis. It was formerly the custom to bleed for everything and for nothing. It was not considered that an animal whose life was one continued period of toil, was more likely to become the victim of debility than of repletion. The thought never occurred to the owner that his wretched slave stood more in need of having blood put into his veins than taken out; consequently the animal was subjected to the erroneous notion of ignorant humanity. Fortunately the light which science has thrown upon their subject, partially renders bleeding a thing of the past, although there still exist people whom science cannot advance past the customs of ancient fogyism. Phlebitis always follows bleeding. No particular quantity abstracted and no condition of the animal indicates the disorder. It has appeared in different forms of the operation, and all classes of horses are alike subject to it. If in the opinion of some it is found necessary to bleed, the animal should be kept in a stall with the head tied up to the rack for at least a couple of days, as exercise, and the horse being allowed to hang his head after blood being abstracted, have brought about the disease.

Symptoms. The first noticeable symptoms are: the lips of the wound begin to enlarge and separate and a foul discharge issues from the vein. Next, a round, hard enlargement appears above the opening as large as a hickory-nut and the vein becomes swollen and hard, superior to the orifice. Next, abscesses are seen along the line of the vein which soon maturate and send forth a filthy discharge. Should the case be neglected, the discharge becomes thick, dark and fetid. The animal grows dull and stupid, at length the inflammation extends to the brain and a violent death from phrenitis relieves the sufferer.

Treatment. The treatment consists in blistering along the line of the diseased vein; as soon as the first blister becomes smooth apply another, and sometimes a third one is necessary. The abscesses should be opened with a sharp knife.

Vermin. Vermin are both a cause and a consequent of skin disease; and being also bred in the hairy covering, perhaps in the very skin itself, they are properly treated in this connection. Every species of animal is more or less troubled with his own peculiar insect tormenter; and while no well defined cause can be assigned as to their origin, they are almost always found associated with filth and squalor. They sometimes, however, trouble animals of fair condition, and accustomed to reasonable care, but in this case they are generally caught by contact. Poor, ill-cared for, mangy horses, colts in the spring of the year, with long uncurried coats, and old and feeble horses with like rough and shaggy covering, most probably breed them; and on these they are most frequently and plentifully found.

The itching torment to which they subject diseased animals doubtless intensifies whatever disorder may exist, and the very earliest opportunity should be taken to eradicate them from the sufferer. When horses stand in proximity to a hen-house, they are often seriously annoyed with hen lice, which are even

more tormenting than those peculiar to the horse himself.

Symptoms. The horse infested with vermin will usually manifest his uneasiness by biting and rubbing himself; but their presence may be unmistakably detected by a more or less careful examination of his coat.

Treatment. If the horse is suffering from some skin disease requiring treatment, the means adopted for this will almost invariably suffice of themselves to remove the vermin; but where no such disease exists, and it is a simple case of lousiness, anoint him with the following salve: one drachm carbolic acid crystals; one quart fresh lard; or one ounce of sulphur to one pint of lard. Rub it upon every part of the body thoroughly; wash with warm soapsuds next day; repeat if necessary—at last washing and drying.

Attention to his general health will also be demanded; and to this end he should be upon good pasture, or a liberal supply of nourishing but not heating food should be given.

If it is a case of hen lice, the first thing to be done is to remove the horse from the place infested with these, and then to anoint and wash as before directed.

VARIOUS FRACTURES. To fracture a limb completely, so the leg hangs loose, is of so serious a nature, in the horse, that unless in the case of a very valuable animal for breeding purposes, it had better be killed at once.

WARTS. It is difficult to point out anything that may be implicitly received as the cause of these excrescences. They are abnormal growths, which appear upon all parts of the body. They are highly vascular and sometimes the source of great annoyance. The manner of their formation seems to be this: Knots form in the true skin and gradually develop, being surrounded with a covering of the scarf skin, sometimes thickened and matted together, and this outer covering generally dries and splits into fibers towards the top, while blood, in greater quantities than usual, is sent to the inner or vascular parts, and more nutriment is thus diverted than to the surrounding flesh, so that an upward or outward growth is promoted. Seed warts usually make their appearance on the eyelids, the nose, the sheath and adjoining parts of the belly; the encysted or sac warts on the pasterns, hock joints and knee joints, and sometimes upon the sheath and neighboring parts. Unless warts appear upon the penis they are not injurious to health, and at first occasion little inconvenience, unless upon the shoulder or some part where harness or saddle touches constantly; but they should be removed, nevertheless, particularly the sac wart and those seed warts which manifest a tendency to enlargement.

Symptoms. There are two kinds of these formations, one of which is fibrous, white and gristly or cartilaginous, but somewhat spongy lump, contained in a sac or cell which has taken its rise from the outer or scarf skin, and the other is a somewhat cartilaginous substance, not inclosed but adhering firmly to the skin—a hard excrescence, the "seed wart," which is too well known to require description. It is sometimes difficult to distinguish the blood wart, as the former is sometimes called, from the seed wart; but it generally presents a more rounded, smooth appearance, and sometimes hangs as by a little stem, in which last case it is readily known.

Treatment. The best method of treatment, in all cases were the situation will admit, is to take a sharp scalpel (Fig. 120) and cut the wart down level with

FIG. 120.—*Scalpel.*

the surface, and then apply at once tincture of iron until the hemorrhage is arrested. To prevent its return, apply equal parts of powdered alum, corrosive sublimate and arsenic. Apply Venice turpentine in case the styptic should fail to arrest the hemorrhage. When the wart is first removed with the scalpel, take a piece of iron and heat it to a dull red heat and apply it well to the parts, which will not only close the arteries and arrest the hemorrhage, but will have a powerful tendency to prevent their return. Where the wart is very large, and the party lacks boldness to remove it with the scalpel, there may be a ligature tied tightly around the corn, and by tightening it every day the wart will soon drop off; then treat as above.

WIND-GALLS. Wind-galls may arise either from strains, over exertion, or dropsy of the parts. As a rule they are elastic, round swellings on each side of the tendons, rarely becoming solid from coagulation of the lymph, unless, as is occasionally the case, the strain is so severe as to cause inflammation of the bone, ulceration and bony deposit. They do no injury whatever, and do not cause unsoundness.

Treatment. If the puffs (wind-galls) are just appearing, they may be scattered sometimes by a strong decoction of white-oak bark and alum. They may be reduced by blistering, from subsequent contraction of the skin, so the liquid lymph may be drawn out with a hypodermic syringe, after which a wet bandage should be applied over the part. If there is heat and tenderness in connection with the wind-galls it must be treated with fomentations and a high-heeled shoe, as recommended for such disabilities. As a rule, simple wind-galls, being so common, often appearing on colts and doing no injury, had better not be meddled with, unless there is inflammation attending them.

WITHERS, FISTULOUS. See Fistulous Withers, page 766.

WORMS. See Intestines, page 785.

WOUNDS, LACERATED. A lacerated wound is a torn wound. The wound by treading, calking etc., is

a lacerated wound. The tearing up of the skin and sub-cellular tissues, leaving a flap, is a lacerated wound.

Treatment. In any wound, if feverish symptoms occur, give ½-ounce of pulverized saltpeter in the drink night and morning, and administer a moderate purge, unless the bowels are open, say 3 drachms podophyllin, 1 drachm cream tartar, and 25 drops

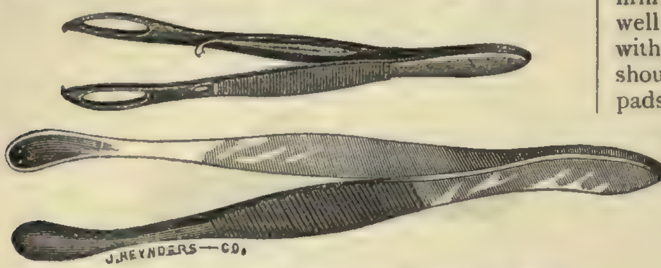


FIG. 121. *Forceps for Lifting Bleeding and Wounded Blood-Vessels so they may be tied.*

tincture aconite. In the case of any lacerated wound, if extensive, clip away all torn shreds, bring the edges nicely together and sew them with fine catgut, or white waxed silk, and let the subsequent treatment be as directed for other wounds.

WOUNDS PENETRATING THE ABDOMINAL CAVITY. A penetrating wound of the walls of the abdomen is generally followed by protrusion of the bowels. Sometimes it is so extensive as to allow a large portion of the intestines to escape. If so, they should be supported by a sheet fastened over the back to prevent injury by the feet and the admission of dirt until relief is given.

Treatment. The horse should be cast, the bowels washed with tepid water, the horse turned on his back, the intestines properly returned to their place by pressure, and the wound sewed up with catgut, well soaked in warm oil, and at intervals of an inch apart, bringing the edges nicely together. Then encircle the belly with a strong bandage properly fastened, by being laced along the back. Empty the rectum, if necessary, by means of injections of warm water or soapsuds, and keep the bowels open by feeding scalded shorts pretty well salted.

WOUND, PUNCTURED. A nail, the point of a fork, a splint of wood, a thorn, or any similar substance, makes a punctured wound. They are the most dangerous of wounds, from risk of internal poisoning, or ending in fistula, lock-jaw, etc.

Treatment. First examine carefully by means of a probe for any foreign substance lodged inside. If found remove it, even if a clean cut has to be made. A clean cut is not dangerous unless an artery is severed. If the instrument inflicting the wound was dirty or rusty, syringe the wound thoroughly with weak carbolic water. If the wound heals kindly, use the dressing for contused wounds. If inflammation sets in, and matter forms in a deep, narrow wound, it may be necessary to enlarge the opening to let out the pus. Then treat as directed for contused wounds.

YELLOWS: see Jaundice.

Horseback Riding. We need not attempt to impress upon minds of the rural residents the importance of this healthful and inspiring exercise. It certainly cannot fail to commend itself to those of either sex who attain any proficiency in the art. It is quite important that the saddle should rest easy and firm upon the horse. Beneath, the saddle should be well chambered,—that is, it should be wide over the withers, and free from stuffing at this point, and there should be a space of at least two inches between the pads of either side to leave a free space over the horse's spine, from one end of the saddle to the other. The pads should only be sufficiently stuffed to protect the horse's back from injury, as too much stuffing, by increasing the distance between the rider and his horse, gives an insecurity to his position. On either side of the saddle, just in front of the stirrup bars, there should be a ring about three-fourths of an inch in diameter, to which to attach the breast-plate, if it should at any time be necessary to use one.

There should be two girths made of the best quality of webbing, good width, and supplied with strong, long-tongued buckles. The stirrup irons should be of sufficient size to permit the ball of the foot to pass through them without difficulty. A light stirrup should be avoided, as it is more easily lost by the foot and more difficult to recover. The crupper should be used only on such horses as are, from their straight shoulder and low withers, unfit for the saddle. It is claimed by some that martingales should only be employed by unskillful riders on fretful horses, their use being deprecated as unnaturally constraining the movements of the horse. The bridle for horseback riding is generally of russet leather, with polished steel or nickel-plated mountings. It should be as plain as possible. As to the form of bit, much depends upon the temper of the horse and the condition of his mouth. This matter is fully presented in the article Bridle, commencing on page 148. to which we refer the reader, in order to prevent repetition here.

To educate or gauge a horse to certain modes of travel, as well as to hurry him up in cases of emergency, a spur is of the greatest convenience. The new style, represented by Fig. 2, is superior to the old, Fig. 1, in several respects, as may readily be seen in

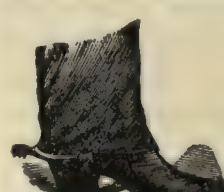


FIG. 1.—*Old Style.*

FIG. 2.—*New Style.*

the engravings. The new is small and light, weighing less than an ounce, and is easily carried in the

pocket, or a pocket-book; it allows the trowsers to come down full length and smooth, and can be inserted into the boot heel and taken out with readiness, and, if done with care, many hundreds of times with one pair of boots before the thread is worn out.

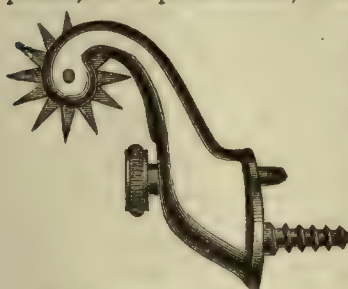


FIG. 3.—*Thompson's Pocket Spur.*

The regular trot is easy to produce, but sometimes, when the canter has been much adopted, it is not so readily effected. The best plan for riding in the trot is this: The foot should bear strongly on the stirrup, so that the elasticity of the ankle takes off the jar and prevents the double rise, which in some bad horses is very apt to be produced. The knees should always be maintained exactly in the same place, and the legs be held perpendicularly from the knee downward. The chest should be well forward, the waist in, the rise nearly upright but slightly forward, and as easily as can be effected without effort on the part of the rider, and rather restraining than adding to the throw of the horse.

To develop the canter, by restraining the gallop, there are required good hands, a quiet seat and a curb bit properly adapted to the mouth. To make a horse start off at once, just at the moment before starting pull the rein and press the heel on the side opposite to the leg which it is desired the horse should lead; for every horse, in starting to canter (and many even in the canter itself), turns slightly across his line of progress, in order to enable himself to lead with that leg he first throws forward. A similar process on the other side will cause him to "change his leg,"—that is, make the other side take the lead.

The gallop requires no special skill to develop, but there are two modes of riding it. One is, to sit down close to the saddle and the other to partially stand in the stirrups; the former is the most common method.

MOUNTING. The breaking of the horse to the saddle, the mode of mounting to do this, etc., is treated on page 710.

There are two methods recommended for mounting. One is to place the left hand on the withers, or grasp with it the horn of the saddle, at the same time holding the reins in that hand, while standing with the back towards the horse's head; then place the left foot in the stirrup and spring up from the ground with the weight partly on this stirrup and partly lifted with the hands. In this process the right hand first grasps the cantle of the saddle, or is placed on the back of the animal corresponding to the cantle, and as the right leg is thrown over, the right hand is removed to the horn of the saddle or to the withers. The left hand all the while holds the reins in such a manner as to keep control of the horse and be ready for guiding or checking him on the instant. The other method of mounting, recommended by Rarey, is to place the right hand and arm over the saddle, with your face toward the horse's head, put the left foot in the stirrup and draw yourself skillfully up into the saddle. But by this method one is more apt to receive a kick, if the horse be vicious.

The position in the saddle is various, mainly according to the relative length of the stirrups. In the military style these are comparatively long, permitting the body to come well down into the seat; but for ordinary riding the stirrups should be adjusted in the following manner: Sit easily in the saddle and let the feet and legs hang down passively as far as they will; then take up or let out the stirrups until their basal portion is directly opposite the ankles. This enables the rider to distribute his weight in proper proportions between his feet, thighs, and seat. While riding, no effort should be made to move in any direction, but the body and limbs should be permitted to follow the motion of the horse. To attain a position that "looks well," the aid of a friend who is a good horseman is necessary, for printed rules are of no account. A rider may think he sits square and all right when in reality he does not. For most purposes, however, where pride does not prompt one to show off, the rider will assume the easiest position regardless of appearance. Even such a position, moreover, is difficult for some persons to attain.

The most graceful manner of holding the reins is to hold them both in the left hand, in such a manner that it will be easy to guide the animal; but to rest that hand the right must be used a portion of the time. Horses difficult to manage require both hands to be used at once to some extent; but such horses, of course, do not permit their riders to "show off" much. The attainment of "good hands"—that is, the light and delicate handling of the reins—is, or ought to be, the aim of every rider. The most delicate mouth in the world is soon spoiled by bearing heavily upon it, as is generally the case. In order to keep a horse from stumbling, or falling into an unnatural gait, he should be allowed to "have his head," for this is just as necessary as that a man in walking or running should be allowed the free motion of his hands and arms. Bad riders use the reins as a means of balancing themselves in the saddle. As to the manner of using the reins the late Henry William Herbert makes the following observations:

"Lightness of hand," about which much is said, is really a firmness; and, except with delicately-formed and perfectly-trained horses, a light hold of the bit is not only dangerous but is injurious to the perfect action of the horse. On the road the rider should always maintain his horse's head in a perpendicular position; this requires the rein to be drawn to a certain point, at which it should be constantly kept, unless it be necessary to slacken the pace. The horse will soon learn that it is only within this limit that he can be free from the pain caused by the pressure of bit, and by keeping his mouth just within it he will render the hold a light one; but should he attempt to pass beyond

it, he should find his rider's hand as firm and unyielding as iron. When in this position, the horse is extremely sensitive to the least movement of the rider's hand, and by an awkward motion he may be thrown upon his haunches, or at least interrupted and confused in his gait.

Every rider should be taught to go through all the paces, and to jump the bar without any reins in his hand; and when he finds he is able to do without them, he will learn to use them only in the way for which they were intended.

Etiquette of Riding. The etiquette of horseback riding should be observed by those who practice it, either for pleasure and exercise or as a mode of travel in pursuance of business or professional calls. There are a few observations we desire to make in reference to some of the principal points.

Your left when in the saddle is called the near side, and your right the off-side. Mounting is always done on the near side. In doing this, put your left foot in the stirrup; your left hand on the saddle; then, as you take a spring, throw your right leg over the animal's back. Remember, also, that the rule of the road, both in riding and driving, is, that you keep to the right.

In riding with ladies, recollect that it is your duty to see them in their saddles before you mount; and the assistance they require must not be rendered by a groom; you must assist them yourself.

The lady will place herself on the near side of the horse, her skirt gathered up in her left hand, her right on the pommel, keeping her face toward the horse's head. You stand at its shoulder, facing her, and stooping, hold your hand so that she may place her left foot in it; then lift it as she springs, so as to aid her, but not to give such an impetus that, like "vaulting ambition," she loses her balance and "falls o' the other side." Next, put her foot in the stirrup, and smooth the skirt of her habit; then you are at liberty to mount yourself.

If the lady with whom you are to ride is a good horsewoman, and her horse is perfectly trained, your responsibility is a light and pleasant one, involving only those usual attentions in mounting and dismounting which suggest themselves. Any unnecessary interference with the lady, or her horse, or excessive solicitude for her safety, must, to a woman of good sense, be annoying, and may not unfrequently be the cause of accidents. As, however, a lady is never so well prepared, from her mode of dress, natural timidity and inferior strength, for the exigences of an accident, or a contest with a frightened horse, you should always be watchful of her horse, without appearing to be so, especially when passing vehicles or unusual objects on the road.

Few ladies know how to dress for horse exercise, although there has been a great improvement, so far as taste is concerned, of late years. As to the head-dress, it may be whatever is in fashion, provided it fits the head so as not to require continual adjustment, often needed when the hands would be better employed with the reins and whip. It should shade from the sun, and, if used in hunting, protect the nape of the neck from rain. The recent fashions of wearing the plumes or feathers of the ostrich, the cock, the pheasant, the peacock, and the king-fisher, in the riding hats of young ladies, are highly to be commended.

The hair should be arranged in the firmest manner possible. If suited to the style of the lady, it may be plaited at the back and looped across, in a manner which will support the hat and present a very comely appearance. Or it may be found pleasanter to turn all of the hair back to the top of the head, where a high hat is used. All loose arrangements of the hair, except short curls, when they are natural, should be avoided. But few hair-pins should be used, and those long and firmly woven into the hair.

Ladies' habits are usually made too long; if the extra length be turned to a heavy hem at the bottom, it will be found much more likely to stay well down over the feet, which is all that is required; weights are unnecessary and cumbersome. A foot longer than an ordinary skirt will be found sufficient, if the material be suitable. Light cloth will be found the most appropriate for the skirt, if the color be becoming and sufficiently dark. For country riding it may be bordered a foot deep with leather. A habit of the same should be worn in winter, adapted in shape to the figure of the lady. If she be short and plump, the more closely it fits the figure the better, particularly the sleeves, which should never be large. If she be slight the dress may be opened in front and the sleeves loosened at the wrist, with white linen chemisette and sleeves. No basque, or a very slight one, should be worn, nor anything else which will flutter in the wind. No ornament is needed. A good effect of color and form is all that is seen or that is desirable.

Keep to the right of the lady or any ladies riding with you.

Open all gates and pay all tolls on the road. Never, under any circumstances, allow a lady to attend to any duty of this kind while under your escort. You must anticipate her every need, and provide for it, making her comfort your first thought.

If you meet friends on horseback, do not turn back with them; if you overtake them, do not thrust your company upon them unless you feel assured that it is agreeable to them for you to do so.

If you are on horseback and meet a lady who is walking, and with whom you wish to speak, dismount for that purpose, and lead your horse. To put her to the inconvenience of straining after and shouting to you, would be a gross breach of manners

Horse-Bot. See Gadfly, page 553, and Bot, page 747.

Horse Chestnut, a tree of the Buckeye tribe, noteworthy for the beauty of its figure, flowers and early foliage. The wood is soft and of little value. The nuts contain much nutritious matter, which is combined with a disagreeable bitter. A valuable tree for the landscape.

Horse-fly Family. This family comprises large two-winged insects, which in the female have a proboscis enclosing six sharp lancets, and in the male four. The eyes are very large and cover almost the entire head. These are among the largest of the diptera, and are notorious for their attacks upon horses and cattle, piercing them and sucking their blood, and causing them great pain. The larvæ live in the ground. We give an illustration by the accompanying engraving of the black horse-fly. This is nearly seven-eighths of an inch long and expands nearly two inches. In this genus are also the orange-beetled horse-fly and the lined horse-fly.

Black Horse-fly.

Horse Jockey, a dealer in horses.

Horse-Power, as a measure of force, the capacity of raising 33,000 pounds one foot in a minute; a unit or standard by which the capabilities of steam engines and other prime movers are measured. Work is an exertion of pressure through space. The unit by which quantities of work are measurable is the labor necessary to raise one pound through the height of one foot. The rate at which work is done is expressed in horse-power, and one horse-power is equivalent to the work done by continuous exertion at the rate of 33,000 pounds raised through one foot in one minute; that is, to the performance of 33,000 units of work per minute. As a horse can exert such a force but six hours a day, one machinery horse-power is equivalent to that of four and two-fifths horses. "Nominal horse-power" is a term still used in England to express certain proportions of cylinder, but of no value as a standard of measurement. The actual or indicated horse-power of an engine is from three to five times the nominal horse-power. The elements of its calculation are the speed of the piston, and the pressure upon it as shown by the indicator card, or as calculated by approximate rules.

The term "horse-power," in the farming community, is more generally understood to be a machine to communicate the power of horses to other machinery. Fig. 1 gives a cut of a large, substantial horse-power, such as is used for driving threshers. It has the great advantage of working on the wheels by which it is moved from place to place. It has ample strength for 12 horses, being devised in competition with steam power. The bull-wheel is made so strong as never to break, and at the same time the power is comparatively of light draft.

The "spur-speed" mounted power of Nichols, Shepard & Co., Battle Creek, Mich., is constructed on the Woodbury principle, possessing all the good points of the foregoing, with perhaps some advantages. The shafts are made of the best quality of steel, the lower friction pinion is provided with an improved adjusting bridge tree, by which it can be easily kept in gear; the line shaft is so arranged that the tumbling-rod can be attached at either end, which is very convenient when operating threshers with different side gear; the line shaft boxes are provided with set-screws for properly adjusting the line shaft; and a powerful brake is also provided.

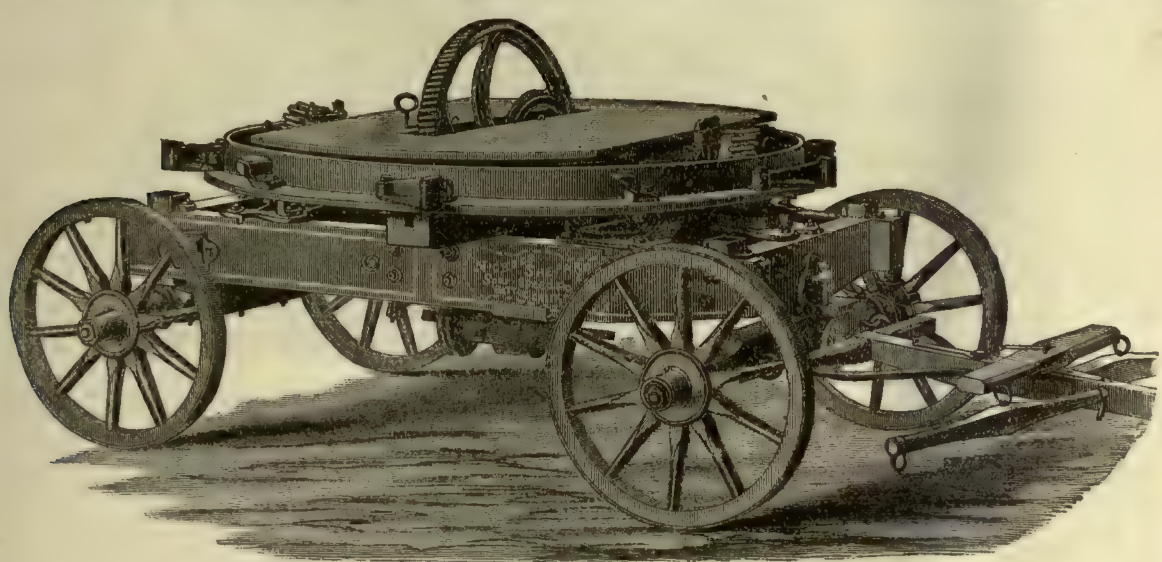


FIG. 1.—*Spur-Speed Mounted Power.*

A fine example of a sweep power is illustrated by Fig. 3, which is a cut of a horse-power manufactured by the Taylor Horse-Power Company, Chicago. This power has been well tested, having been in use for many years. As can be seen in the cut, it is adaptable to the various purposes of the farm, the dairy, etc. The same company make also a smaller sweep power, Fig. 2, to be run by one, two and four horses. This

arrangement of having the gearing and tumbling-rod overhead is patented by this company.

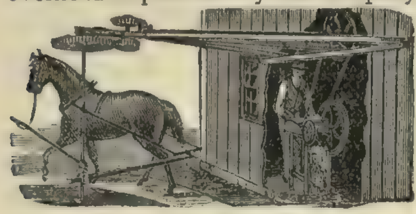


Fig. 2.—*Horse Sweep Power.*

Tread-powers possess an important advantage for the moderate farmer. He may do his threshing at any time in winter, without securing the large force of laborers required to man a large machine. With lever powers six to ten horses may be employed and more rapid work performed.

Horse-Racing: see Speed.

Horse-Radish. This popular salad for meats is so easily raised, growing spontaneously with such vigor, that no directions for its cultivation are required. By cultivation, however, the size and quality of the root is somewhat improved. The roots are dug in early spring, washed and grated to be used as a salad upon meats. It is almost an equivalent of mustard. Its leaves are also used in making pickles, poultices, etc. To keep horse-radish to use in winter, take it up in the fall and put it in the cellar, in a large box filled with earth, or put in the cellar with plenty of earth around it.

Horse Rake, generally used for raking hay. The

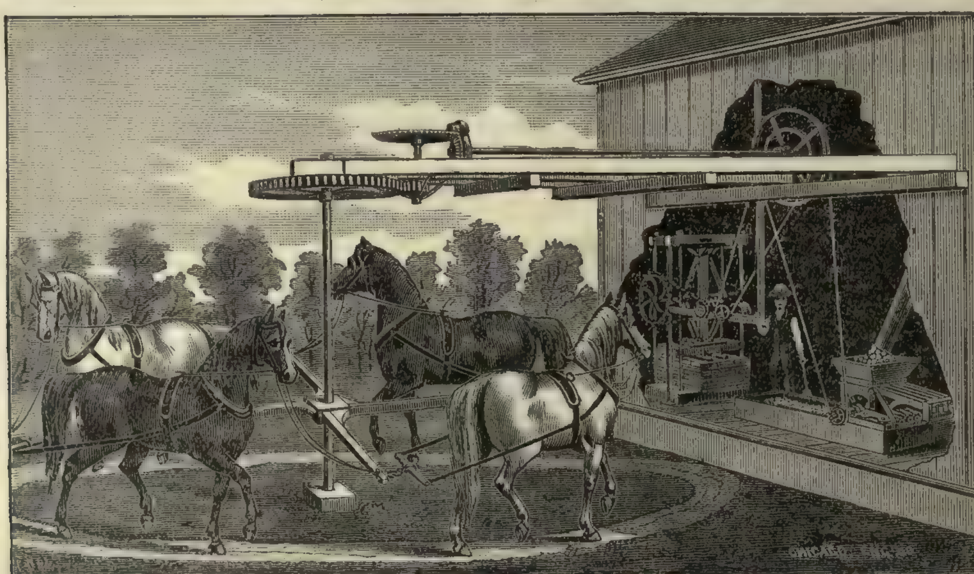


Fig. 3.—*The Taylor Horse Sweep Power.*

Among the tread-powers, that made by E. S. Bristol & Co., Chicago (Fig. 5), is one of the best.

Dederick & Co.'s, Fig. 4, is also a substantial tread-power, having wrought links and steel rods. The speed is adjustable to any sort of work, pressing hay, threshing grain, sawing wood, etc. The horses work abreast on all but the four-horse power, in which they work two abreast, and the other two behind them. The four-horse power is designed for rapid and steady work, as the power may be placed so near level that the horses will walk all day steady without rest. Their 4-horse power is no wider than two-horse, but nearly twice the length.

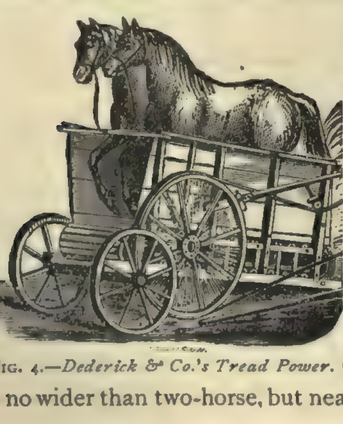


Fig. 4.—*Dederick & Co.'s Tread Power.*

Long & Allstatter Company, of Hamilton, Ohio, manufacture an excellent sulky horse rake. Fig. 6, on the next page, plainly illustrates the manner of its working. We also illustrate the wooden hay-rake by Fig. 1 of article on Hay.

Horse Tick. This is one of those tenacious insects, about the size of the horse-fly, which attack the horse. It prefers those parts of this animal where the hair is thinnest, and skin softest, particularly under the belly and between the hind legs. Its bites cause severe pain; indeed, so terribly annoying is it that it will irritate the gentlest horse into kicking, rendering him almost uncontrollable. It clings so tenaciously that its removal is quite difficult; nor is it easily crushed, which should always be done, however, on first being noticed. Fortunately they are not numerous.

Horse Shoe. See page 733.

Horticulture. On page 433 in the article on Farming, we spoke of Horticulture as embracing the second great division of Agriculture, or that which pertains to the forest, the orchard and the garden. These

include pomology, arboriculture, vegetable gardening, floriculture and landscape gardening. See Garden, Orchard, Floriculture, Forestry and the respective fruits and vegetables.

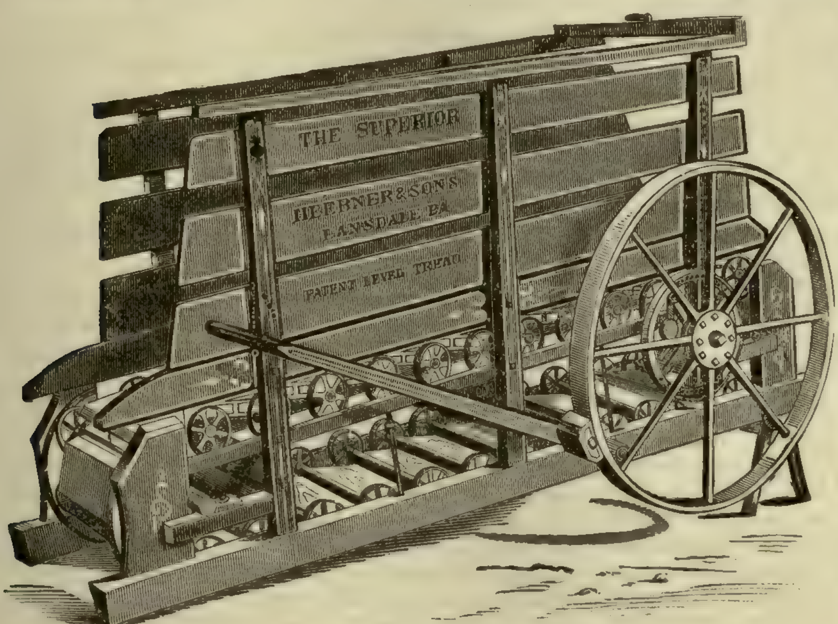


FIG. 5.—*Horse Tread Power.*

Hose (hoze), covering for the legs; close-fitting trowsers or breeches, as formerly worn, reaching to the knee; stockings; also, flexible pipe for watering plants or throwing water upon fires, etc.

Hospitality. See Etiquette.

Hot-Bed. About six inches of soil over about two feet of well packed fresh manure, and enclosed so that it can be protected against the excessive cold of frosty nights and against rains, constitutes a hot-bed. It is generally covered with glass windows or doors. The use of the hot-bed is to "force" the germination of seeds in early spring, so that the plants will be of some size when the settled warm weather of May arrives. It is used for both vegetables and ornamental plants. Of course, care will be required to have the bed just warm enough to suit the nature of the plants to be started in it, and generally during the day the covers should be tilted up a little to let in the air. These covers should slope facing the south, and the lights in them so arranged that they will turn the rain, when more is offered than is needed for the plants. The inexperienced should use a thermometer, as for most vegetables the temperature should not rise above 85° during the day or sink below 65° at night. As the heat of the bed declines with the age, fresh manure may be put around the outside, with closer watching of the weather; but this is seldom necessary, as it will generally last until warm weather arrives. "Cold frames" are simply the hot-bed frames set upon a warm spot of ground, and covered at night to preserve the warmth accumulated during the day.

The structure and management of a hot-bed is much the same as that of a cold frame, treated on page 277, with the exception that being started earlier the requisite temperature has to be kept up by artificial means, fermenting manure being relied upon for the purpose; and the loss of this heat has to be checked more carefully by straw matting, and in the far North by shutters also. The front and back are also made higher than in a cold frame. Horse manure with plenty of litter and about quarter its bulk in leaves, if attainable, all having been well mixed together, is thrown into a pile, and left for a few days until steam escapes, when the mass is again thrown over and left for two or three days more, after which it is thrown in the pit (or it may be placed directly on the surface) from 18 inches to two feet in depth, when it is beaten down with a fork and trodden well together. The sashes are now put on and kept there

FIG. 6.—*Horse Rake.*

until heat is developed. The first intense heat must be allowed to pass off, which will be in about three days after the high temperature is reached. Now throw on six inches of fine soil, in which mix a very liberal supply of well rotted manure free from all straw, or rake in thoroughly superphosphate or guano at the

rate of 2,000 pounds to the acre and plant the seed as in cold frame. Keep day temperature 70 to 80 degrees and don't allow it to fall below 55° at night. If the temperature exceed 75° the plants are liable to grow spindling and weak. Do not move the sashes to give air immediately after removing the mats in the morning, lest the young plants damp off.

The following variety of detail is also good :

Select a place well exposed to the east and south; now cut it out evenly with the spade about 18 inches deep, then fill one foot of the depth with fresh horse manure and litter, tramping it down well, and then cover it over with good, rich garden soil. Next prepare a frame and fit it in the top of the trench having the north side the highest by a few inches; let the bed stand open two or three days until it feels hot to the hand, which, if it does not do in the time stated, pour on it a pail or two of hot water, which will soon make it all right. For the cover make the frame to fit the other in the bed, have a cross-piece in the center and braces on the corners (it is well to make it strong, for the frames will do for many years). Take white cloth (new or old will do) for the cover, tack it on the frame even and make a paint of linseed oil, one pint with two well-beaten eggs, mix and paint it all over the cloth, seeing that it is all well saturated, and let it dry; and when the bed is ready to sow, fasten it on the other frame with strips of leather for hinges, then the wind cannot blow it off. Now, if the bed is done steaming, even it down nicely, sifting, picking out all stones and lumps, and finally sift over it about an inch of nice, rich soil, and it is ready for the seeds, which sow in even rows and not too thick, for they are very sure all to come up. Write the names on a piece of shingle to mark the different sorts. Some use this cloth cover not because it is cheaper, but because it is really the best. In the use of glass there is need of constant watching and care, or all is lost, while with this plan there is no danger of heat or damping off, but the plants come as if by magic, and they are so robust, and do not feel the change when transplanted.

It makes a nice place to set slips of house plants, or sow perennials after annuals are out of it.

Hot-House, a green-house heated with fire, the heat passing through pipes around the inside of the structure. Heated water is preferable to either steam or hot air, as it is more easily kept uniform. See Green-house.

Houdan (hoo-dan′), a breed of the domestic fowl. See Fowl, page 524.

Hound, literally a dog; conventionally, a dog of several varieties, which traces game by the scent; a dog used for hunting. They are more slender and better built for running than the mastiff and bull-dog kinds, which are better calculated for attacking, fighting, killing or holding animals. See Dog. Hound of a wagon, is the forward portion, to which the tongue is attached.

House: See Residence.

Household, the family. "Household science," those sciences and arts which pertain to housekeeping and the welfare of the family; called also "Domestic Economy," which see. A large portion of this encyclopedia is devoted to household science.

Housekeeping, taking care of one's self and his or her family, furnishing board and lodging, as independent of other families.

Houseleek, a fleshy plant, which is very tenacious of life, often growing on old walls and roofs, with no roots; called also "live-for-ever," "life-everlasting," etc. Has been used in Herbal practice.

Hovel (hov′l), a shed, or rude building used for shelter.

Hoven (ho′vn), swelled or puffed out; applied mostly to cattle when distended with gas from eating too much green food; colic; blown. For treatment, see pages 230 and 754.

Huckleberry, or Whortleberry, a popular fruit, of several varieties, growing on shrubs in the Lake region. The largest kind grow on low shrubs, are bluish black, with a whitish bloom, and are known also as blueberries. The small, glossy, black sort is the true or black huckleberry. These berries are produced so abundantly by nature that no attempts at cultivation in their native region have yet been made; and in other regions such attempts would probably prove unremunerative.

Hulled Corn. To hull corn is generally regarded as a tedious and dreadful task, because an effort is made to eat off the points of the grain with the lye, and with weak lye at that. The result is, that by the protracted boiling the grain becomes saturated with the lye, which has to be "parboiled" out; this cannot be done perfectly, and at the same time the richness of the corn is considerably reduced. Take strong lye water, say half as strong as that which first runs from a leach tub of good ashes, heat it to boiling, throw in the corn, and boil it briskly for five or ten minutes, but not a minute after the hull begins to slip easily; take it out and immediately wash it in several waters; it is then ready for the final boiling, and will not need parboiling. In four or five hours it will be done, and done nicely. The second and third hour of the boiling the corn swells very rapidly, and drinks up water excessively. Keep it well supplied with boiling water, so that the cooking will not be retarded, and watch it closely that it does not scorch. Just fire enough to keep it boiling is sufficient. Do not stir it. In preparing the lye, by sifting the ashes the corn can be boiled with them and much time be saved. From the time the corn is poured into the lye to the time it is put into the water for the final boiling need not be more than 15 or 20 minutes. It is best to prepare this corn in freezing weather, so that it can be kept in a frozen state. When done boiling, pour it into a tin pan and set it in a cold place to freeze. The next morning, warm the pan a little and the corn can be

easily slipped out into a clean tub or upon brown paper, where it can be cut into chunks of convenient size. Re-set it in the cold place, and it will be ready for use at any time. The most healthful way to eat it—and as palatable as any—is to thaw it and boil it a minute or two, in as little water as possible, taking care not to let it scorch, and then eat it with sweet cream or rich milk. Many persons prefer it even without salt.

Hominy is prepared from coarsely ground corn: see Hominy.

Humble-Cow, a hornless cow.

Humbug, an imposition under fair pretenses; something contrived in order to mislead; a piece of trickery; a hoax; also, one who deceives. The term is often applied also to false systems of doctrine or false and plausible ideas. See Swindle.

Humor (hu'mor or yu'mor), moisture or fluid in the body; a vitiated or morbid animal fluid, such as often causes an eruption of the skin; also, the eruption itself; a rash; state of mind, etc., as good humor, or bad humor. See Blood.

Humus (hu'mus), a pulverizable brown substance formed by the action of air on solid animal or vegetable matter. It is a valuable constituent of soils, not, however, directly nourishing plants, but having the power, under moisture and heat, of rendering nutrient material soluble and available for the plants. No soil should be without an abundance of humus.

Hunting: see Guns and Gunning.

Hurdle, a texture of twigs, osiers or sticks; a crate of various forms; a movable frame of split timber or sticks wattled together, serving for gates, inclosures and the like: sometimes made of iron.

Husbandry, that branch of agriculture which includes the raising of farm crops, stock, the feeding and fattening of animals, dairying, etc. See Farming.

Husk, the external covering of certain fruits or seeds of plants; glume; hull; rind; chaff; especially the covering of ears of corn. To "husk" is to strip off this covering.

Hyacinth (hi'a-sinth), a very graceful plant of the lily family.

Hybernation, that state of torpidity into which some animals fall during a part of the autumn and in winter, but from which they escape early in the spring. Although we are wholly ignorant of the cause of this winter sleep, the effects and design are well known. It seems intended to preserve the animals in situations where they could not have maintained their existence, from the impossibility of finding an adequate supply of food. Accordingly. all the active functions of life are suspended.

At a more or less advanced period of the autumn, depending upon the degree in which the temperature is lowered, animals possessed of this peculiar constitution seek to shelter themselves from the cold and wind by retiring into holes in the ground, walls, trees or among bushes. These retreats they line carefully with grass, dry leaves, moss and other bad conductors of heat. Hybernation occurs among several of the mammalia, as in the dormouse, hedge-hog, bats, Alpine marmot, etc. Animals with cold blood hybernate as well as some of the mammalia. Many reptiles become torpid in cold climates, as well as some insects and worms. In general, however, the degree of their lethargy is much less profound than that of the hybernating mammalia. They pass this period without food, but are not always deprived of sensation and motion, even at the freezing point.

Hybrid (hi'brid or hib'rid), the product of cross-breeding; the product of mixing two species in one individual; mongrel. A hybrid in the vegetable kingdom corresponds to a mule, for example, in the animal kingdom.

Hybridize (hi'brid-ize or hib'rid-ize), to cross-breed; to produce a new variety by mixing two species. For process, see Breeding and Varieties.

Hydrangea (hi-dran'je-a), a beautifully flowering plant, popular in house cultivation. See figure on page 498.

Hydraulic Ram, an apparatus for raising water several times higher than its source by employing the momentum of the descending current in successive beats or strokes.

Hydro-carbon, any oily, waxy or resinous product of vegetation which is rich in hydrogen. An essential element in nutrition.

Hydrophobia. Perhaps the most awful of all diseases is that which is derived from the bite of an animal suffering under dog madness, or rabies, and unluckily the apprehension often produces mental torture hardly less terrible than the disease itself. It is consolatory, therefore, to be assured that the disease in animals is more rare than might be inferred from the constant cry of "mad-dog" which is raised whenever a poor cur, being worried into a bad temper, bites and foams at the mouth. Dog-bites are extremely common: hydrophobia one of the rarest of maladies.

The disease derives its name from the dread of water which its development causes in the human subject, but rabies in the dog causes no such dread; in fact the dog generally seeks the water greedily, though possibly spasm may prevent him from swallowing it. The disease in the dog ought to be known, in order that proper precautions may be taken against them when thus afflicted. Indeed, the subject is so important in respect of precaution that we think it necessary to give the symptoms of dog madness. There are three well-marked stages of the complaint in the dog. The first is characterized by melancholy, depression, sullenness and fidgetiness; the second by excitement and rabid fury; and the third and last by general muscular debilitv and actual paralysis.

Whether the disease originated in the dog or was communicated, the dog looks ill and sullen after a

period of incubation of very variable length; he is constantly agitated, turning round and round inside his kennel, or roaming about if he is at large. His eyes, when turned on his master or friends of the house, have a strange look in them, expressive of sadness as well as of distrust. His attitude is suspicious and indicates that he is not well. By wandering about the house and yard he seems to be seeking for a remedy to his complaint. He is not to be trusted even then, because, though he may still obey you, yet he does it somewhat slowly; and if you chastise him, he may, in spite of himself, inflict a fatal bite. In most cases, however, a mad-dog respects and spares the person to whom he is attached. But his agitation increases; if he is in a room at the time, he runs about, looking under the furniture, tearing the curtains and carpets, sometimes flying at the walls as if he wished to seize a prey. At other times he jumps up with open jaws, as if trying to catch flies on the wing; the next moment he stops, stretches his neck, and seems to listen to a distant noise. There follows then an interval of calm; he shortly closes his eyes, hangs down his head, his fore-legs seem to give way beneath him, and he looks on the point of dropping. Suddenly, however, he gets up again, fresh phantoms rise before him, he looks around him with a savage expression, and rushes as far as his chain allows him against an enemy who exists only in his imagination. By this time already the animal's bark is hoarse and muffled. Loud at first, it gradually fails in force and intensity, and becomes weaker and weaker, apparently indicating incomplete paralysis of the muscles of the jaws, just as the dropping down pointed to the paralysis of the muscles of the fore-legs.

In some cases the power of barking is completely lost, and his tongue hangs out through his half-opened jaws, from which dribbles a frothy saliva. Sometimes his mouth is perfectly dry and he cannot swallow, although in a majority of cases he can still eat and and drink. Although he can no longer drink, people are misled into the belief that he does so from his lapping fluids with great rapidity. On close examination, however, the fluid is found to keep the same level in the vase which contains it, and one can see that the dog does not in reality swallow,—that he does not drink, but merely bites the water. Although he cannot swallow fluids, he can still, in some cases, swallow solids, and he may thus swallow anything within his reach,—bits of wood, pieces of earth, the straw in his kennel, etc. The circumstance is one of very great importance to bear in mind, because when the body of a mad-dog is dissected, a good many substances which have not been digested may be found in his stomach, and do thus furnish a proof of his complaint.

One period of the disease does not pass suddenly into another, but by an easy transition. Even in the first stage, that of depression and melancholy, the animal is from time to time very agitated, and shifts his posture. This agitation increases to a considerable degree, and in the second stage constitutes the rabid fury which characterizes this period, together with hallucinations of sight and hearing. During this second period the animal drops down in a state of exhaustion after paroxysms of rage; he seems completely prostrate; his head hangs down, his limbs give way under him and he can no longer swallow.

Towards the close of the second stage the dog often breaks his chain and wanders about, seized from time to time with paroxysms of fury, and then he stops from fatigue, as it were, and remains several hours in a somnolent state. He has no longer the strength to run after other creatures, although, if he be worried, he can still find strength to fly at and bite an individual. If he be not destroyed as he wanders about, he generally dies in a ditch or in some retired corner. He apparently perishes from hunger and thirst and intense fatigue.

What distinguishes hydrophobia from every other form of poisoned wound is the great uncertainty of its period of incubation, and the incredible length of time during which the poison may remain latent, and yet ultimately break out in all the virulence of the disease. Many cases are recorded in which more than a year has elapsed between the receipt of the injury and the outbreak of the disease. The disease undoubtedly originates spontaneously in the dog, but in the human subject it is only known as a consequence of inoculation.

Like other poisons, except, perhaps, those which are most virulent, the poison of hydrophobia is very uncertain in its action. Thus, if several persons be bitten, only one may suffer. The disease begins not uncommonly with renewed irritation in the scar of the wound, or with irritation in the nerves leading from it, testifying to the fact that some morbid action is going on there. And there is often a period of sullen depression, a passion for solitude, and a change of temper and disposition exactly analogous to the first stage of rabies in the dog. Feverishness then succeeds, more or less marked in different cases, and then, at a variable period, the peculiar and characteristic feature of the disease manifests itself, viz., that any attempt to swallow fluids will produce severe paroxysms of dyspnœa; and in the worst cases these paroxysms are produced not only by attempts at drinking, but by swallowing anything, and even by the sight or the very idea of fluid, and in some cases they occur spontaneously. As the case proceeds the mind, which was at first quite calm and reasonable, sinks under the agony produced by thirst and by constant restlessness, and the patient becomes more or less insane, yet is usually quite under control and easily made conscious of his own delusions. The excitement increases, the eyes become wild and staring, the whole countenance expressive of rage mixed with terror; the patient is in a constant state of excitement, and gets hardly any sleep, and that little is unrefreshing and imperfect. After this stage of excitement and mania often follows one of exhaustion, in which the patient recovers his reason and his power of swallowing, but dies of asthenia; at other times he

dies in the furious stage, either exhausted or suffocated. No instance of recovery has hitherto been recorded.

The disease has never, as far as we know, been propagated from man either to other men or to the lower animals, though the saliva of hydrophobic men has been inoculated for experiment into the dog.

Immediate attention should be given to the bite of a dog, in whatever condition; but should he exhibit any of the symptoms above described, there is great danger, should his teeth have penetrated the skin. It is claimed that the bite of a dog afflicted with rabies would far more often prove fatal was it not for the often heavy clothing through which the teeth pass, thus rubbing from the teeth the saliva. We give numerous prescriptions resorted to for relief.

No. 1. Take sweating baths and thus work the virus out of the system.

No. 2. Take immediately after the bite, warm vinegar or tepid water, wash the wound clean therewith, and dry it; then pour upon the wound a few drops of hydrochloric acid, because mineral acids destroy the poison of the saliva. Take large draughts of vinegar for a day or two.

No. 3. Drink freely of a strong decoction of white-ash bark, say a gill three times a day for a week or two.

No. 4. One ounce of elecampane root, boiled in 1 pint of milk until reduced to ½ pint; take such a dose three times for a week. The second and third doses may be a little stronger.

No. 5. After washing the bitten part with clean water, poultice it with good leaf tobacco, renewing three or four times a day for a week.

No. 6. Inject under the skin large doses of morphine and give large doses of powdered castor, mixed with sirup.

No. 7. Instantly tie a string above the wound, cut out the bitten part, or cauterize it freely with lunar caustic; tranquilize the system by a suppository of 10 grains of opium; give a mixture of opium, ammonia, camphor and ether; apply bladders full of pounded ice to the spine, administer chloroform, and use the hot bath, with all the means and remedies advised under Bites, Stings, Rattlesnake, Neuralgia, and Lock-jaw, which see.

Hygiene, the laws of health,—not the "*rules* of health," as laid down by some eminent physician. The term refers to what is really necessary to physical perfection, and not to any man's opinions. Nearly, if not quite, all the laws of health come under two heads, both of which are negative, namely, Cleanliness and Abstinence from Exhaustion, taking the latter term in its literal and most extended sense. To any one who fully comprehends the scope of these two phrases, it is unnecessary to give details.

That the principles of preserving health are numerous, intricate and difficult to understand, and subject only for professional study, is an error. The care of the health being in each individual's own hands, they must of necessity be few and simple. The doctor cannot be with you every moment, as a mother is with her babe. The whole art, in fact, of preserving health may be properly enough said to consist in supplying what is deficient in the system, and carrying off what is redundant, in order that the body may be habitually kept in its natural state; and hence it follows that all the supplies from eating and drinking, and all the discharges of perspiration, and by the other channels and distributions of nature, should be regulated in such a manner that the body shall not be oppressed with repletion, nor exhausted by evacuation. Of these two, one is the cure or antidote of the other, every error in repletion being corrected by a seasonable and congruous evacuation; and every excess of evacuation, should, if it has not proceeded too far, be cured by a gradual and suitable repletion. This is the art of enjoying a life of health, or of recovering lost health, and preserving it when once established. "It is health that makes your bed easy and your sleep refreshing; that renews your strength with the rising sun; that makes you plump and comely, enriching the complexion with nature's choicest colors; that makes your exercise a sport, increases the natural endowments of your mind, and makes the soul delight in her earthly mansion."

In this article we will attempt to enumerate only the particulars required to set the average reader to looking in the right direction at every point of daily life.

Air. The air we breathe should always be pure, both day and night, and nearly always the out-door air is much purer than that indoors, night as well as day. Many persons are so afraid of catching "cold" that they exclude out-door air and so pursue the surest way to bring about that malady, besides rendering themselves effeminate. While a person, although sick in bed, is kept warm, he cannot have fresh air too constantly, and even a draft will not hurt him so long as his face is turned toward it. In foul-smelling chambers, do not depend upon disinfectants and deodorizers for purifying the air. Remove the cause of the impure air so far as possible. Some impurities are absorbed by quicklime, charcoal, onions, etc. Pure air is not only necessary for the lungs, but for the skin all over the body. Indeed, strictly speaking, air and sunlight are the only things that "toughen" the skin, or even the body; they are the only true "tonics." Frequent rubbing the whole body while exposed naked to pure air and sunlight are the best tonic baths.

The most prolific source of malaria (foul air) about a residence is the cellar. No matter how neat it is kept, on entering it from out doors one always perceives a damp, heavy odor, which indicates an atmosphere that generates moss, mildew, mold, mushrooms or fungi, microscopic germs, seeds of disease, etc. Many people do not notice it much, but an extreme case may so call their attention to it that they will ever afterward recollect its nature vividly enough; and that is, if they will pass along the sidewalk in the

business part of a village, on the lee side of the buildings, on one of the warmest days in May, June, or July, they will almost constantly breathe such a rank exhalation from the cellars as will nearly or quite turn their stomach or take away their appetite for dinner. After once noticing that fact, they will be able to perceive more or less of the same odors in every cellar. Such effluvia continually pass up through the cracks of the floor into the various apartments of the house, and, combined with the already confined and vitiated air of the house, contaminate the lungs, blood and tissues of every inmate, rendering him or her pale, weakly, diseased and susceptible of severe attacks of sickness of any kind. Hence, office men in the towns and cities and women everywhere show the effects of such exposure, for "exposure" it is, most emphatically. Burning sulphur in the cellar, when it is tightly closed all around, is the best way to kill off all vegetable growths in it. For health's sake, there never should be a cellar,—at least under the house. Have it anywhere else; have an ice-house, a conservatory, anything, rather than a cellar under the building in which you reside. The best way to fix the ground under the house is, to first dig away all the soil, and then fill up with clean yellow clay, or sand and gravel, heaping up a little toward the center and leaving space enough between the surface of this filling and the floor to allow an opportunity to remove the top earth or sand, and renew with fresh once a year or two. It is well to have movable planks nicely fitted around the building next the ground to keep it warm under the floor in the winter time, and moved away during the summer to allow a free circulation of air underneath.

Some houses are so constructed and kept as to generate a musty odor, even independently of the cellar. Dark, unventilated rooms, rotten wood in the floor and walls, wall-paper, old and new, nasty sinks, foul cupboards, closed cases and shut-up closets, all are manufactories of the agencies of disease and death. In every part of a dwelling, above and below, the air should be as fresh and sweet as out of doors, and it is a great deal more important, as the family pass the largest portion of their time in the house.

Some stoves and fire-places are great enemies to man. The draft is not strong and uniform, especially during the night when a smothered fire is being kept over, and carbonic acid and sulphurous gases fill the apartments where the innocent and unsuspecting are asleep, and commit irreparable depredations upon their constitutions. In this volume we tell how to construct houses, sinks, drains, cellars, fire-places, stoves, etc., etc., with a view to health as well as to beauty.

LIGHT. The difference between the white, tender potato sprout in the dark cellar and the green, tough vine out in the field, strikingly exemplifies the hygienic influence of light. As remarked above, light is essential, next to good air, to a healthy condition of the skin. So far as concerns physical perfection, artificial darkness should never be resorted to except in case of weak eyes. As to the swarthiness of the skin resulting from exposure to light, this is not the place to say anything, as we cannot argue the "looks" of any object. All special rules necessary to the preservation of the eyes are embraced in the prohibition, "Never strain the eyes."

HEAT. While it is well for the body to be exposed to some changes of temperature in the atmosphere, a severe change is to be deprecated. As within enclosed rooms the warmer air is always overhead, it should be our constant care to "keep the head cool and feet warm" by special appliances. Out of doors it is always slightly warmer at the surface of the ground, where the feet naturally are, than at any point above the surface. Our method of dress in this country is far from perfect in a hygienic point of view, as it is out of proportion and keeps some parts of the system too warm, or others too cool. (See Clothing, a little further on in this article.) In abnormal conditions it is often necessary to heat up, by fire, friction exercise or hot water, certain parts of the body, or all of it, in order to equalize the temperature and the circulation, and thus restore healthy action to the debilitated portions. Heat is applied to the body in various ways, according to the nature and location of the malady, as by full hot baths, partial hot baths, Turkish and vapor baths, packs, fomentations with flannels wrung out of hot water, boiled meal or corn, India-rubber bags of hot water, bags of sand, flat-irons, soapstones, etc. Some of these processes, to a certain extent, are very simple and require no description here, while some of them, to have their best effect, are too complicated to delineate in a single article like this, but should be learned from a professional nurse.

While in a state of rest, as standing, sitting or lying down, never suffer the wind to blow upon any part of the body, except as it strikes the face first: by the latter provision one can cool down in a short time from an overheated condition with comparative impunity. Walking or working with a hot sun constantly shining on your back, especially after a hearty meal or when you have on a black coat, is very injurious. Nor should we remain long in a close room in cold weather, after the fire has gone out, as that is a very sure way to "catch cold," while we still feel comfortable and can scarcely imagine we are exposing ourselves. Nearly all "colds" are caught in confined air, especially if it be foul. Sitting in cold chairs, as the cane or wood-bottomed, in cold weather, induces neuralgia, rheumatism and sciatica in the hips, back and legs, lameness in the back and various disturbances of the bowels, urinary system, liver, and sometimes even the stomach and head.

FOOD. As to quality, "absolute cleanliness" again, and as to quantity, "no exhaustion"—of the stomach. Most persons will agree with this maxim in general terms, but when we descend to particulars, every one cries out, "Let me alone; don't preach to me; 'what is one man's food is another man's poison.'" Yet when one is brought down to a bed of sickness he is constantly inclined to inquire of his friends and of the

doctor, "May I eat this?" and "May I drink that?" Everybody in a state of health is more unapproachable on the subject of food and drink than on any other thing in the whole round of hygienic law, but sickness reduces us to submissiveness; hence, what little the physiologists have to say on this topic must be addressed to the invalid.

The most popular maxim is, Eat whatever agrees with you, and as to quantity, Stop a little short of satiety. We would add that, as condiments are not food, the less we take of them the better. Good cookery and a proper degree of hunger supersede condiments, and by this rule one can "enjoy his victuals" through a long and happy life much more than by the present practice.

As to time, we urge the importance of not eating when the mind or the body is excited or exhausted with fatigue. Nor should one rush into severe exercise, either of body or mind, immediately after eating, especially with a hot sun shining on the back. Piecing between meals, even by taking a taste, interferes with digestion, or with the stomach's rest. Many persons can feel the evil results of irregular eating very definitely. Drinking at meal times should mainly be done on first sitting down at table, for copious drinking during the progress of eating will surely get some of the food down into the stomach before it is sufficiently chewed and insalivated. The temperature of food and drink should always be moderate,—not colder than 60° or 70° (Fahr.), nor warmer than about 105°.

A very popular error on the question of food is to reason that, because many have eaten this and drank that until a very old age with apparent impunity, therefore it is not very injurious,—at least not injurious enough to speak of. "Because sentence against an evil work is not speedily executed, therefore it is set in the hearts of men to do evil." One individual uses tobacco and lives to a good old age; another drinks tea and coffee and has average health ("extra good health," some imagine), until he is 90 years old; another eats an abundance of pork and sausage, with no apparent trouble; another drinks whisky and leads a jolly life until nearly 100 years of age; another indulges in all doubtful things promiscuously, with no care on his mind as to "laws of health," and remains a stout man until three-score and ten; and so on, with all the foul substances in existence. Now, take a second thought and consider what proportion of mankind, going it rough-and-tumble in all these respects, keep their bodies in good trim until a hundred years old, as they should: very few, indeed. There is something at fault.

The following we believe are excellent rules or observations on such food as should be given to the sick, and if observed, together with those given above, alleviate much distress and quickly restore health.

1. Solid food should rarely be given during the progress of an acute disease, as the stomach and digestive organs are not in a condition to furnish the fluids necessary for its proper comminution, and hence it does not digest, but decomposes, giving rise to irritation and other annoying results.

2. As a general rule, the severer the disease, and the further the system is from a condition of health, the lighter and more diluted should be the food. Thus, in a high grade of fever or inflammation, we would give whey, toast-water, thin farina, or tapioca, weak chicken or mutton broth, etc.

3. In states of great exhaustion the food should be concentrated, very nutritious, and yet deprived, as far as possible, of all material that cannot be appropriated by the stomach. Thus we would give beef essence, concentrated chicken or mutton tea, farina, with milk, etc.

4. In all febrile and inflammatory diseases the food should be given at that period of the day in which there is least vascular and nervous excitement, and it should never be forced on the patient when suffering from high fever.

5. Never give food when the patient is suffering from severe pain, as at such time it is impossible for the digestive organs to appropriate it.

6. If the tongue is heavily coated with a yellowish coat, a bad taste in the mouth, and a feeling of weight and oppression at the stomach, it is better not to give food, or at least give it in a fluid form and in small quantities.

7. Never force food on a patient when his stomach revolts at it, or if it produces nausea, oppression, or pain. It is much better to wait until medicine or time has placed the stomach in condition to digest it.

8. When the digestive powers are much impaired, and it is important to give food to sustain the strength, it should be given in small quantities, and at regular intervals, like medicines.

9. If there is an absolute demand for nourishment to sustain the strength of the patient, and it cannot be given by mouth, it is sometimes an excellent plan to administer it as an injection.

10. Much care is necessary during convalescence from disease that the patient does not eat too much, or that which is indigestible. The digestive organs are now enfeebled, and, if overworked, there is not only an excess of imperfectly-elaborated material taken into the system, but the exhaustion is extended to the entire system, and impairs the functions of other organs and parts.

WATER, AND BATHING. Water is the only inorganic substance which all parties agree should ever be taken into the stomach; and where one eats all the juicy fruits physiology prescribes, and does not inflame the stomach with condiments, he will scarcely ever be thirsty. Water is the only neutral solvent, and thus the only proper vehicle of nutritious matter to the tissues and of effete matter from them, as nitrogen is the neutral solvent and vehicle of oxygen to the lungs and of carbonic acid gas from them.

As a beverage the qualities of water differ materially. Every one is sensible of the great difference between that of a soft and clear spring and that of a

stagnant pool. Many persons, much accustomed to this simple beverage, can distinguish flavors which are not sensible to others. All water in a natural state is impregnated with a certain proportion of air, which is highly useful; and of many other substances found more or less in water, some are harmless, while others are extremely prejudicial. For further facts on the composition and general properties of water, see the article on Water. One can scarcely over-estimate the importance of an abundant supply of pure water in order to preserve health.

That the function of perspiration holds an important relation in the general economy to the health and well-being of the system none will deny. Among the means best calculated to promote a healthy condition of this function, that of frequent bathing may be claimed among the most valuable if not altogether the most valuable. Cleanliness of the body, it must be remembered, is one of the fundamental conditions of health, because it is essential to a healthy condition of the skin, and consequently of the entire perspiratory apparatus. Frequent bathing of some sort or other is to be recommended during the entire year, and especially should it be observed during the warm seasons. The condition of the water for such purposes may be warm, tepid or cold, according to the time and the inclinations of the individual. As a general rule, however, the morning bath should be cold or cool, and the night bath should be warm or tepid.

Of the different modes of taking baths, there are the following: A "full bath" is taken by lying, standing or sitting for a few minutes with all the body except the head in the water. A "half bath" is taken by sitting in water with the legs extended, so that the water covers only the lower part of the body, from the waist to the feet. A full "pack" is the envelopment of the whole body in bed clothes for a half hour or more, so as to produce copious perspiration and uniform, vigorous action for expelling morbific matters from the system. A cotton sheet or woolen blanket, wrung out of hot water, is placed next the body. Sometimes a "dry pack" is taken for a similar purpose, when the hot wetting is omitted. A "half pack" is the same, given to the lower half of the body. A "compress" is a wet cloth, cotton, linen, or woolen, cold or hot, laid upon a part,—not bound tightly, as the word seems to signify. A "sitz," "sitting," or "hip" bath is taken by sitting in a tub (generally a tin one made for the purpose) partly filled with water. A "vapor" bath is given in a box so arranged that the person has his head just outside, to breathe pure air. A "Turkish" bath is simply a universal hot-air bath. In this the air is raised to 150° or over, which produces copious perspiration. Besides the above, there are head baths, arm baths, etc., according to the locality treated. All these baths may be medicated, or accompanied with electricity, for specific purposes. An excellent moderate morning bath may be taken by simply applying the water from the wash-bowl with the hands, rubbing vigorously with the hands and afterward with a coarse towel until dry. Dress immediately. This simple bath opens the pores of the skin for the healthy action of the perspiratory function and greatly invigorates the system.

The greatest care is required to come out of a bath properly. Almost every universal sweating bath cures the "cold" for which it is taken, except that in many, possibly most, cases, the patient comes out in such a way as to reproduce the "cold." He should, on coming out, be wiped and rubbed with the hands vigorously, and dress very warm, or get into a bed and warm up quickly. In either case he should rest an hour or two after the bath. Nor should a bath ever be taken soon after a meal, or after eating anything which it is at all difficult to digest. A cold bath should never be taken when one is weary or exhausted. "Going in swimming" at the close of a hard day's work, as farmers sometimes do, is sure to do mischief, often very severe mischief. Ordinarily, from 10 to 12 a. m. is the best time for general bathing. When boys "go in swimming" they generally remain in the water too long. The hint which nature gives as to the time of coming out of the water, is known by a sensation of passiveness or non-resistance. Indeed, it is better to come out before this sensation is realized, for this condition is really one of congestion. It is no objection to plunging into cold water that one is hot and covered with sweat, if he only has a strong sensation of resistance and activity at the time. But a minute or two, and that of activity, is sufficient time for a universal cool bath. In going in to swim, it is best to wet the head and upper part of the body first. Plunging in head foremost is a good substitute.

Bath-tubs can be obtained through most dealers in hardware or furniture, made either of tin or copper lined with tin, or of zinc, all with wooden bottom. But if a portion of the bottom is bare metal, an oil stove can be set under to heat the water, a great advantage. A mechanic can make a bath-tub or trough out of staves, barrel-fashion, with stout iron hoops, at a cost of about $5. Wood tubs, however, are not so neat as tin or zinc, as the woody tissue collects disease-matter from invalids bathing in them and exposes others to contagion. A vapor-bath can be cheaply taken by sitting in a chair while loosely enveloped in quilts, sheets, or blankets, over a pan of hot water into which heated bricks are thrown.

Clothing. In this connection we can say nothing about "fashion;" we can merely state what is healthful. Clothing is worn mainly for keeping the body in a proper temperature, but the prevailing modes often fail to do this. In men's habit of dress the principal faults are, confinement of air and exhalations upon the scalp by heavy, air-tight hats or caps; the upper portion of the bosom and the waist exposed by having over them only one thickness of cloth, and that cotton, while the vest and pants together constitute several folds, part of them wool, on the abdomen; hanging the trousers and drawers by a belt around the waist instead of wearing suspenders over the shoulders; wearing leather shoes, often too tight. With women's

dress the chief faults, in a hygienic point of view, are: A large body of hair confined to one spot on the back of the head; too little protection to the arms; wearing gloves too constantly; loading down the waist by suspending dresses upon it, often a superfluity of skirts; wearing corsets and garters; tight lacing; thin, light shoes, generally, if not always, too tight, although the wearer thinks them large enough.

As to material of clothing next the skin, cotton and linen are the purest, but woolen is generally recommended, on account of its capacity to protect against sudden changes of temperature and to keep up activity by friction. Dyed material should never be worn next to the body, as the coloring matter is more or less poisonous. Not even socks or hose should be dyed.

In respect to color, the lighter the more healthful, the year round, for several reasons, namely: White is a reflector of heat, and thus preserves the warmth of the body in cold weather and excludes excessive heat in summer; light-colored clothes show dirt sooner than dark-colored, and will therefore be washed oftener and kept cleaner; they have not so much poisonous dye-stuff in them, and have less capacity to catch infections.

Clothing should not remain packed in a bureau or confined in a closet, but promptly and thoroughly aired and sunned; nor should we sleep in the same undergarment we have worn during the day.

Children's Clothing. Some further hints and facts on the subject of clothing for children may be found useful. The practice of binding a newly-born infant with bandages and flannels, which has rendered many a healthy infant weakly and ailing, has happily gone out of fashion. Still, however, we often see a baby so loaded with clothes that they almost equal its own weight, which renders a healthy child so tender and chilly that it cannot bear the external air; and if by accident it should be exposed to a refreshing breeze, the consequence is frequently a serious inflammatory affection of the lungs or bowels. The clothes should be in all cases proportioned to the climate and temperature of the atmosphere. A newly-born infant is more susceptible than an adult to changes of temperature. The clothing should be loosely put on, so that the bowels may have room, the limbs liberty to act and exert themselves, and the circulation of the blood through the superficial vessels may not be impeded, for malformation or unnatural swellings may be produced by partial compression. To this error are doubtless attributable very many distortions and deformities, particularly among females, who suffer more in this respect than the males. The great pleasure a child manifests on being divested of a superfluity of dress by all its powers of expression one would suppose sufficient to convince nurses, were they capable of making just observations, that the free use of its muscles is both agreeable to its feelings and necessary for its proper growth and strength. A flannel waistcoat, without sleeves, should be made to fit the body and tie loosely behind with a petticoat, and over this a kind of gown, which in summer should be thin and light. The petticoat should not be too long, and the gown or robe should be a few inches longer. Shoes and stockings are often an encumbrance. The latter keep the legs wet and nasty if they are not changed two or three times a day, and the former frequently cramp the legs and hurt the feet so as to prevent them learning to walk. Children in this simple dress would be perfectly easy, and enjoy the free use of their legs and faculties. They should be put into it as soon as they are born, and continued in it until they are three years old, when it may be left off for any other more fashionable and genteel. The baby's clothes ought to be changed at least once a day. The night-clothes should be loose, and less in quantity than those worn during the day, otherwise the child will be very liable to be affected with cold and complaints of the bowels. Safety-pins should be used instead of ordinary pins in fitting on napkins. The common practice of leaving the neck and upper part of the chest bare all the year round has been very largely a source of disease. The parents must not, however, run into the opposite extreme by overheating the body. The infant's clothes should be light, but warm enough to meet the requirements of the season; and the best materials for this purpose are flannel and calico. For some months after birth the infant's skin is peculiarly sensitive, so that a shirt of fine linen between it and the flannel should be put on. A child's clothes should allow for growth, and never be too tight around the chest, arm-holes, or wrists, and should be easily put on and taken off. When the child is short-coated, socks should be put on which will keep the legs sufficiently warm according to the condition of the weather. Shoes should be light and pliable, and by no means small. A child should not be short-coated in cold weather. Garters and tight stays are things to be avoided in children's clothing.

Exercise. Exercise is one of the best means of keeping the muscular system healthy and vigorous. Every part of the animal system is so intimately and curiously interwoven with every other part that causes affecting one affects the whole. If the muscular action becomes enfeebled for want of proper exercise and development, the digestive powers suffer, and a loss of appetite ensues. The necessary work of animal combustion does not go on with its proper vigor, the blood circulates slowly, the respiration grows imperfect, indigestion sets in, and all its long train of attendant diseases and complaints begin more or less seriously to threaten life.

Various Kinds of Exercise. Although the kind and degree of exercise should be varied to suit the special constitution concerned, the main object should be to bring the whole of the muscular system into action with special reference to such muscles as by the accidents of occupation or position are weak for want of proper development. Walking agrees with almost everybody, but the exercise obtained by it is chiefly confined to the muscles of the loins and those of the

lower limbs. Rowing, fencing, boxing, and other sports, on the other hand, bring into action the muscles belonging to the upper parts of the body. Excessive fatigue should, however, always be avoided. Riding is excellent exercise, its special advantage being that of not hurrying the respiration. It calls almost all the muscles into play, and is extremely favorable to the proper circulation of the blood. Dancing is a very useful exercise, and would be more so if it were not associated with the heated and dust-laden air of ball-rooms. Certain handicrafts, such as carpentering, turning etc., afford useful exercise. Gymnastic exercises, provided they be suited to the constitution, not over-indulged in, and not too violent, are very valuable. Excessive perspiration, it must be remembered, is injurious; nor must it be forgotten that exercises suitable for the strong and robust may be very unsuitable for others whose constitutions are of a different kind. Bodily exercise, judiciously regulated, strengthens the whole body, removes the causes of certain disorders, gives a proper tone to the system, and enables it to resist contagion. In children it promotes growth in its best and most proportionate degrees, for beauty and health are more intimately associated than many people imagine. Jumping, running and wrestling are all good in moderation, and, in excess, all equally bad. For the delicately constituted, exercises of this description should be carefully planned, with a view to this or that special case. For strengthening the muscles of the chest, fencing is an excellent exercise. Ball playing benefits the trunk, chest and arms. Dumb-bells, used in moderation, and when they are not too heavy, or when the exercises are not too difficult, are very useful. When they are too heavy, mischief is done. Reading, singing and reciting aloud exercise certain important muscles to an extent which few people dream of. The lungs may be exercised both directly and indirectly,—indirectly by means which quicken and deepen the respiration, and, as in the above exercises, directly. Walking up-hill is a capital exercise for strengthening the lungs, giving expansion to the chest, promoting free circulation, and more completely oxygenating the blood. For the same reason, playing on wind instruments is often found beneficial if indulged in by one free from anything like active pulmonary disease. Throwing the arms and shoulders back, and while in that position slowly inhaling the open air, is to be recommended for young persons, who would find great benefit from its daily practice. The loud laughter and noisy voices of children serve the same beneficial ends.

The best single exercise, which calls into play all the muscles and departments of the human system in proper proportion, is probably climbing a tree and going through all the motions involved in gathering fruits and nuts. This is far better than all the gymnastics and lifting machines ever invented. Severe exercise in-doors, where the air is more or less confined, is not so good as that out-doors. In very foul air it is worse than no exercise at all. Walking, merely for the sake of exercise, is not so good as "going somewhere on an errand." The best thing in the world, under this head, is an excursion to the wilds of nature, where one can ramble at will. When the noon hour arrives he has a better appetite for his dinner than he had thought he was capable of having. The plainest of food tastes extraordinarily good.

One should not exert his utmost strength at the first outset. As with lifting machines one should make several lifts some minutes apart before doing his utmost, so in any other severe labor, he should go into it somewhat gradually.

"Passive exercise" is that which is received from an operator. The subject, who is an invalid, lies upon a couch, while a friend rubs, kneads and spats him, either with dry hands or with hands wet with water or medicated liquid. This practice is essential in nearly all cases of sickness, and sometimes indeed is the only thing necessary to a thorough cure. It has gone under the names of "kinesipathy," "motorpathy," "movements," "Swedish movements," "manipulations," "rubbings," "magnetic treatment," etc. It is often given by Spiritualists, "Hygienists," and other "irregular" practitioners, generally with good results. In the cities there are establishments fitted up with steam machinery for giving nearly all sorts of movements to all parts of the body. In most cases of protracted sickness passive exercise is more important than active, as the latter is generally impracticable.

Exercise of Children. Without a proper degree of exercise, all our care in feeding and clothing infants will not succeed to our wishes till, by due degrees, a child is brought to bear a good deal of exercise without fatigue. It should be pushed forward and taught to walk judiciously, but soon, so that at the end of 12 months it may (if healthy) be capable of walking alone. It is a common error to suppose children are not to be put on their legs because they are weak, or at least bent or crooked. Daily experience shows crooked legs will grow in time strong and straight by frequent walking, and that disuse makes them worse. The walks should be increased gradually every day, till they can go two miles without weariness, which they will very well be able to do in three years, if they are properly accustomed to it. From this daily exertion they will, from the impulse of their own vigor soon be found running, leaping and playing all day long. Thus a dull, heavy child becomes playful and sprightly, and acquires good habits and permanent health.

The rocking, jolting, jouncing and swinging of babes is happily going out of use. Tickling a babe by gently scratching the soles of its feet or manipulating its ribs, is also a dangerous piece of cruelty.

REST. Naturally, this is an element in exercise, for all action has more or less intensity, according to the degree of rest mixed with it; and exercising one department of the human system seems to give rest to the other parts, as exercise of the muscular system, for instance, acts as a sedative to the nervous system, brain work rests the muscles, attending orchard is a rest from field work, etc. After very severe labor one

generally "feels so tired he can't rest" thoroughly. It is therefore our instinct, under those circumstances, to keep up a little exercise for a time, and quiet down gradually. The system cannot bear very sudden reactions without injury, and it is therefore possible for one to undertake a rest which is too sudden, thorough and radical. It is a rule, however, in physiology, that one should rest thoroughly, in the course of some hours,—indeed, until he "feels like" going to work again. Hence many laborers work too hard all the week, and not enough on Sunday, and on this day they feel stupid.

Sleep. No arguments are requisite to prove the necessity of sleep; nor will it answer any practical or useful purpose to enumerate or attempt to reconcile the various and fanciful speculations relative to the causes of sleep; experience tells us, in a language not to be misunderstood, that "the chief nourisher of life's feast," "tired Nature's sweet restorer, balmy sleep," cannot safely be dispensed with for any considerable length of time. When its accustomed visits are not paid, or, when paid, are not attended to, the whole frame is thrown into disorder; the appetite ceases, the strength fails, the spirits become dejected, and the whole body is reduced to a state of exhaustion and misery; in fact, a prostration and dissolution of all the animal and vital powers seem likely to ensue. And it may be added that nothing gives the countenance the early appearance of age more than the want of healthy and refreshing sleep. But while too great exertion or prolonged action enervates both body and mind, exhausts and unhinges all the organs, and lays the train for a host of destructive evils, excess of sleep, or prolonged inaction, is equally to be guarded against; it deadens and enervates the body, and occasions a concentration of the vital powers on the brain or the stomach. On the due equalization, therefore, of sleep and activity, the preservation of health and strength depends; and regularity in the hours of rising and retiring to rest mainly contribute to this preservation. The common abuses on those points necessarily induce numerous indispositions, and often serious diseases. The causes or circumstances which principally contribute to sleep are: good air, labor or exercise, wholesome diet, and regular habits and hours.

Various practices have been recommended for promoting sleep. Walking up and down the parlor or bedroom before retiring is one of the specifics; after supper walk a mile is an excellent rule, and may be practiced in the house as well as the open air. Washing the mouth and rubbing the gums and teeth with a brush before going to bed, is a wholesome practice, and has a tendency to promote sleep. Friction, or rubbing the body, arms, legs, soles of the feet, etc., with the hard flesh brush, or a coarse towel, besides promoting the insensible perspiration, is one of the most effectual sedatives to repose.

The most important thing to observe under this head is to have the sleeping apartment clean and well ventilated. The toughness of Indians and of pioneers in this country who sleep in open rooms is proverbial. But the trouble is, many persons imagine they have clean and well-aired rooms when they have not. To meet this difficulty, we say to all, the nearer you come to sleeping out-doors entirely, and yet keep comfortably warm, the better you do. No one can catch cold in bed so long as he keeps himself warm, and does not permit a draft to strike him anywhere except in the face. Some persons, who are very particular to keep all draft out of the room, will nevertheless turn over so carelessly in bed sometimes as to leave a hot and perspiring portion of the body partially uncovered, and hey "catch" either a "cold" or a rheumatism, or some other ailment. To keep the neck and shoulders and the feet properly warm requires special pains in the adjustment of the bedding. The covering should be kept up close to these parts, except when the nights are so warm and sultry that one wants no covering at all. The modern practice of making up a bed by tucking the ends of the quilts under the foot of the ticking is all good enough for the day, and so long as the bed is not used; but to do one's self justice when he sleeps in it he must jerk the covering loose from such moorings, that he may be able properly to tuck it close around his feet and legs.

The use of feathers in bed and pillow ticks is happily going out of fashion; and any animal matter, either feathers or hair, is not so pure and wholesome as husks, straw, moss, or other vegetable fiber.

As to amount of sleep, the substance of modern advice seems to be, Sleep all you can; but commence your sleep early in the evening. Surely, to be natural, or normal, we should sleep as much, or nearly as much, before midnight as after. Remember still, that in announcing the demands of health one cannot compromise with custom, or even with emergencies. Both these often interfere with our highest physical interests.

Agreeable and lively conversation, and listening to music, reading, etc., are often good preparations for repose. Gently titillating the soles of the feet will frequently produce sleep. Again, when the soles of the feet are cold, no disposition to sleep can be induced, on account of their affinity with the brain, until their natural warmth is restored. The best means of procuring the required warmth is to rub the feet with a hard brush or a coarse towel for some minutes before going to bed, which will be found a more effectual method of preventing the sense of coldness and conciliating sleep, than the immediate application of bottles filled with warm water, or anything else actually hot. It is scarcely necessary to add, that in order to enjoy sound and refreshing sleep, every object that may excite unpleasant ideas or violent emotions in the mind, should, for some time before going to bed, be most sedulously avoided. If none of these practices will procure sleep, then try the effect of conning over some task that in childhood was apt to create it, or of the counting from one to five hundred, or a thousand, or reciting any long pas-

sage from any ancient or modern author. By these means the attention is diverted from uneasy thoughts, and you are overtaken by sleep in the midst of your efforts. Many other methods may be also adopted to induce sleep. For instance, reading aloud in a slow, monotonous manner, and the gentle noise produced by vessels full of water, so arranged that it may fall drop by drop into a sonorous vessel. A continued sound indeed, if uniform and moderate, is well suited to absorb the attention without fatiguing it; the vibrations of a pendulum, or the sound of soft, gentle music, or a long, uninteresting recital, are often productive of similar results. But it is frequently in vain that every means are resorted to to induce the balmy influence of repose; it evades, like a fleeting vision, the feverish body, or the busy mind. In this case, if you find yourself restless from feverish heat, a parched state of body, or any other cause, or should you be awakened by any accident, and cannot easily get to sleep again, then put into practice Dr. Franklin's rules, viz., get out of bed, beat up and turn the pillow, shake the bed-clothes well and repeatedly, with at least twenty shakes, then throw the bed open, and leave it to cool; and, in the meantime, take some turns about the room, till the skin has dispersed its perspirable matter, and become sufficiently cool; then turn to your bed, and you may soon fall asleep, and your sleep will be sweet and pleasant. If the room be cold, or the season of the year be winter time, both stockings and a dressing-gown should be put on while you are out of bed. There are other various artificial means of procuring sleep, such as opiates, but they should be cautiously and sparingly given, as they cannot be employed for any length of time without constitutional inconvenience, and even danger of apoplexy and the different kinds of paralysis. Air, exercise, wholesome diet, and regular habits, will best insure sleep in its natural form.

Sleep is repelled and interrupted by a variety of circumstances, as noise, light, sleeping in a new apartment, having slept during the day, or just before going to bed, repelled perspiration, from too great a weight of bed-clothes, mental disquietude, over-exertion, the nightmare, deficiency of muscular action, drinking tea, coffee, or any thin or weak liquor immediately before going to bed, etc. But the more common causes of disturbed and restless sleep, frightful dreams, etc., and which are often erroneously ascribed to the vapors and other unfounded causes, arise either from the defective state or the derangement of the functions of the digestive organs, or are occasioned by the use of heavy suppers, malt and other fermented liquors, just before retiring to rest; in which last-mentioned case no rest can be obtained until the first stage of digestion has been performed, and the stomach relieved from its crudities. Though digestion is favored by a state of repose, and increased energy is given to the circulation by the concoction of the food being allowed to proceed uninterruptedly, yet the habit or custom of indulging in diurnal sleep or taking a nap, as it is called, after dinner, should be avoided by every one in good health, and not aged, or who is of a plethoric habit of body; for when a person is in a recumbent posture, and the stomach is distended with food or aliments, it is apt to press on the great blood-vessels, by which too much blood is thrown on the brain, and thus plethoric headache or apoplexy is sometimes occasioned. When habit, however, has rendered the custom of napping after dinner almost natural, or where nature, from extraordinary fatigue or want of rest during the preceding night, requires some refreshment, an afternoon nap may be indulged in, provided that it is taken in a sitting posture, with the body inclining towards the back of the chair, and a little turned to the left side, with the feet raised by means of a stool about four or five inches from the ground. Care also should be taken that all those parts of the clothes, which are likely to prevent the circulation of the blood, be removed, and the body should be well covered, by putting on a great-coat, or some external covering, in order to defend it against catching cold, and prevent it from becoming chilled, and the circulation checked. The same indulgence, provided it is not carried to excess, and is not likely to break or interrupt their rest during the night, may also be taken by the infirm, the delicate, the sickly, the care-worn, or those whose bodies are enfeebled or enervated by the relaxing influence of the weather. Persons advanced in years may advantageously sleep a little after dinner, that the heat of their bodies, which is weak and feeble, being internally concentrated, may enable the digestion to perform the better. It has been said that "the most complete and healthy sleep that can be taken in the day, is in summer time out in a field." It must, however, be recollected, that though the sensation of slumbering on the grass or hay is exceedingly pleasurable, yet it, as well as falling asleep on a garden bench, may be attended with injurious consequences. Neither should we ever suffer ourselves to "take a foretaste of repose, a relishing snatch of slumber," before we go to bed, lest it should diminish the chance of getting sleep for a considerable part of the night.

Dreaming and nightmares are always caused by a noise or some physical disturbance of the body. They are made more annoying by intense mental care or anxiety. Not only late, heavy suppers, but also any twisted or cramped position of the body will create disagreeable dreams or nightmare. If one's body were turned over every few minutes during his sleep, these dreadful spells would be avoided.

Electricity. As a hygienic agent this is recommended by many, opposed by some, and treated with comparative indifference by nearly all. As a remedial agent for some chronic affections it is generally recommended. The most important of these conditions are mentioned under the different diseases in this volume. No directions as to its use are required here, further than the general warning not to take electrical treatment as strong as you can for the moment bear, else you may cripple yourself or otherwise create a local trouble.

We wish to say a word to the farmer in the way of caution upon this point. The aggregate amount of imposition, petty swindling, and larger humbuggery, now practiced, based upon "electricity," "magnetism," "galvanism," etc., is incredible to any one who has not watched the general newspaper advertising, and collected an assortment of a class of circulars now being daily distributed throughout the country by the ton, in the mails, from drug stores, shops, and in various other ways. There are now heralded electric or magnetic or galvanic bands, batteries, belts and brushes, pills, potions and lotions, in infinite form and variety; while "electrical doctors" rival Egyptian frogs in number. As the enormous expense of all the above is kept up continuously, there must be an immense number of people gulled into paying the tax on their credulity, often at the sacrifice of the comforts and even necessities of daily life.

There is some satisfaction in the fact that most of these mechanical contrivances sold, are in themselves positively inert and useless, and therefore not injurious; while imaginatively sick people, and others with slight nervous disorders, are soothed and comforted, and sometimes actually cured through their belief in the efficacy of the otherwise useless nostrums. Take an illustration: We know a person in good position, of more than ordinary intelligence on most other subjects, who positively believes himself benefited by a large horse-chestnut always carried in his pocket! To lose this, and be unable to get another, would give him the blues, if not bring on a spell of actual sickness. Another person, of like intelligence, has equal faith in a combination of copper and zinc, the size of a silver dollar, worn suspended from the neck, and called an "electric battery," though having no more electrical or galvanic or magnetic effect than so much silver, iron, stone, or wood,—that is, no effect at all save upon the imagination.

There are now half a score or more varieties and forms of the wonderfully be-puffed and advertised electric things, all equally nonsensical and intrinsically useless so far as electrical or magnetic or galvanic effect is concerned. A hair-brush, costing 50 cents to $2, according to the quality of bristles and handle, if applied briskly to the head may, and often will, have a soothing effect, and sometimes relieve pain on the principle of "counter-irritation." The effect may be heightened if the user can only be persuaded that there is some electrical or magnetic effect. This can easily be done with those not skilled in the science of electricity. Conceal in the handle or back of the brush a slender steel magnet (or even a bit of iron or steel), and when the brush is brought near a small pocket compass, the concealed metal will disturb the needle just as a pocket-knife, or scissors, or a nail will attract and move the needle of any compass. For appearance' sake, fine wire may be mingled with or substituted for part of the bristles, though any wire in a brush, however fine, we consider too harsh for use upon the delicate cuticle that ought always to exist upon the human head.

The entire class of fixed combinations of metals of whatever kind, whether offered by Boyd, Elias, or any one else, whether called "electric," "galvanic," or "magnetic," whether of American or foreign origin, whether large or small, whether round or oblong, or any other shape, whether ornamented with embossed figures of devils or angels, with the flames of Hades or the lightnings of heaven, are all in reality just as useful "electrically," "magnetically," or "galvanically," as so much plain copper, or lead, or zinc, or silver, except as they operate upon one's faith through the preposterous claims put forth for them in the enterprising sellers' advertisements. This faith is so strong in many people that it is even safe for the dealers to promise to "return the money" if the purchaser does not find benefit—albeit it is easier in most cases to pay money than to get it back for "guaranteed" medicines and the like. The man who has got your money by ingenuity will be ingenious enough to worry you out with pretenses that "it was not used according to directions," or some other subterfuge.

MAGNETISM, animal or vital. Manipulations are already spoken of under head of "Passive Exercise." How much magnetism is imparted by the operator is a mere theory, and therefore is without the pale of this volume.

CHEERFULNESS. In order to have good digestion and be perfectly healthy, we are generally exhorted to be cheerful, and not borrow or brood over trouble; but our moods are so dependent upon physical conditions and uncontrollable circumstances, that all exhortation of this kind is useless. To be cheerful one must have his body right, and then have "good luck" generally. Next to all other appliances in hygiene, sociability and frequent ramblings through the wilds of nature are the best general means of putting the mind into good humor.

An erect posture of the body, with the head up and shoulders well back, is generally insisted upon. All sedentary work should be broken by change as frequent as practicable. Dosing to keep off diseases, to keep one in trim, tone-up, etc., is prohibited by the priests of nature. Moderation, or temperance, in all normal things, and total abstinence from all abnormal or doubtful things, constitute the "golden rule" of physical morality.

HYGIENE, PUBLIC; Sanitary Science. This refers to health laws which concern a community as such, and hence becomes a subject of public legislation. Leaving dead animals or other foul matter above ground where it becomes a nuisance to the public, is a moral and civil misdemeanor of which the public must take cognizance. This is especially important in towns and cities, but even in the country are some regulations necessary. The propagation of contagious diseases also becomes a contraband of civil law. The best manner of disposing of excreta and all manures and decaying rubbish, and the arrangement of cess-pools, etc., are indicated in the proper places under head of Manure, Privy, Cess-pool, Landscape Gardening, Barn, Drainage, etc.

HYGIENIC system of medication. This is treatment of the sick, in all cases, by hygienic or normal means only, excluding all drug medication. As we give, in this work, the "Hygienic" prescriptions as well as others, for certain diseases, we will greatly abridge matters by outlining the general hygienic treatment of all diseases here, which is far more important than the special appliances:

1. Warm up or cool down the body, or any part of it, by water, air, or manipulations.

2. Whenever the body or any part is too cold or inactive, warm it by hot water, hot compresses or hot air, or by rubbing and kneading with warm hands, or by exercise, generally passive.

3. Reduce inflammations by warm or tepid water, sometimes cool or cold water. "Sponge off" fever patients as often as is comfortable to them. This is done by wetting them, either by hand or a sponge or a towel, and wiping them off very gently.

4. Direct emetics and purgatives are given in the form of warm water. For the former sometimes a quart or more of water is necessary, accompanied by tickling the throat with a finger or a feather, kneading the region of the stomach, etc. For a purgative, or "enema," sometimes a pint or more of water is necessary. But in either case, if the water is not soon ejected, no harm is done. Nausea is often allayed by a few sips of hot water.

5. For a general purifying of the body, the various sweating processes, described under head of Bathing, in the article on Hygiene, are prescribed. In this connection the most important thing is to take no more impurities into the body, either as medicine or as food.

6. In dietetics, eat or drink nothing that is doubtful or disputed, as white flour bread (or anything else made from such flour), pork, or even flesh of any kind, intoxicating liquors, beer or cider, tea, coffee, tobacco, butter, cheese and all the condiments, mineral waters, "herb teas," etc.

7. Observe all the directions given under head of Hygiene.

Hypochondria, or **Melancholy,** a nervous affection in which the patient is gloomy, and inclined to imagine the most absurd things happening to him. The disease is intimately connected with, and probably caused by dyspepsia, disordered liver, etc. All schools of physicians unite in prescribing an out-door life, with labor and cheerful company; or, an excursion by camping out, "roughing it," etc.,—such things as aid digestion, tone up the nervous system and keep the mind of the patient off of himself. No drugs are a substitute without injuring the sufferer in some other way.

Hypodermic Syringe (hip-o-der′mic sir′inj), a small syringe with a beveled, needle-like tube, for thrusting through the skin and injecting a medicated fluid, as a morphine solution, to produce insensibility to pain. Useful in cases where the stomach cannot bear the drug. See cut, page 230.

Hysteria, or **Hysterics.** This disease mostly affects young, nervous, single women. It manifests itself by fits, often preceded by nervous lowness, difficult breathing, sickness at the stomach, palpitations and a pain at the left side, a rumbling noise in the bowels, the sensation of a ball ascending to the throat, with a feeling of suffocation, convulsions, laughing and crying without any apparent cause. Almost every part of the nervous system is liable to this affection. The disease seldom proves fatal. It is caused by menstrual irregularities, indolence, irregular living, costiveness, indigestion, worms, obstructed perspiration, etc. An hysteric fit may be easily distinguished from fainting; for, in fainting the pulse and respiration are entirely stopped; in hysterics, they are both perceptible. The fit may be prevented by the administration of 30 drops of laudanum, and as many of ether. When it has taken place, open the windows, loosen the tight parts of the dress, sprinkle cold water on the face, put the feet and legs in warm water, etc. Give a glass of cold water when the patient can swallow. Avoid excitement and tight lacing. Friends should not indulge in tones of sympathy, but rather in scolding. The general or constitutional treatment consists, of course, in observing those specialties recommended under the heads of Dyspepsia, Hypochondria, etc. When uterine disease exists in connection with this trouble, nine times in ten it is the cause of it, and the cure of one consists in the cure of the other. In such cases, consult a good surgeon, whom, by the way, it is generally very difficult to find.

I

Ice. Every frozen liquid—in a more limited sense frozen water—is known by the term ice. As soon as the temperature is raised, the solid state again gives way to the liquid. We see, then, that ice is nothing but water deprived of its heat. The freezing of water is a phenomenon so remarkable that the greatest naturalists have thought it worthy of a careful investigation. Expose a glass, filled with water, to a degree of cold producing ice. An extremely thin film of ice is observed first on the surface of the water in contact with the cold air. Slender threads of ice are soon seen to shoot out from the sides of the vessel, generally forming with it obtuse or acute, seldom right angles; from these rays, new ones continually shoot out, till the whole surface is covered with a single coating. While this process is going on, a great number of air-bubbles arise, as in boiling, which pass out of the water when the congelation is slow; but when it is sudden, they are frozen in, and by their expansion cause rents in the ice. Although cold generally produces contraction, ice occupies a larger space than water: it is hence specifically lighter and floats upon it.

It is well known that stagnant water freezes sooner than flowing water; perfect rest, however, seems to be unfavorable to freezing, for we know by experience that water perfectly still is not frozen when its temperature is reduced much below the freezing point, but a little agitation is sufficient to change it into ice. Sea-water, and in general all salt water, freezes with greater difficulty, because the salt and other ingredients retain the caloric longer. Salt is, moreover, separated in the process of freezing, and precipitated to the bottom; so that drinkable water can be made from sea-water. Salts, however, produce a degree of cold beyond the freezing temperature, and, by means of them we can cool water much below the freezing point, while it still remains fluid. Most salts have this property, especially nitre, muriate of ammonia, and common salt. A degree of cold sufficient for the freezing of water may be produced by them in summer or even over a fire. Artificial ice is formed, also, by exposing pure water in proper vessels to such freezing mixtures. The more severe the cold, the greater the hardness and firmness of the ice. The ice of the polar regions can hardly be broken with a hammer. See Freezing point, page 543.

Strength of Ice. Ice two inches thick will bear men on foot. Ice four inches thick will bear men on horseback. Ice six inches thick will bear cattle and teams with light loads. Ice eight inches thick will bear teams with heavy loads. Ice ten inches thick will sustain a pressure of 1,000 pounds per square foot. This supposes the ice to be sound throughout its whole thickness, without "snow-ice."

Besides the ordinary signification of water solidified by cold, ice denotes concreted sugar and ice-cream. We give two or three recipes for that fancy dish called "ice."

Lemon Ice. Lemon juice and water, each ½-pint; strong syrup, 1 pint; the rind of the lemons should be rasped off, before squeezing, with lump sugar, which is to be added to the juice; mix the whole; strain after standing an hour, and freeze. Beat up with a little sugar the whites of two or three eggs, and as the ice is beginning to set, work this in with the spatula, which will much improve the consistence and taste.

Raspberry or Strawberry Ice. One-half gallon of the fruit, the juice of a lemon, a pound of sugar, or 1 pint of strong syrup, ½-pint of water. Rub the fruit through a sieve, mix and freeze.

Ice-Cream, frozen cream, flavored and sweetened.

Self Freezing Ice-Cream. One quart rich milk, 8 eggs, whites and yolks beaten separately and very light; 4 cups sugar, 3 pints rich sweet cream, and 5 teaspoonfuls vanilla or other seasoning, or 1 vanilla bean, broken in two, boiled in the custard, and left in until it is cold. Heat the milk almost to boiling, beat the yolks light, add the sugar, and stir up well. Pour the hot milk to this, little by little, beating all the while. Put in the frothed whites, and return to the fire—boiling in a pail or sauce-pan set within one of hot water. Stir the mixture steadily about 15 minutes, or until it is thick as boiled custard. Pour into a bowl and set aside to cool. When quite cold, beat in the cream, and the flavoring, unless you have used the bean. Have ready quite a quantity of ice, cracked in pieces not larger than a pigeon egg—the smaller the better. You can manage this easily by laying a great lump of ice between two folds of coarse sacking or an old carpet, tucking it snugly, and battering it, through the cloth, with a sledge-hammer or mallet until fine enough. Use an ordinary old-fashioned upright freezer, set in a deep pail. Pack around it closely, first, a layer of pounded ice, then one of rock salt,—common salt will not do. In this order fill the pail; but before covering the freezer lid, remove it carefully that none of the salt may get in; and, with a long wooden ladle, or flat stick, beat the custard as you would batter, for five minutes, without stay or stint. Replace the lid, pack the ice and salt upon it, patting

it down hard on top; cover with several folds of blanket or carpet, and leave it for an hour. Remove the cover of the freezer when you have wiped it carefully outside. You will find within a thick coating of frozen custard upon the bottom and sides. Dislodge this with your ladle, which should be thin at the lower end, or with a long carving-knife, working every particle of it clear. Beat again hard and long until the custard is a smooth, half-congealed paste. The smoothness of the ice-cream depends upon your action at this juncture. Put on the cover, pack in more ice and salt, and turn off the brine. Spread the double carpet over all once more, having buried the freezer out of sight in ice, and leave it for three or four hours. If the water has accumulated in such quantity as to buoy up the freezer, pour it off, fill up with ice and salt, but do not open the freezer. In two hours more you may take it from the ice, open it, wrap a towel, wrung out in boiling water, about the lower part, and turn out a solid column of cream, firm, close-grained, and smooth as velvet to the tongue.

Chocolate Ice-Cream. One quart of cream, 1 pint new milk, 2 cups sugar, 2 eggs beaten very light, and 5 tablespoonfuls chocolate rubbed smooth in a little milk. Heat the milk almost to boiling, and pour by degrees in with the beaten egg and sugar. Stir in the chocolate, beat well three minutes, and return to the inner kettle. Heat until it thickens well, stirring constantly; take from the fire and set aside to cool. Many think a little vanilla an improvement. When the custard is cold, beat in the cream. Freeze.

Lemon Ice-Cream. One quart of cream, 2 lemons, the juice of 1 and the grated peel of ½, and 2 cups of sugar. Sweeten the cream, beat the lemon gradually into it, and put at once into the freezer. Freeze rapidly in a patent freezer, or the acid is apt to turn the milk. You may make orange ice-cream in the same way.

Pine-Apple Ice-Cream. One quart of cream, 1 large ripe pine-apple, and 1 pound of powdered sugar. Slice the pine-apple thin, and scatter the sugar between the slices; cover it, and let the fruit steep three hours; then cut or chop it up in the syrup, and strain it through a hair-sieve or bag of double coarse lace; beat gradually into the cream, and freeze as rapidly as possible. You may, if you like, reserve a few pieces of pine-apple, unsugared, cut into square bits, and stir them through the cream when half frozen.

Peach Ice-Cream is very nicely made after the preceding recipe, with 2 or 3 handfuls of freshly-cut bits of the fruit stirred in when the cream is half frozen.

Raspberry or Strawberry Ice-Cream. One quart ripe sweet berries, 1 pound sugar, and 1 quart fresh cream. Scatter half the sugar over the berries and let them stand 3 hours; press and mash them, and strain through a thin muslin bag; add the rest of the sugar, and when dissolved, beat in the cream little by little. Freeze rapidly, opening the freezer (if it is not a patent one) several times to beat and stir. Or, you may have a pint of whole berries, unsugared, ready to stir in when the cream is frozen to the consistency of stiff mush. In this case, add a cup more sugar to the quart of crushed berries.

These ices are often colored by cochineal, but the addition is not advantageous to the flavor. Strawberry or raspberry jam may be used instead of the fresh fruit, or equal quantities of jam and fruit employed. Of course, the quantity of sugar must be proportionately diminished.

Frozen Custard with Fruit. One quart milk, 1 quart cream, 6 eggs, and 3 cups sugar beaten up with the yolks, and 1 pint peaches, cut up small, or fresh ripe berries. Heat the quart of milk almost to boiling, and add gradually to the beaten yolks and sugar; whip in the frothed whites; return to the custard kettle, and stir until it is a thick, soft custard; let it get perfectly cold; beat in the cream, and freeze. If you let it freeze itself stir in the fruit after the second beating; if you turn the freezer, stir in the fruit when the custard is like congealed mush.

Tutti Frutti Ice-Cream. One pint of milk, 1 quart cream, yolks of 5 eggs, beaten light with sugar, 3 cups sugar, 1 lemon, juice and grated peel, 1 glass of pale sherry, and ½ pound crystallized fruits, chopped. Heat the milk almost to boiling; pour by degrees over the eggs and sugar, beating all together well; return to the fire and boil 10 minutes, or until set into good custard; when cold, beat in the cream, and half freeze before you stir in a ½ pound of crystallized fruit,—peaches, apricots, cherries, limes, etc.,—chopped very fine; beat in with these the lemon and wine; cover again, and freeze hard. In all fruit ice-creams the beating of the custard should be very hard and thorough, if you would have them smooth.

Iced Tea. As a summer drink iced tea is becoming quite popular. It is eminently restorative when the system is enervated by intense heat, but the injurious effects alleged against tea are certainly none the less diminished by its being taken cold.

Ice-House. Ice is not merely a luxury, but becomes a necessity as soon as its value is known, and the advantages and benefits to be derived from an abundant supply of ice on the farm can hardly be overestimated. Aside from its use for the preparation of articles for the table, the numerous domestic uses to which it is applied, such as the preservation of fruits, butter, meat, etc., and the various sanitary benefits to be derived from its use, make a well-filled ice-house almost a necessity on the farm. An ice-house can be constructed at so small an expense, that the owner of every farm can well afford one. Of course the actual cost may be large or small, according to the size and style of the structure. They may be made ornamental or plain, above or below ground. The smallest quantity of ice stored in a house that will keep well through the entire season is a cube of ten feet; the larger the quantity stored together the better it will keep. The walls should be made double, and the space between filled with dry tan bark or sawdust. This space should be at least twelve inches wide. The floor may be made of heavy plank, earth,

gravel or sand. There should be a drain beneath, by digging or boring a hole down to the ground, unless you have a milk-house attachment. This hole should be filled with gravel. The floor should incline slightly toward the drain, so that the water from the melting ice may be readily carried away, while at the same time no air is admitted to the ice through the drain. The several designs and estimates given will serve as a guide to the builder. Still cheaper plans might be used if the directions as to the double walls, drainage, etc., are followed.

The principle of preserving ice is to prevent the heat from reaching it, and whatever will accomplish this end is to be adopted. This is the object of the filling between the wall and the packing about the ice. Whatever is a non-conductor of heat, therefore, is to be selected for this purpose. Keeping this principle in view, almost any man's ingenuity can devise an ice-house which, though it may be unlike anything else that was ever built, and very rude in construction, will preserve the ice, and that is all that is wanted.


FIG. 1.—*Ice-House and Cool Chamber.*

Ice should be cut with a saw, not with an axe, into blocks of regular size, so that they will pack into the ice-house solidly and without leaving spaces between them. If cut in this manner, ice will keep perfectly well, if not more than three inches in thickness; but a thickness of six inches at least is preferable. It should be cut and packed in cold, freezing weather, and if, as it is packed, a pailful of water is thrown over each layer to fill the spaces between the blocks, and exclude the air, it will keep very much better than otherwise. For a day or two before the house is filled, it is well to throw it open in order that the ground beneath it may freeze, and it may be left open a few days after it is filled if the weather continues cold. The ice-house should be finally closed during cold, dry weather, and it should be opened but once in each day during the summer season, and then a competent man should remove the necessary amount of covering, and take out a full supply for all purposes; then restore the covering, carefully packing it about the opening, and close the house for the day. Much waste follows frequent visits to the ice-house, especially by unskilled persons, who dig down to the ice and, by much tugging, perhaps succeed in getting some irregular fragments, and then throw into the place from which they took them some lose sawdust, through which the air penetrates, and melts perhaps ten times as much ice as has been taken away in this very irregular manner of proceeding. In cold regions, where water-courses from which ice may be cut are scarce, ice-houses may be filled by making large water-tight boxes or troughs, which are filled with water and permitted to freeze. As soon as the water is frozen solid the ice is removed, stored in the ice-house and the boxes re-filled. In this manner an ice-house may easily be filled with pure ice. A huge cake of ice may be formed by throwing on water and allowing it to freeze. When sufficiently large it may be sawed into blocks and stored in the ice-house. The blocks in the ice-house may be all frozen together, if the weather is cold, by throwing water over them, and leaving the doors open nights.

The following are some general principles to be observed in the proper construction of any kind of an ice-house, and all else is of secondary importance. There must be perfect drainage, and no admission of air beneath, ample ventilation and perfect dryness above, and sufficiently non-conducting material for packing below, above and around the ice, by which its low temperature may be preserved. The best packing consists of sawdust, either of pine or hard-wood, spent tan, charcoal powder, oat, wheat or buckwheat chaff, or marsh hay.

In Fig. 1 we give the design of an excellent ice-house with cool chambers below. The building is so designed that it not only affords excellent facilities for keeping the products of the dairy during the summer months, but also during winter. Attention has also been given to the exterior beauty, and a building of this nature will add greatly to the surroundings of the farm home besides affording the luxury of ice in summer and being able to preserve milk, butter, fruit, meats, etc., during the hot seasons.

The principal requisites for such an ice-house as

represented in Fig. 1 are: A locality where the ice can be expeditiously placed in the upper part, and provision for drainage to carry off the waste from the ice. A hillside is the most convenient position for such a house. The method of construction is the same as for any other ice-house, excepting in the floor. The walls are double, and are filled in between with sawdust or other non-conducting material. The roof should be wide in the eaves so as to shade the walls as much as possible, and it will be found convenient to have a porch around the building, on a level with the floor of the ice-house. The floor of the ice-house must be made not only water-tight, but air-tight. If a current of air can be established by any means through the floor of the house, the ice will melt away in a very short time. A double floor of matched boards should be laid, tarred at the joints, and between the floors. The joists are placed so that the floor slopes from both sides to the center, to collect all waste water from the ice. A channel is made along the center to carry the water to the side of the building, where it passes off by means of a pipe, with an ∽ curve in it, to prevent access of air. Or the pipe may be brought down through the lower chamber, and made to discharge into a cistern, where the water is kept always above the level at which it is discharged from the pipe. The method of this arrangement of the floor is shown in Figure 2, which represents a section through the floor and lower chamber. The shelves are seen in place upon the sides, Fig. 2.

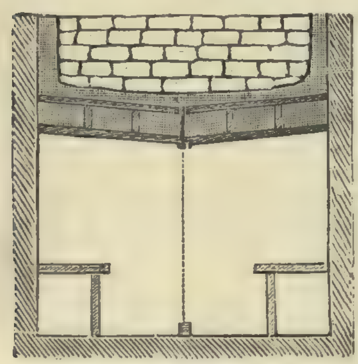


FIG. 2.—*Interior View of Cool Chamber.*

The items of material for the construction of such an ice-house, if on a foundation of brick or stone, may be estimated as follows:

	FEET.
4 pieces 2 x 8 (laid on the wall in the place of sills), 16 feet long	88
12 joints for lower floor, 2 x 8, 16 ft. long	268
12 " " second " 2 x 12, " "	400
7 " " ceiling, 2 x 6, " "	112
42 pieces " studding and plates, 2 x 6, 16 ft. long	672
40 " " rafters and sundries, 2 x 4, " "	320
Sheeting for roof	400
4 M shingles	
75 pieces 1 x 12, 16 ft. long, surfaced for siding and cornice	1,200
65 barn battens for same	
Flooring for floors, ceiling and lining	2,000

The third item in the above bill provides pieces for tagging on the top so as to make the floor lower in the center, as shown in Fig. 2. The number of windows and doors may be made to suit location and taste.

ICE-HOUSE AND REFRIGERATOR. Fig. 3 represents an inexpensive contrivance for keeping milk, butter, and other perishable articles in hot weather. Its size may vary with the wants of the owner, but the larger the ice-chamber is, the less frequently it would require filling, and if sufficiently large, it would keep ice all summer. The walls (Fig. 3) are double, and filled with sawdust, as common in ice-houses. The door, *a*, is double, with a space of three or four inches in it, filled with sawdust to exclude the heat. Two doors, one opening outward, and one opening inward, would be more perfect. Whether one or two, they should be made to fit very closely. These doors open into the refrigerator, which is kept cool by the ice above, and it may be lined with shelves. The joists, *b*, must be stout, so as to hold several tons of ice above, provided a large-sized building is erected. They are cut down towards the center, so as to form a trough for the discharge of the water from the melting ice. On these joists galvanized sheet-iron is laid. On this the ice is deposited, and the iron being thus kept constantly cold, cools the air in the apartment below, by the natural descent of the cold air. By sprinkling sawdust over the iron floor, the thawing of the ice will be retarded, and thus its melting and duration may be entirely controlled, according to the depth of this layer of sawdust. The door, *c*, receives the ice, and the window, *d*, kept always open, is for ventilation. There should be one in each end. The freer this ventilation, the better the ice will keep—being covered with eight or ten inches of sawdust. It is better to line it with a few inches of sawdust at the sides, in addition to the sawdust walls. There is no use in a double roof.

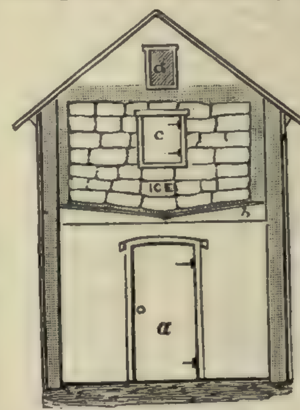


FIG. 3. *Elevation and Section of Ice-house and Refrigerator.*

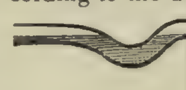


FIG. 4. *Section of Discharge Pipe.*

The water from the melting ice runs down into the trough, and thence into a lead pipe, which, being bent, as shown enlarged in Fig. 4, allows the water to escape freely, but excludes the warm air from without.

BILL OF MATERIAL FOR ABOVE, the building being 10x12 feet and 12 feet high, the first story 7 feet, and the second 4:

	FEET.
Two sills 6x8, 12 feet long, } Two sills 6x8, 10 feet long, }	176
Eight sleepers 2x8, 10 feet long	104
Nine joists 2x12, 10 feet long	180
Seven joists 2x6, 10 feet long, for ceiling	70
Forty-four studding 2x4, 12 feet long	352
Sixteen pieces 2x4, 14 feet long, for rafters and sundries	160
Sheeting	250
Two and one-half M shingles.	
Siding	650
Cornice	100
Flooring, for floors, ceiling and lining	1,200
One double batten door.	

AN ICE AND FRUIT HOUSE COMBINED. The principal requisites for an ice-house with a cool chamber below for fruit, are: A location in which the ice can be handily placed in the upper part of the building,

and facilities for drainage. A hillside naturally suggests itself, and will, of course, be used for the purpose, when it can be. However, the house can be built upon the level, and the ice hoisted to its place. The method of construction does not differ from that of other ice-houses, except that the floor on which the ice rests must be water tight as well as air tight. This can be accomplished by laying a double floor of matched boards, tarred at the joints and between the floors. The floor should be made sloping toward the center, in order that the waste water may collect, which is carried along the channel to the side of the building, and is thence carried off by means of a pipe, which should have an ∞ curve in it to prevent access of air; or what is still better, we think, the water can be discharged through a pipe leading from the center through the lower room, into a cistern below, in which the water is kept above the level at which the discharge is made.

The walls should be made double, and filled in between with sawdust or other non-conducting material. In order to provide for the weight of the ice above, the building must be much stronger than the ordinary ice-house. It is advisable to have the eaves of the roof pretty wide in order to shade the walls as much as possible. It is preferable, when at all convenient, to build the lower part of brick or stone. The upper part may be constructed of wood, or of any material. Ventilation in the cool chamber must be provided, else the fruit or vegetables will mould. This room can also be used as a milk room, but should not be used for both fruit and milk.

Iceland Moss, a kind of lichen (li'ken or lich'en, a vegetable growth somewhat between a moss and mushroom) from the mountainous districts of Europe. It has a slightly bitter taste, and is used both as a tonic and as an article of food. As prepared for the table, however, its bitterness is scarcely, if at all, perceptible; it has a grayish color, and the flavor of new rye. It is generally served up in the form of a pudding, blanc mange or jelly, as follows: To make one pint of the pudding, steep 2 ounces of the moss in 3 pints of water for an hour or two, then simmer down to about 1 pint; add fine sugar and a little lemon juice. It may be improved with ½ ounce of isinglass. Some prefer to have the fibrous portion separated from it by a sieve.

Idiosyncrasy (id-i-o-sin'cra-sy), a constitutional peculiarity. This term is the best and most common name of certain singular and unaccountable features in the taste and susceptibility of most people,—peculiarities which are really morbid. We will illustrate: One person cannot bear the taste of a tomato; another cannot bear the smell of cheese without becoming sick at the stomach; another cannot eat at a table where there is a dish of any kind of fish prepared; another cannot bear the sight of an oyster, either at the table or anywhere else; another cannot take this medicine, another cannot take that; one has a partiality for dark color in all the ornaments of a parlor, another is partial to green, another to blue, etc.; one has a singular passion for singing only sad songs, or for doleful music; another for copper ware for all her kitchen utensils; another for some other unreasonable thing. Most persons are more or less affected with abnormal intensity of some passion, taste, like or dislike, which must be regarded with indulgence for their comfort, but which are to be deprecated and worked against in the science of stirpiculture and rearing of children. From the above examples it will be seen that idiosyncrasies are the first step in the line of insanity—the latter term denoting the extreme. An idiosyncrasy in the development of a single faculty is called "genius."

Impact, or Percussion; the force with which one body strikes another. The center of impact, or of percussion, is that point of a moving body at which its impetus is supposed to be concentrated.

Imphee (im'fee), African sugar cane. See Cane.

Implements, tools, including the larger apparatus in farming, as plows, harrows, scythes, cradles, etc.

PROGRESS. The civilized world is a constant surprise to itself in respect to inventions. In the line of agricultural implements, it is wonderful to contemplate the strides we have made within the present century, especially the last forty years. We have passed from the wooden-moldboard plow, of clumsy make, to polished steel, of the neatest form, sometimes operated by steam; from single-plow and hoe cultivation to fine-toothed buggy cultivators; from sickles, cradles and scythes to self-binding harvesters and mowers drawn by horses; from flails and treading by oxen and horses to steam threshers and separators; from shelling corn an ear at a time by hand to large machines, run by horse or steam power, doing the work of many men; from pitching hay by hand, an hour or two of the severest labor to each load, to hoisting half a load at a time by horse power, etc., etc. In short, farming has changed from a life of the most monotonous drudgery to one comparatively of play and romance.

The business of mannfacturing farming tools and machinery has become one of the great interests in this country, and during the last twenty-five years the increase has been over ten-fold. According to the census figures of 1880, there were 1,942 establishments in the United States engaged in the manufacture of these implements. Of these, 265 are in New York, 221 in Illinois, 220 in Pennsylvania, 158 in Ohio, and 143 in Michigan. The aggregate capital invested in the industry is $62,315,968, and the highest number of hands employed during the census year was 49,180, to whom $15,496,114 were paid in wages, while $5,791,916 were expended for lumber, $18,424,052 for iron and steel, and $7,878,202 for other material, making the total value of all materials used, $32,094,107. During 1880 the value of all agricultural implements manufactured amounted to $69,374,088. Of this vast sum the manufactures of Illinois, Indiana, Iowa, Ohio, Michigan, Minnesota,

and Wisconsin aggregated $45,000,000, or 64 per cent of the whole. In 1850, New York and Pennsylvania made most of the implements, but to-day the prairie States of Ohio and Illinois have taken their place, the value of the implements made in Ohio in 1880 being $15,473,825, and in Illinois, $14,249,175; while those made in New York were worth $10,747,766, and those in Pennsylvania, $4,271,212. Altogether there were made of lighter implements 1,361,443 plows, 1,244,-264 scythes, 437,178 scythe snaths, 308,732 dozen hand-rakes, 211,738 dozen hay forks, and 325,057 cultivators; while of heavier implements there were manufactured 72,000 mowers, 25,537 harvesters, 35,-337 reapers, 54,884 reapers and mowers combined, 10,387 threshers, 10,202 cider and wine mills, 2,356 cane-mills, 1,460 sirup-evaporators, 11,161 horse-powers, 1,412 clover-hullers, 33,453 potato-diggers, 44,370 corn-huskers, 59,157 corn-shellers, and 45,412 fanning-mills.

The description and care of all farm implements are given in this volume, in alphabetical order, but we wish to make a few observations on the general care of farm implements and machinery. Every implement of a farm, especially every one of the more complicated and valuable class, ought from time to time be minutely inspected, in order that any part of it which has received damage or undergone derangement may be immediately repaired; for when even a very small or very limited injury has been sustained, a large portion of the implement may soon become seriously and extensively affected, or absolutely the whole be rendered unfit for use. All movable implements also ought, whenever they are not wanted, to be thoroughly cleaned, and carefully stored, the larger ones in sheds, cart-houses and plow-houses, and the smaller ones in the implement house. Machines and implements, likewise, which are much exposed to the weather, ought, every two years or so, to receive a new coat of paint, as a means of protecting them from the effects of both drouth and rain. We suggest to farmers generally that a little instruction given to the workmen in the use of machines, and care in preserving them, would add to their efficiency and durability. Attention to washing implements and machines before laying them by, a little oil on such as have revolving wearing parts, and a coat of paint occasionally to each, will cost but little, and make the difference between having a machine ready for use and one covered with rust and wanting repair, just as the season for its use commences. Contrive by care and good management to make the implements as durable as possible. The cost of this will be trifling compared with the advantage. In order to effect it, select the most likely agricultural laborer upon a farm, put the implements under his care; make it a strict rule with all the men that each implement done with for the season shall be brought to one particular place, say near the pond or pump; the man having charge of the implements must then wash and clean them well before putting them into the shed, and at a convenient time, when not otherwise engaged, or during weather when out-door work cannot be performed, get them repaired and painted, if needed. At the end of this shed or implement house, there might be a lock-up workshop, with door to open into the place, with a few tools, paint pots, etc., the expense of which would be nominal in comparison with the benefit derived. The man should be encouraged to make his duty a pleasure, and to feel a pride in showing his employers, implements in good order.

In-and-In Breeding. See page 142.

Inarch, to unite by grafting, as a cion, to a stock, without separating it from its parent tree; to graft by "approach." After the union is well cemented by natural growth, the cion is separated from its parent stock. This process is of no general utility, being called into requisition only for a curiosity, or to save a rare and valuable tree.

Incisor, one of the front teeth: so named from their function as "cutters."

Inclined Plane, one which has one side higher than the other, at least relatively.

Incubation, sitting over, as eggs, to keep them warm until hatching; period of apparent repose of a virus in the system, between the time of catching the infection and the breaking out of the disease; as, for example, the period of incubation for the small-pox virus averages 9 to 14 days. For incubation of fowls, see page 532.

Indian Corn. See Corn.

Indian Mallow. This is that velvety weed, growing five to six feet high, so rank and so common in the rich and neglected corners of our fields, called in some places, "stamp-weed," "butter-stamp," "button-weed," "velvet-leaf," etc. Its tough, fibrous bark is found to be nearly equal to hemp for rope-making. A process for its manufacture has been invented, and the experiments give promise of profitable results. The plant will yield nearly twice as much as hemp to the acre, and its vigor is such that its cultivation is of the easiest kind. Plow the land deeply in the fall, and lightly in the spring; sow the seed at the rate of 12 to 16 quarts to the acre, in the spring, in good corn planting time, in the same manner as hemp. In July it can be cut with a common reaper, shocked in the field the same as hemp, until cured, and the first crop water-rotted also like hemp. After this a second crop will spring up the last of July, which may be cut and dew-rotted in October. In cultivation the mallow will grow nine to fourteen feet high. The seed is separated from it the same as hemp. The total cost of raising and rotting is $20 to $30 per ton, while hemp brings $250 to $400 per ton. The crop is said not to exhaust the land, if the refuse is restored to it. The fiber is said to receive and retain colors well, and is good for carpets, rugs, etc.

Indian Hemp, a poisonous East-Indian plant, from which hashish and some medicines are made; also, the name of a semi-poisonous plant growing in

the woods of the United States, and sometimes used in medicine.

Indian Pony: see page 693.

Indian Tobacco, lobelia, the celebrated Thompsonian emetic. Grows sparingly in waste places throughout the United States. See Lobelia.

India Rubber, gum elastic, caoutchouc, etc. To cement rubber which has not been vulcanized (hardened by compounding with sulphur), melt together 16 parts gutta-percha, 4 parts India rubber, 2 parts common calkers' pitch and 1 part linseed oil, and apply while hot. Also good for leather. To fasten rubber to wood or metal, soak pulverized gum shellac in ten times its weight of strong ammonia, and let it stand 3 or 4 weeks, when it will become liquid without the use of hot water. This will soften India rubber and, after volatilization of the ammonia, become hard and impermeable to gases and fluids. There are other compounds to be had through the drug stores, more complicated in their manufacture, which are good cements for India rubber.

Indigenous Plants, plants in a wild or native state. The indigenous plants of the United States, for example, are such as grow naturally in the United States, or are not known to have been artificially introduced from other lands.

Indigestion, if not merely the effect of another disease, is best overcome by fasting and out-door life. Almost any one of the ten thousand bitters and tonics and stimulants and sedatives and alteratives and other medicines will give temporary relief; but this immediate effect is nearly always followed by more troubles in the same line or some other.

Indigo. Several varieties of this plant are indigenous to the Southern States, and one or more in the Northern, which yield inferior dye. Its cultivation in the South is sometimes remunerative, but never in the North. The Indigo plants of the East and the West Indies are not cultivated in this country.

Indorser, in commerce, one who guaranties the payment of a note or bill by writing his name on the back of it; also, one who recommends a thing as true or good.

Industrial Education, training in the industrial arts, as agriculture, horticulture, gardening, carpentry, blacksmithing, civil engineering, and mechanics generally. The giving of this kind of training at public schools, called colleges and universities, is peculiar to the present century, is an outgrowth of the utilitarian character of the age in Christian countries, intensified by reaction against the time-killing studies of the dead languages and metaphysics of the dark ages. During this transitional period, when so much is said on both sides of this great question, we cannot give in an encyclopedia article even an outline of the controversy; but we feel abundantly warranted to state that the almost universal sentiment of the farming community and of other laboring classes is in favor of substituting manual training for the old-time Greek and Latin, in all our *public* schools; and accordingly an advance is made in the establishment of agricultural and industrial schools, almost every State having a college of the kind under its fostering care, as follows:

STATE.	PLACE.	NAME OF INSTITUTION.
Alabama	Auburn	Agricultural & Mechanical Col. of Ala.
Arkansas	Fayetteville	Arkansas Industrial University.
California	Berkeley	University of California.
Connecticut	New Haven	Sheffield Scientific School.
Delaware	Newark	Delaware College.
Florida	Eau Gallie	Florida State Agricultural College.
Georgia	Athens	University of Georgia.
"	Dahlonega	" "
Illinois	Urbana	Illinois Industrial University.
Indiana	La Fayette	Indiana Agricultural College.
Iowa	Ames	Iowa State Agricultural College.
Kansas	Manhattan	Kansas State Agricultural College.
Kentucky	Lexington	Agricultural & Mechanical College.
Louisiana	New Orleans	Louisiana State Agr'l & Mech. Col.
Maine	Orono	Maine State College of Agriculture and the Mechanical Arts.
Maryland	College Station	Maryland Agricultural College.
Massachusetts	Boston	Massachusetts Institute of Technology.
"	Amherst	" Agricultural College.
Michigan	Lansing	Michigan State Agricultural College.
Minnesota	Minneapolis	University of Minnesota.
Mississippi	Oxford	University of Mississippi.
"	Rodney	Alcorn University.
Missouri	Columbia	University of Missouri.
"	Rolla	" "
Nebraska	Lincoln	University of Nebraska
New Hampshire	Hanover	Dartmouth College.
New Jersey	New Brunswick	Rutger's College.
New York	Ithaca	Cornell University.
North Carolina	Chapel Hill	Universitv of North Carolina.
Ohio	Columbus	Ohio Agricultural and Mech. Col.
Oregon	Corvallis	Corvallis College.
Pennsylvania	Centre County	Pennsylvania State College.
Rhode Island	Providence	Brown University.
South Carolina	Orangeburgh	Claflin University.
Tennessee	Knoxville	East Tennessee University.
Texas	Bryan,	Texas Agricultural and Mech. Col.
Vermont	Burlington	University of Vermont and State Agricultural College.
Virglnia	Blacksburg	Virginia Agricultural and Mech. Col.
"	Hampton	Hampton Normal and Agricult. Inst.
West Virginia	Morgantown	West Virginia University.
Wisconsin	Madison	University of Wisconsin.

It will be observed from the foregoing table that many of the industrial schools are departments of the old institutions. The Sheffield Scientific School at New Haven is under the supervision of Yale College, the Indiana Agricultural College is a department of the Purdue University, etc. In the Congressional land grant made about 30 years ago to the several States for the founding and sustaining of agricultural and mechanical schools, it seems to have been the design of the movement to exclude the most useless parts of the old curriculum, in order to give room for the more modern and practical studies; but the conservative element was still formidable enough to wedge in the proviso, "and not excluding other scientific and classical studies," and thus practically compel the progressive masses to walk somewhat in the old grooves. The work of modernizing, however, still goes on, despite the whines and growls of the old-school educators. In the article Education, pages 383–390 of this work, we have spoken at length on some features of a practical education.

Complaint is sometimes made by farmers that a large proportion of the graduates of the agricultural colleges do not return to the farm, but go into some profession or fancy business not at all akin to farming. The fact they complain of most surely exists; but what shall we do? Compel the boys to return to

farming? or abolish the schools? On the other hand, we may console ourselves that the practical education received by these young men at the agricultural colleges is infinitely better for them than the Greek, Latin and higher mathematical education of the classical school is for the farmer, or, possibly, even for the professional man himself.

We are aware, also, of the justness of the complaint against taxing the people for the support of schools of "higher education" (Greek, Latin, higher mathematics, etc.) and of specialties in any art. We know that oft the majority transgress constitutional or fundamental rights, oppress the minority and make unbelievers in a given measure sacrifice their purse for its support. The best we can hope for is to continue to complain and instruct in first principles of right until there is a proper adjustment. Taking the history of older nations, however, as a guide to prophecy, the outlook for a perfect adjustment of rights seems gloomy; for it seems to be characteristic of human nature to get into the mire on one side as fast as it is pulled out on the other.

We will not discuss here the value of "book learning" in agricultural science (see page 388), further than to observe that very few persons are willing to confine all their school training and self-education to mere money-making art. There are pleasures in scientific study and mental discipline which are far superior to money-making or anything that money can buy. After you have made your money, then what? After you have learned farming, followed farming and made a fortune, what? Very few, indeed, know how to spend their money, or dispose of their property after they have made it; and it really becomes a matter of consideration whether we should not spend more time in learning what to do with our money or property than in learning how to accumulate. It is all of no use to us except so far as we expend it for virtuous pleasure. Do not forget the object of life amid the turmoil of using the means to obtain that object.

Inertia, the property or force of matter by which it retains its state of rest or motion,—requiring force to be started or to be stopped.

Infant, a child too young to know right from wrong; in law, any person not old enough to vote for or hold any civil office, or hold property in his own trust, etc.; a minor.

Infection, the matter of disease, whether "contagious" or not.

Inflammation, excessive vital action, attended with swelling, redness and pain. This is particularly a local inflammation, being limited to some part of the body: a general inflammation is mostly in the skin and mucous membranes, and is called a fever. As a general rule, all local inflammations should be soothed down by fomentations or compresses (wet clothes or poultices) of such temperature as is most comfortable to the patient. Among the most efficient drugs for allaying inflammation are sugar of lead and iodine. Tincture of iodine will scatter most of them; put a drop, more or less, on the place once or twice a day and they will gradually disappear. Even a schirrous tumor may be scattered with it. It will sometimes arrest what would have been a cancer, and ought to be kept in every house. The bottle must have a glass stopper, for it very soon eats up the cork. Sugar of lead will act in many cases, but iodine is both safer and better. People who are liable to these things ought to eat but little grease or sugar in any form, and no buckwheat or spices or stimulating food of any kind. Of course, it is understood in all the above that so long as the cause of the inflammation exists there will be trouble. See also part affected.

Influenza (in-flu-en′za), a violent form of catarrh, which occurs with great suddenness, and is accompanied with debilitating fever. It often occurs in the manner of an epidemic, affecting many persons or animals in a community at once. The term is very loosely applied to several forms of disease attended with catarrhal discharges, especially among horses. See Catarrh, page 195. For influenza in the horse, see page 782.

Infusion, the medicated liquid obtained by soaking or steeping in it some organic substance. No particular rules can be laid down as to the quantity of each article required. It will, however, serve as some sort of guide, that we generally use from one to two ounces of aromatic herbs and roots to every quart of fluid. A bitter infusion, such as wormwood or camomile, requires less of the herb. All kinds of infusions can be rendered palatable by the addition of a small quantity of honey or molasses. As a general rule, the human palate is a good criterion; for if an infusion be too strong or unpalatable for a man, it is unfit for cattle or sheep.

An infusion of either of the following articles is valuable in colic, both flatulent and spasmodic, in all classes of animals; caraway, peppermint, spearmint, fennel seed, angelica, bergamot, snakeroot of several kinds, anise seed, ginseng, etc.

Inhale, to draw into the lungs, by the breath. Medicated vapor of many kinds are invented for inhalation, in the treatment of throat and lung complaints, but very few of them are either safe or efficient. The substances generally used for this purpose are vinegar, camphor, benzoin, ether and chloroform, the two last being used as anæsthetic agents to induce insensibility, and are inhaled by an apparatus specially adapted for the purpose; the others are generally thrown into boiling water, and the watery fumes, charged with the medicament employed, are inhaled through a tube. Great relief is often found in congestive asthma from inhalation of steam or smoke; for this purpose an inhaler should be half filled with boiling water mixed with about a dessert-spoonful of strong acetic acid or half a drachm of sulphuric ether or a few drops of creosote, which being poured on the hot water and the lid firmly secured, the patient is to adjust the mouthpiece to his lips, and slowly inhale

the impregnated vapor that rises through the tube, retaining the steam as long as convenient in the mouth. Whatever article is used for the inhalation, the quantity employed should be steadily increased, and the operation always commenced with a small dose. Inhalation of the steam of plain warm water, sage or balm tea, or a decoction of camomile and poppy-heads, poured into the inhaler, will often afford very great relief, and more particularly when used alternately with any of the above articles—acetic acid, ether, etc. See also the respective diseases, either of man or beast, where inhalation may be practicable.

Inject, to throw in; in medical treatment, to force medicated fluid under the skin (see Hypodermic Syringe) or throw water or other fluid into the bowels (rectum) by a syringe.

Injection, a throwing in, as fluid into the bowels or under the skin; a clyster; an enema. A common enema is an injection of tepid water, to relieve constipation or diarrhœa.

Ink, To Make. Although at the present day it is generally cheaper to buy ink at the book or drug-stores, a ten-cent bottle at a time, than to make ink at home, we give two or three of the best recipes for making ink.

Recipe for black ink that will not freeze: Five ounces extract logwood, ¼ ounce bichromate of potash, ¼ ounce prussiate of potash, 2 gals. alcohol. Put the logwood in the alcohol cold, bring to a boil, then put in the bichromate and prussiate of potash, and boil five minutes.

Or, mix with a gallon of pure soft water, and stir in well, 12 ounces of coarsely powdered Aleppo galls; 6 of chipped logwood; 5 of protosulphate of iron; 5 of gum Arabic; and two of dry sugar.

Indelible Ink. Six cents' worth of lunar caustic; 1 drachm of salt of tartar, one quarter of an ounce of gum Arabic.

Sympathetic or Invisible Ink. Onion juice, or lemon juice, or sulphuric acid and sugar, or blue vitriol and sal ammoniac, etc., will be invisible until heated. Other substances, when used in writing, are invisible until moistened with water or some chemical solution.

Ink Stains, To Eradicate: see Stains.

Inoculate, to insert eyes, or buds; to bud. See Budding. In medical language, it is to propagate a disease by the transfer of its virus to another individual,—also called "vaccination."

Insanity, literally, want of mental soundness. We have a number of terms in the English language denoting various degrees of insanity; as genius, idiosyncrasy, eccentricity, peculiarity, simple-mindedness, imbecility, mental aberration, derangement, unsoundness of mind, craziness, frenzy, foolishness, doltishness (dunce, blockhead, etc.), folly, want of balance, furor, stupidity, melancholy, mania or madness (see Monomonia), idiocy, etc., besides several terms from other languages, as non compos mentis, insipientia, dementia, etc. There are also numerous slang phrases, as "kink in the head," "bee in the bonnet," "cracked brain," "off his balance or pegs," "cranky," beside himself," "out of his mind," etc., etc. Most of these terms are too much used in scoffing, being applied to sound men and women who simply differ from us in opinion. The more ignorant and uncultured one is, the more he is given to applying these epithets to men of wisdom.

Idiocy applies to one who is born with so little intellect as to be irresponsible for his acts, and insanity to one upon whom mental unsoundness has been induced some time after birth. The latter is sometimes curable, the former never. A person, moreover, may be physiologically insane and not legally so; that is, he may be partially insane, but not so much so as to be irresponsible for his actions; he may still know right from wrong; and so far as he does know right from wrong, he is not "insane" in the sense of the law.

Practically, the most important things for us all to know are the signs of in-coming insanity; for it generally creeps on so slyly that the family or inmates of the house where the patient resides have a deal of trouble, explaining and quarreling, etc., before it is fully determined what is the difficulty. Difference of opinion, accompanied with ugliness of temper or unwillingness to compromise, is not evidence of real insanity, although it is of wickedness; but, as medical jurists have already agreed, the first reliable evidence of real insanity is the commission of acts (or omission) which are clearly aimless and cannot be regarded by any one as effecting any good whatever for the subject himself; as, eating clay or sand, pricking the skin in various places as if only to see it bleed, unnecessarily freezing or burning one's self, standing with arms extended, beating the ground, making constantly an unmusical noise, saying things that have no sense, remaining disagreeably silent and sullen, persisting in ridiculous postures, etc. Of course the acts of those who are near the dividing line between sanity and insanity will be confusing, and there are indeed many people at that point. It is difficult to distinguish their acts from those of a dunce or an unusually depraved person. In nature there is no more definite line between sanity and insanity than there is between heat and cold, although the terms in both instances are of opposite meaning. No person becoming insane will ever acknowledge himself becoming so, but rather regard most, if not all, other peoples a insane. This conduct may in fact be regarded as a second evidence of approaching insanity.

As insanity is nearly always due to the action of physical causes since the birth and childhood of the patient, the treatment consists mainly in ferreting out the causes and removing them; and the treatment is therefore physical rather them mental. The most common causes are dyspepsia, disordered viscera, uterine diseases, nervous diseases, brain diseases, mental troubles coming in heaps, etc. The last mentioned class comprise love affairs, deaths of

friends or relatives, loss of property, disappointed ambition, etc.

Bromide of potassium, 5 to 10 grains three times daily, is the most common medicine given at insane asylums where a disordered brain is supposed to be the primary trouble; but the various schools of medicine differ, of course, very widely as to any prescribed course of medical treatment. We all know we are right, however, in endeavoring to remove the supposed cause of the malady and in administering the usual laws of health, as taught and agreed upon by all the schools. These are given under the head of Hygiene in this volume. Excursions and cheerful company are very important where mental troubles have been the cause of the disorder.

In this country all the States and Territories provide by statute for the care of the insane, at the expense of their relatives wherever practicable. If the patient is not dangerous to other people, and his relatives prefer to keep him at home, of course they are allowed to do so. Whenever a case is developed in a family, let them report the matter to the overseer of poor, or a similar officer appointed for the purpose, and they will be advised what to do. Generally a jury will be called to investigate and decide the case.

Our older States have one, two or three immense institutions for the care of the insane, at the expense mainly of the public; and they are generally full of patients. It seems to be settled that insanity is on the increase in the United States, due to disappointed ambitions, loss of property, hurried living, foolish medication and intemperance of all kinds. Considering the nature of the causes, it seems a hopeless task for a few men to undertake to arrest the tide, and philanthropists have to patiently work and wait in the field of physical education and mental discipline. While "the wise man foreseeth the evil and hideth himself, the simple pass on and are punished."

Insects, animals having a jointed body, composed of three distinct parts,—the head, the thorax and the abdomen,—the thorax furnished with six legs, and usually a pair or two of wings, and the abdomen with small holes, called "spiracles," along the sides, through which the creatures breathe. Formerly spiders, "sow bugs," shrimps and other crustacea, and even worms, etc., were loosely referred to as insects; but at the present day the term "insect" comprises only that class of animal forms as described above and exemplified by beetles, bugs, flies, bees, gnats, mosquitoes, grasshoppers, locusts, fleas, lice, bed-bugs, etc.

Insect life is generally divided into four very marked stages,—the egg, the larva, the pupa and the perfect state. The egg is also called *ovum*, plural *ova*; the *larva* (plural *larvæ*) is Englished into *larve*, plural *larves*,—sometimes called the "worm form;" the *pupa* (plural *pupæ*) is sometimes called *chrysalis* or *chrysalid*, plural *chrysalids;* and the "perfect," "developed" or "winged" state, the *imago*, plural *imagos*. The changes which insects undergo from the egg to the imago are called "transformations," or "metamorphoses." Some insects undergo only a partial transformation.

A very few insects do not lay their eggs, but retain them in the body till they are hatched, and thus they are called "ovoviviparous." Most insects lay eggs, and lay them where the young as soon as hatched will find a plentiful supply of food.

Insects proper are divided into seven sub-orders, as follows:

1. Hymenoptera, or Membranous-winged Insects, as bees, wasps, ichneumon flies, saw-flies, ants and their allies. The hinder pair of wings are smaller, and all the wings are traversed by a few irregularly branching veins. These insects have four jaws, the upper pair hard and fitted for biting, the lower pair softer, adapted for collecting honey. The females have stings.

2. Lepidoptera, or Scaly-winged Insects, as butterflies and moths. The "scales" are a fine dust, which readily comes off upon the fingers when one handles them. These insects have two pairs of wings, a long sucking tongue which rolls up like a watch-spring when not in use, and five-jointed feet. Their larves are called "caterpillars," and have 10 to 16 legs. The wings of the butterflies are erect when at rest while those of the moths lie flat. Butterflies are diurnal in their habits, moths mainly nocturnal.

3. Diptera, or Two-winged Insects, as flies, mosquitoes and their allies. These insects have sucking tubes as mouths, accompanied with sharp bristles for cutting into or piercing objects upon which they feed. The larves of the flies are called maggots. They are footless, and many of them are noted for subsisting upon carrion.

4. Coleoptera, or Sheath-winged Insects, as beetles. Beetles are so well known and so distinctly marked that no particular description is necessary for their identification. The number of species is counted by thousands.

5. Hemiptera, or bugs, cicadas or harvest-flies, plant-lice, parasitic lice on man and animals, bed-bugs, etc. The principle upon which these are classed together is this: They have the mouth parts in the form of a slender horny beak, consisting of a horny sheath, containing three stiff and intensely sharp bristles. When not in use, this beak is bent under the body and lies upon the breast.

6. Orthoptera, or Straight-winged Insects, as grasshoppers, katydids, cockroaches, crickets and their allies. Their wings lie straight along the top or sides of the back, the upper ones being somewhat thick and opaque, and sometimes slightly overlapping, and the under ones larger, thin, and in plaits.

7. Neuroptera, or Nerve-winged Insects, as dragon-flies and kindred insects. Dragon-flies are also called "devil's darning-needles," "snake doctors," etc. These insects have four membranous net-veined wings, the hinder ones largest, the mouth furnished with jaws and the abdomen destitute of sting and piercer. In some the transformation is complete, in others only partial.

Insects, Injurious. Were we to state the annual loss to our country caused by insect depredations, very few would believe us. In Illinois alone, by one insect, on one crop in one season, the loss was over $32,000,000. Some of our productions, for instance our plum crop, have been generally given entirely over to our enemies, and hence are little thought of. Other of our crops are so constantly raised on thirds, the insects taking one or two-thirds, that we have ceased to possess any idea of a full yield, and so take no heed of our loss. Still other of our products are cut off, withered or dwarfed, and the cause is like the wind; we see the effects thereof, but know not whither it cometh. Hence it is that nearly all, even those most closely interested, have no conception of the magnitude of their losses from these causes. Take the apple-tree and its product, for example; there are no less than six insects which seriously affect its vigor by despoiling it of foliage; four are engaged with too good success in hastening death by mining the trunk; at least two are sucking the vital fluid from the roots, while no less than five are demonstrating, by actual works, that they appreciate good apples, and mean to gratify their appetites, man's interest notwithstanding. Seventeen on one! Isn't it time to demand fair play? We have no doubt that could we rescue the spoils from all our insect banditti for three successive years, they would more than cancel our national debt. Surely such a statement ought not to be received with indifference, nor will it be by the thoughtful and enterprising. The best success with all our fruits, even apples, demands the planting of a succession of orchards; but proper attention to this insect question would greatly broaden the intervals of planting. Many orchards have gone on giving ever-increasing returns for 50 years, and single trees for more than 100 years. Nor need we doubt but that with wise precaution such experience may be oft repeated.

But it is often asked, "What does this important question demand for its solution, and has past experience given us any hope that it may be solved?" We briefly answer: Earnest, persistent study and research by the most capable men; and secondly, that our practical men, those directly interested, should all take "the bull by the horns,"—in other words, that there should be such interest elicited, through grange and club, that every man in every neighborhood of our country should give battle in lines already marked out, and adopt new ones and better ones as soon as they were suggested by the investigators. As well say that all the children of a neighborhood would be gentle, courteous and beautiful in heart and soul because one man gave good and wholesome training, as to say that insects could be kept at bay without concert of action. Suppose one farmer in a community instils into the lives of his children correct moral principles, will that insure the safety of his apples and melons? To be sure, his property will be safer for this wisdom. No more can the codling moth or curculio be exterminated by one man, though his persistent action would benefit himself and even his neighbors. No; the means must be generally made known to all farmers and fruit-growers, and then all must be fired with such zeal that practice may keep pace with knowledge.

But have we results that show that such a course will bring us respite from these thousand ills which waylay us on every hand? Yes. It was found by the fruit men of the peach-belt of Michigan that, unless the peach-borer was fought to the knife, this important interest would prove a failure. The trees would all be speedily killed. It was a case of life and death. Sluggish humanity woke up. Everybody rushed to the fight, and the beautiful peach orchards flourished. Now for the sequel: The peach men now tell us that that this enemy gives very little trouble. In the same region the curculio, which had utterly whipped us out of the plum culture, driving us from the field and taking undisturbed possession, came all undaunted, flushed with success, and cried surrender to the peach men. The latter, armed with chips, mallets, one and two-wheeled artillery, soon brought the little Turks down. "That bright dream was their last;" and now the fruit men tell us they have no fears of the curculio, and more, that these little snout-beetles are yearly growing less. Dr. Trimble and a live farmer's club so aroused the people of Vineland, New Jersey, to action that the fruit and region have gained a high reputation as being void of insects. The people at Old Mission, Mich., enforce their edict that all shall enlist in the insect battle. If such action does not attract a society worthy their climate, soil and position, then the future cannot be judged by the past. Had we space, we would give many other examples, both from home and abroad, that fully sustain the position that real, earnest, persistent effort, and that, too, right in the line of the fullest pocket,—the best financial prosperity,—is all that is required to rid us of those foes that require so large a share of our gains, and often make us look sad and discouraged in view of our prospects.

Our insect enemies are counted by the thousands, and that practical knowledge requisite to successfully combat their noxious work demands large libraries, costly apparatus and prolonged study. In view of the extent and intricacy of this subject, no less than its practical importance, we have planned to formulate in this article that part of our practical knowledge which bears directly on the remedy and cure for insect depredations, in the hope that it might assist the farmer and fruit-grower to work intelligently and efficiently, even though they possess but a limited knowledge of the insects themselves.

Insect Transformations. Most if not all persons know that insects are wondrously different in successive stages of their development from the egg to the mature state. How seemingly wide apart are the maggot or larva of the meat-fly, which so vexes the good housewife, the motionless, apparently lifeless, seed-like pupa, and the buzzing fly; yet all are but different stages of the self-same insect. Our cabbage butterflies experience equally striking transformations.

The caterpillar is green, worm-like and disgusting to the cook who attempts to prepare the savory vegetable for the noon-tide meal. The chrysalis is gray, inactive, and, as it swings from its silken cord, would seem void of all possibility of future mischief. The butterfly is white, dotted with black, graceful of motion as it slowly wings its flight from garden to garden, and, with its short sucking tube and frail body, would seem little capable of the serious mischief which it scatters with its tiny green eggs that it glues thick and wide to the cabbage plants.

FIG. 1.—*Adelges of the Spruce.* (Chermes abieticolens ?) Chrysalis on the left, imago on the right.

Most insects, like the one just referred to, are only destructive while in the worm-like or larval stage. Thus the maggot of the Hessian fly or wheat midge is what robs the farmer's pockets often to the tune of millions. It is the caterpillars, not the moths, which, as cut-worms, sometimes destroy whole fields of growing corn. It is the white grub, not the May beetle, that causes the corn and grass to wither often for acres in extent. The wireworm or grub, not the parent snapping beetle, is what blights the grain fields. The caterpillars known as army worms, not the graceful moths which only lay the eggs, are what devastate the oatfields, sometimes throughout entire neighborhoods, counties, or even States. The same truth is illustrated in the orchard. The canker-worm, the tent caterpillar, the apple worm, the borers, the slugs are all larvæ of insects which in maturity would be entirely harmless, except that they laid the eggs which hatched and thus gave rise to the terribly destructive larvæ.

FIG. 2.—*Apple-Leaf Crumpler.* (Phycita Nebulo.)

On the other hand, a few insects like the destructive rose-chafer, and the small but ravenous striped cucumber-beetle are most troublesome, often only destructive, when in the mature state. Other insects, like the Colorado potato beetle, which has worked such ruin in its devastating march across our country, and the bugs and locusts, are not content to feast and destroy only while in the larval stage, but continue their voracious habits even to their death. Some of these insects, as illustrated in the Western locust or grasshopper, do their very worst damage when in the mature state.

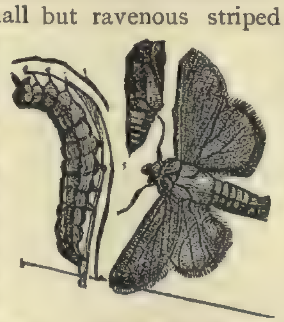


FIG. 3.—*Army Worm.* (Agriotes mancus.)

SPECIES. We give illustrations of most of the injurious insects, in alphabetic order as nearly as we can. Some of them have no common names.

FIG. 4.—*Dynastes Tityus.*

ADELGES OF THE SPRUCE. Found in abundance on the spruce in Maine, where it produces swellings at the ends of the twigs, in size and form resembling the cones of the same tree. The true length of this insect is imdicated by a hair line in the cut, Fig. 1.

APPLE-LEAF CRUMPLER: see page 27. The lower part of the cut represents a horn-like case webbed to a dead leaf and enclosing the worm form of the moth.

ARMY WORM: see Wheat.

BARK LICE: see Lice, in this article, and respective trees which they infest.

BEETLES. These are characterized by crust-like wing-covers, and are often called "bugs" by the unscientific. Fig. 4 gives a fine view of a magnificent beetle, found toward the South. It has no common name, and we give the engraving here to illustrate the beetle form, although this species is not known to be injurious. It burrows in old wood.

Bacon Beetle: see page 55.

Blister Beetle (Lytta cinerea and atrata). These soft-shell, long-necked, trim beetles are frequently injurious to various vegetables and flowers. They are half an inch long, narrow oblong square, and one is ash-colored and the other coal black. They sometimes attack beans and asters, and make quick work with whatever falls a prey to their voracious habits. It is supposed the larvæ feed on the roots of grass and other plants. The beetles appear in early summer and autumn. The best

FIG. 5.—*Bacon Beetle.* (Dermestes lardarius.) *a*, larva; *b*, antenna; *c*, beetle.

way to manage them is to jar them off upon a sheet, and scald or crush them.

Cucumber Beetle, Striped. This species is very destructive to the cucumber, melon and squash, attacking the roots and boring into the lower part of the stem in the larval or grub state, while the perfect beetle feeds on the tender leaves when the plants are young, and on the buds and young shoots of the older plants. It is very common and often inflicts heavy damage on the vegetable gardener by its depredations. It is nearly one quarter of an inch long and half as wide, of a bright or pale yellow ground color; the head is usually black, but not always, as it is sometimes yellow; the thorax yellow, with two black dots near the middle; wing-cases with a rather broad black stripe along the middle of each, and a narrow black border entirely around each.

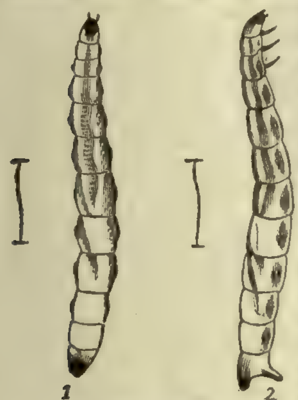


FIG. 6.—*Striped Cucumber Beetle.* (Galeruca vittata). 1, back view of larva; 2, side view of same.

The beetles make their appearance in the spring from the middle of April to early in June, according to latitude, feeding for a short time on the tender leaves of various plants until the cucumber plants begin to develop, when they turn their attention to these. After they have paired, the female deposits her eggs near the roots of these

FIG. 7.—*Beetle for Fig. 6.*

FIG. 8.—*Death Watches.* (*a*, Anobium paniceum; *b*, Ptinus brunneus.)

vines; the grub which hatches from these is very slender, and when full-grown is about one-third of an inch long and not thicker than an ordinary knitting-needle. As soon as hatched, the worm commences to work upon the stem, eating the bark and perforating and hollowing out the lower portion of the stem which is in the ground, sometimes even working up above the surface. In about a month, according to Dr. Shimer, from the time the egg is laid the larvæ complete their growth; they then enter the earth and form little cells, where they enter upon the pupa state, which lasts about a fortnight before they are transformed into beetles. There are about three broods each year, the last of which passes the winter in the pupa state in the ground.

FIG. 9.—*Grape-Vine Flea Beetle.* (Haltica chalybea.) *a*, grape leaf eaten by young larvæ; *b*, larva magnified; *c*, earthen cell in which the insect transforms; *d*, beetle.

"DEATH WATCH." There are two species of beetle, insects, too, of two entirely different sub-orders, which make ticking sounds like a watch. The two illustrated in Fig. 8 infest books. See page 112.

GRAPE-VINE FLEA BEETLE. This is a well-known little, blue flea beetle, which infests the grape-vines, feeding on the buds in the earlier part of the season, and when the leaves have expanded, transferring its attacks to them. It measures a little over one-eighth of an inch in length, the width being just half the length. The thorax is but little narrower than the wing-cases, being fully three-fourths as broad as the latter; it is marked with a cross furrow. It is usually steel-blue, but the color varies considerably, the shade of blue varying from violet to deep blue and even to green; the antennæ and feet being black or blackish.

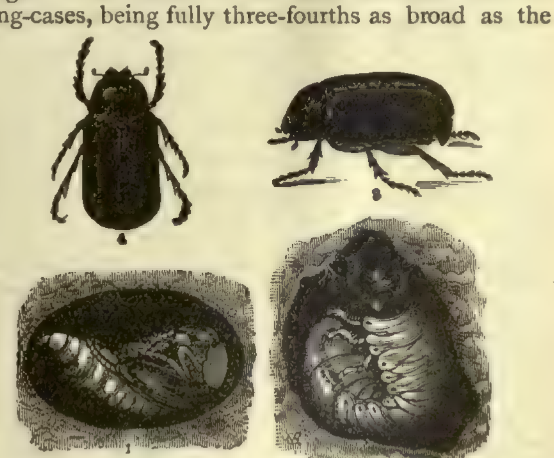


FIG. 10.—*May Beetle.* (Phyllophaga fusca.) 1, pupa in its earthen cell; 3, 4, beetle, side and back view.

They pass the winter in the beetle state wherever they can find shelter in the vineyard or in the vicinity of grape-vines. As soon as the warmth of spring arouses them to activity they commence operations on the buds, and as soon as the leaves expand they deposit their minute orange-colored eggs upon them. From these are hatched dark brown larvæ, usually in the latter part of May or early part of June. These usually feed on the upper side of the leaves, which they eat into holes, completely riddling them when numerous. When full grown they descend into the ground in order to undergo their transformations, the second brood of beetles appearing in the latter part of June or first part of July. They feed on wild and cultivated grape-vines and the alder.

Fig. 11.—*Striped Potato Beetle.* (Epicauta vittata.)

Lady Bug, *or Lady Bird.* Not injurious. See further on, under head of Insects, Friendly.

May Bug. The insects of this family have the attennæ short, with a distinct club at the end composed of three plates or leaves, opening like the leaves of a book; the tip of the abdomen is always exposed, the extremity of the wing-cases not curving down behind to cover it. As a general rule the species are oblong, more or less cylindrical in form and fleshy, so that they fly heavily, the abdomen hanging down. They are generally of a uniform chestnut brown color. The claws of their feet are notched or split at the tip like the point of a pen. In the perfect or beetle state they feed upon the leaves of fruit and other trees, often doing serious damage, their split claws admirably adapting them to this mode of life. As evening and night is their usual time of flying and feeding, the cause of the injury they do is often overlooked by those unacquainted with their habits. The larvæ or worms from which they are produced are thick, fleshy, white grubs, with dark or brown heads; they are generally enlarged more or less toward the posterior end, the last segment being the largest, and marked with an indentation across the tip; they have the usual six thoracic legs; the usual position is on the side and coiled into a semi-circle; the back is transversely wrinkled. These have generally received the name "white grubs." Some of the species remain in this state for three years, feeding upon the roots of grasses and other plants, such as strawberries, corn, vegetables and even nursery stock.

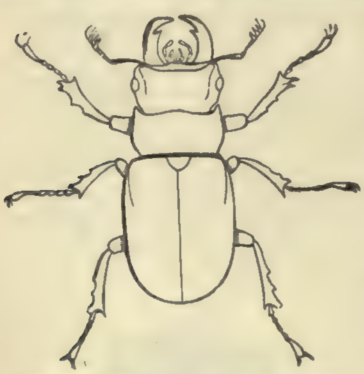


Fig. 12.—*Stag-Beetle.* (Lucanus dama.)

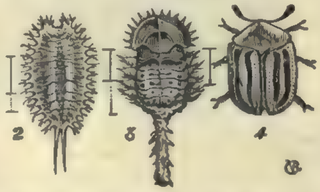


Fig. 13.—*Two-Striped Tortoise Beetle.* (Cassida bivittata.) 2, larva; 3, pupa; 4, beetle.

May Beetle. This species is of an almost chestnut-brown color, though the head and thorax are sometimes darker brown or almost black, the breast is almost covered with pale, silken hairs. The wing cases, though bearing two or three very slightly elevated flattened ridges, are not grooved. It varies in length from three-fourths inch to one inch, the width across the widest part being about one-half the length. It is not hairy above, as is the case with another very similar species which is quite common in some parts of the country. The beetles generally make their appearance in the latter part of May or June, according to the season or latitude; in the Southern and Central portions of Illinois they sometimes appear in the early part of May. In April, when the ground is being plowed or spaded, often hundreds of them are cast out already in the perfect state; but then they are of a pale, creamy color. They usually emerge from the ground about dusk in the evening, and as soon as their wings are sufficiently dried, take flight, which often continues until late in the night, and if caught at this time and examined they will be found paler than we have described them. Sometimes they move in large swarms or bodies, making a buzzing noise as they pass along just overhead. Their term of life in the perfect state is short, not extending more than two or three weeks; having paired they deposit their eggs in or near the ground and die. Yet when they appear in large numbers, as is sometimes the case, they prove quite destructive to fruit and ornamental trees by denuding them of their leaves, and as they hide during the day and feed at night, the agriculturist is often at a loss to divine the cause of the injury. The eggs of this species are globular in form; a little less than one tenth of an inch in diameter, of a clear, watery color, and according to Riley, are deposited between the roots of grass enclosed in a ball of earth; others contend that the beetle deposits them in the ground.

Fig. 14.—*Three-lined Potato Beetle.* Crioceris trilineata.

Fig. 15.—*Larva of Spring Beetle.* Elater.

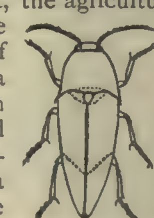


Fig. 16.—*Spring Beetle.* Elater.

It is in the grub state that they prove most injurious to vegetation, attacking the roots of various useful plants, especially grass, which is often severed beneath the surface to such an extent that the sward may be turned up like a carpet. Wheat, corn, strawberry plants, nursery stock, and even young trees also, suffer from their attacks. As a usual thing they appear in considerable numbers in a locality for a year or two, but when they arrive at the

perfect state disappear, and are not troublesome for several years. As a general rule they trouble corn,

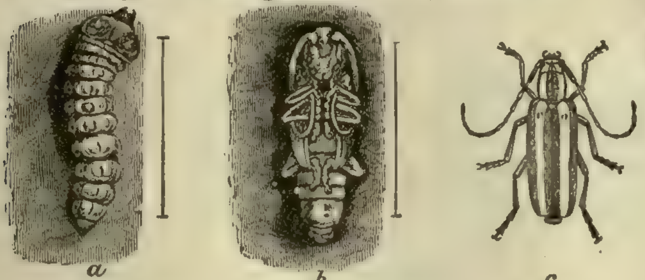


FIG. 17.—*Round-headed Apple-tree Borer.* Saperda candida. *a*, larva; b, pupa; c, beetle.

wheat and nurseries most where these are put in ground which for some time previous was in grass.

FIG. 18.—*Flat-headed Apple-tree Borer.* Chrysobothris femorata. *a*, larva; *b*, pupa; *c*, under side of head; *d*, beetle.

Neither this nor any of the allied species appear to be subject to the attacks of any true parasites; but they are eaten by certain carnivorous animals, as the skunk, raccoon, etc.; domestic fowls greedily devour them, as also do certain birds; the predacious ground-beetles also prey upon them,—each in this way aiding in keeping them in check. Prof. Riley is inclined to believe that a certain digger-wasp (Tiphia inornata) is a genuine parasite on these insects, which he thinks attaches an egg to ths grub, from which, in a short time, is developed a larva that attaches itself to the white-grub, and finally destroys it.

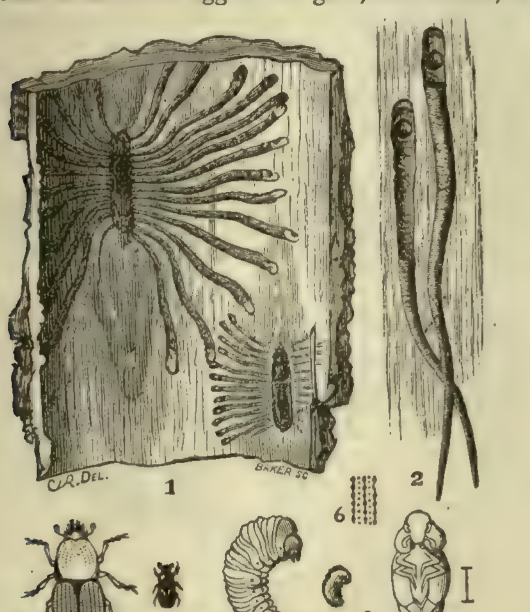


FIG. 19.—*Hickory Bark Borer.* Scolytus quadrispinosus. 1, shows the burrows of the larvæ between the bark and the wood, growing wider as they diverge from the line where the eggs are deposited; 2, another view of the same, showing the hole made by the exit of the beetle; 3, beetle, both magnified and natural size; 4, larva, the same; 5, pupa magnified.

FIG. 20.—*Imported Currant Borer.* Ægeria tipuliformis. *a*, larva; *b*, eggs.

The larva of this wasp forms a small egg-shaped cocoon, which varies in length from half to three-quarters of an inch, and is pale brownish or buff color. This wasp varies in length from a little less than half to three-fifths of an inch, and is of jet black color; the wings smoky or dusky.

FIG. 21.—*Bosteichus basillare*; *a* larva; *b* pupa; *c*, beetle.

The grubs of May beetles are also sometimes destroyed by a parasitic cryptogamic plant or fungus which grows out from one or both corners of the mouth, in the form of an elongate, narrow and somewhat flattened woody stem, which occasionally attains several inches in length. This growth sometimes greatly astonishes persons unacquainted with its history, who suppose it is a plant springing from seed taken into the body.

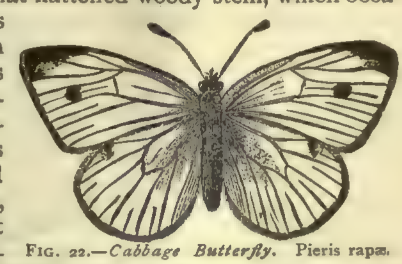


FIG. 22.—*Cabbage Butterfly.* Pieris rapæ.

To destroy the beetles, it has been recommended that they be shaken from the trees every evening into sheets, or something that will secure them. Dr. Harris says the best time for shaking the trees on which they are lodged is in the morning, as then they do not attempt to fly. But this remedy is practicable only in a few cases where but few trees are to be observed, and are of sufficient value to justify a careful

watch and its thorough use. In order to destroy or drive away the grubs from meadows and field crops, applications of salt have been recommended, and in some cases have been at least apparently beneficial. Alkalies are very obnoxious to the grubs, and speedily destroy them when applied directly to them; but they reside so deeply in the soil that it is impossible to reach them with any reasonable surface application. If repeatedly made, and to the utmost extent, the vegetation will bear until the roots and surrounding soil is perceptibly impregnated; it is possible that it may be rendered so obnoxious to them as to cause them to leave. It is

FIG. 23.—*Canker Worm.*

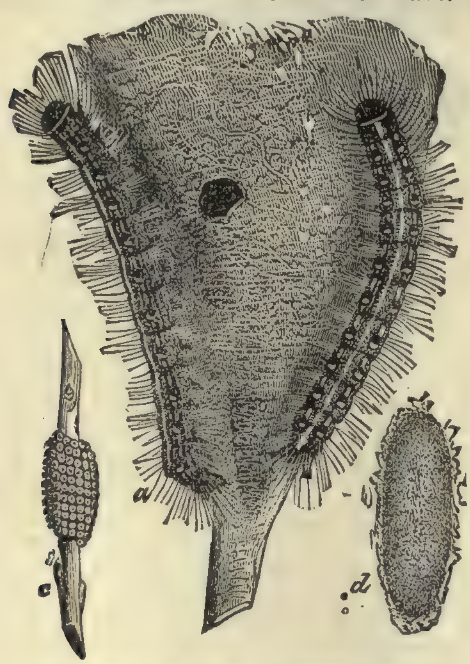


FIG. 24.—*Tent Caterpillar.* (Clisiocampa Americana.)
a, Caterpillars and their "tent." *d*, Cocoon. *c*, Eggs in a mass and protected by a natural varnish deposited by the female.

more than probable that in the majority of cases reported where such applications are supposed to have been beneficial, they have been made the season

FIG. 25.—*Pear-Tree Slug.* Selandria cerasi.

in which the larvæ completed their growth, and that this was the real reason for their ceasing operations, and not the application. Such applications, to be beneficial, should be made annually early in the spring. Hogs and domestic fowls are fond of the grubs, and as far as we will give them an opportunity will assist in destroying them, and in corn fields which

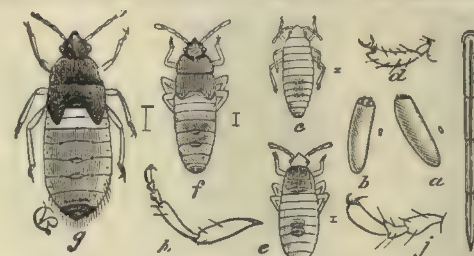


FIG. 26.—*Chinch Bug.* Blissus leucopterus.
a and *b*, eggs; *c*, young larva; *d*, tarsus; *e*, larva after first moult; *f*, larva after second moult; *g*, pupa; *h*, leg; *i*, the beak, or tubular mouth.

are infested it is well to turn in the former as soon as the corn is gathered. Late fall plowing has been recommended, and is doubtless beneficial to a certain extent; but to reach them it must be deep, as they retire to a considerable depth in order to pass the winter.

The best and perhaps the most effectual remedy is to starve them out. If the field is in meadow or grass, as soon as it is ascertained that they are present in destructive numbers, plow it up thoroughly and give it repeated stirrings, and leave it fallow or sow it in buckwheat; plow late and as often as possible, and in the following spring plant it in some crop not allied to the grass; that is, not wheat, corn or oats. After this it may be put in grass, or cereals may be cultivated, with a fair prospect of being free from these pests for several seasons. This method, although somewhat troublesome, is the only one that gives sure hope of success, and it possesses the advantage of being at the same time an efficient means of counteracting the wire worm and, to a certain extent, the chinch-bug and some other injurious species.

FIG. 27.—*Chinch Bug*, magnified. Natural length indicated by a line below.

This species appears to be confined more especially to certain sections, as it seems that other species take their place in the other sections of the country.

FIG. 28.—*Codling Moth.* Carpocapsa pomonella. *a*, work in apple; *b*, place of entrance; *d*, pupa; *e*, larva; *f* and *g*, imagos; *h*, head of larva; *i*, cocoon.

Potato Beetle. The annexed engraving will look familiar enough to every one. The insect comes forth as a beetle just as the potato plants begin to appear above ground. With the coming of the warm days

FIG. 29.—*Colorado Potato Beetle.* (Chrysomelis 10-lineata.)
a, eggs; *b*, young larva; *c*, pupa; *d*, beetle; *e*, wing cover, magnified; *f*, leg.

the female (*d*, Fig. 29) lays her cluster of orange eggs (*a*), sometimes to the number of a thousand. These soon hatch and the young larvæ are as voracious as any insect in the world. For remedies, see article Potato.

The beetle of Fig. 14 is about a quarter of an inch in length and half as wide across the wing cases; the sides are parallel; the thorax, which is of a shining orange-yellow color, is narrower than the elytra; the antennæ are slightly enlarged toward the extremity, dull black; the wing cases are lemon-yellow, with a broad, shining black stripe on each near the outer margin; the inner margins black, so that when closed they form a central black stripe, thus showing three black stripes, from which the species derives its name *trilineata*, or three-lined. There are other beetles which, at a hasty glance, may readily be taken for this species, but a careful comparison with the full specific characters given below will enable any one to distinguish it. The larva may be distinguished from all other insects that feed upon the potato by its habit of covering itself with its own excrement, which, remaining attached to the prolongations of the last segment in a mass, is thrown forward over the back. They are short, thick, slug-like worms, enlarged and arched in the middle, the thickest portion being behind the middle. When young they are of a dull yellow color, growing brighter as they increase in age; a faint stripe is visible along the sides, low down, and a dark line along the back; head and legs black. They are usually more or less moistened with a viscid fluid secreted from the skin.

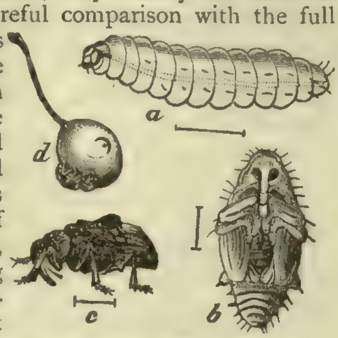


FIG. 30.—*Plum Curculio.* (Conotrachelus nenuphar.)
a, larva; *b*, pupa; *c*, beetle; *d*, crescent-shaped wound on the fruit made by the beetle.

The eggs are of a golden-yellow color, oval in form and about 4–100ths of an inch long, placed in clusters of from half a dozen to a dozen, usually on the under side of the leaf, though occasionally they are placed on the upper side. The eggs hatch in about two weeks after being deposited, and the larvæ complete their growth in about two weeks more. Having completed their growth they descend into the ground, where they form a small oval cell and remain during the pupa state, which lasts about two weeks, when they emerge as perfect beetles. The species appears to be two-brooded during the season, the first beetles appearing, as a general rule, in the latter part of May and early in June, and again in the latter part of July or first of August; but there appears to be much irregularity in this respect, as they can be found in all sizes during the season after they have appeared. They pass the winter in the perfect state, hiding beneath rubbish, leaves, bark, etc., and remaining torpid during the cold weather. They feed upon the leaves of the potato plant, both in the perfect and larval state, but they are not limited to this plant alone, as they flourish on other species of the same order. These beetles seldom occur in such numbers as to excite any great fear for the potato crop, but if they should at any time prove seriously injurious, it is probable the same remedies recommended for the Colorado potato beetle will be equally efficacious with this.

FIG. 31.—*Apple Curculio.* (Anthonomus quadrigibbus.)
a, natural size; *b* and *c*, side and back views magnified.

Spring Beetle. Figs. 15 and 16 represent the worm and beetle forms of a large family. See page 290. More abundant in low, black soils and heavy clays. This well known species, which varies in length from a half to two-thirds of an inch, is elongate and slender in form and sub-cylindrical, differing very materially in this respect from the Colorado potato beetle. The thorax is narrower than the wing cases or abdomen; it tapers forward so that it is distinctly narrower in front than the head; it is rather longer than wide. The elytra are about twice as wide at the shoulders as the thorax—round at the tips. Length of the insect about three times its greatest width. It is of a dull orange or reddish yellow color above, with two black spots on the head, two black stripes on the thorax and two black stripes on each wing case. The

outer stripe on the wing cases is broader than the inner one, extends further back and is frequently divided into two strips by a narrow yellow or orange line. The antennæ, legs and under side of the body are black, but more or less covered with grayish down.

Fig. 32.—*Oak Tree Curculio.* (Magdalis olyra.) *a*, larva; *b*, pupa.

Stag Beetle. Imagine Fig. 12 a coal-black, and you have a perfect idea of this common beetle. It is a slow-moving creature, generally found in old wood. The larvæ live in the trunks and roots of various kinds of trees, particularly those of old apple trees, and in willows and oaks.

Striped Cucumber Beetle: see Fig. 1, page 313.

Striped Flea Beetle (Haltica striolata). This insect is of a shining black color, with two waving lines of buff along the back and one on each side. It is less than one-tenth of an inch in length, but is very active and quick to get away. Sometimes they fairly swarm on young plants, as cabbages, radishes, turnips, etc., doing considerable damage.

Tortoise Beetle, Two-Striped. This insect is nearly round, yellowish, and has two black stripes on each wing case: outer stripes longer and wavy. Larva dull yellowish white, one-fifth of an inch in length. All species of this sub-family feed upon sweet-potato vines and the morning-glory. They continue in the larval state about three weeks, and when fully grown attach themselves by the posterior end of the body to the under side of a leaf, change to the pupa state, and in about a week come forth in the beetle state.

True beetles, by other names, appear further on.

Borers. The *round-headed apple-tree* borer, Fig. 17, and the *flat-headed apple-tree* borer, Fig. 18, are great pests,—especially the latter. See page 26.

Twig-Borer. The larvæ of this little beetle bore into the twigs of fruit trees, especially the apple and the pear. The "twig pruner" has a similar habit, causing the twigs of all such trees to wither and die. Their color is a dark-brown. The borers enter the twig just above a bud and work down through the pith for two inches, making a tunnel about the size of a large knitting needle. The only remedy consists in destroying the infested twigs.

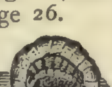



Fig. 33.—*Cut-Worm.*

Peach-Borer. Two or three species of these are common. They are the larves of beautiful, active moths, and they may be prevented from climbing the tree by mounding the base,—that is, piling up earth about the base of the trees during the summer, which collects them; and in the fall these can be pulled down, the larves discovered and destroyed. Or, one can readily find them by the gum oozing out where they work, and with a sharp-pointed instrument kill them, as he would the flat-headed apple-tree borer.

The Imported Currant Borer, Fig. 20, on a previous page. The moth, or winged state of this insect, is a little less than one-half an inch long and expands three-fourths of an inch. The color is deep blue and with three yellow bands across the abdomen, a yellow collar and yellow mixed with blue marking the legs. The body, therefore, has somewhat the appearance of a wasp. The moths appear in June and July. The eggs are deposited near a bud, and as soon as hatched the tiny caterpillars bore to the center of the stem. They attack the red currant more generally, but sometimes also the black currant and the gooseberry. For remedies, see page 316.

Hickory-Bark Borer. Length one-fifth of an inch, or little less. Color entirely black, or black with brown wing-cases. The female beetle, selecting the trunk or larger limb of a hickory tree, bores through the bark and forms a vertical chamber next to the wood from half an inch to an inch in length, on each side of which she deposits her eggs, from the number of 20 to 50. The larvæ, when hatched, feed on the inner bark, each one forming a track of its own, thus forming the radiating burrows so common on the under side of bark of hickory trees. The larva is a soft, yellowish, footless grub, much like the larva of some of the curculios, and from which it cannot easily be distinguished, except by its habits; it is very small, not exceeding the fifth of an inch in length when fully grown. The eggs are deposited during the months of August and September, and the beetle issues about the latter part of June or first of July. It attacks the bitter-nut, shell-bark and pig-nut hickories, and probably the pecan. No practical remedy is known, nor is there much probability of any extensive experiments being made until forest timber becomes more valuable than it is now.


Fig. 34.—*Hessian Fly.* Cecidomyia destructor.

Bosteichus (or Sinoxylon) basillare, Fig. 21, bores into the heart of grape stems, the trunk of shag-bark hickory and in the trunk and limbs of apple and peach trees. No remedy, except to burn the infested wood. The body of the beetle is black, feelers red and the wing-cases are marked with large, dense punctures, which are more dilated toward the tip, where there are three spines; and there is a red spot at the base of the wing-cases. The insect is about one-fifth of an inch in length. The larvæ are smooth, yellowish, and arched and wrinkled transversely.

Cabbage Butterfly: see page 166.

Cabbage-leaf Roller. This is a small, green "worm," which produces a gray moth, having a white stripe along the back. This insect is not common.

CANKER-WORM: see page 27.

CATERPILLAR. Fig. 24 represents the tent caterpillar, which is the most common kind throughout the country, being particularly conspicuous upon fruit trees and wild cherry trees. After pairing in the spring, the female moths lay their eggs in a compact cluster about the small twigs, covering them with a glistening glue, so that they are impervious to water. These eggs, 300 or 400 in number, hatch just as the leaves of the apple and cherry are putting forth, on both of which trees they are wont to engage in their ruinous work, seeming rather to prefer the wild cherry. They immediately weave their tents, and become conspicuous objects in the orchard. They remain huddled in these tents except when going forth to feed. They are quite regular in taking their meals, and usually all go forth at once. These larvæ or caterpillars, variously striped with white, yellow, black, and blue, are very handsome, feed voraciously, so that by the middle of June they are not only matured in size,—being now two inches in length,—but have managed to strip the trees pretty thoroughly of their leaves. They then disperse, seeking in all directions for some crevice in which they may form their closely woven cocoons undisturbed and unseen. They separate almost immediately. In about two weeks they come forth beautiful brown moths, the female a little lighter in color than the male. Two light bands run obliquely across the fore wings. For remedies, see page 195.

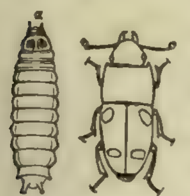


FIG. 35. *Ips faciatus.* *a*, larva; *b*, beetle.

CHERRY and PEAR SLUGS. A shining black fly, less than one-fourth of an inch long, appears in early and late summer, deposits its eggs on the under side of the leaves, which produce the slimy slugs so injurious to cherry and pear trees. These are brown, have 20 feet, and are covered with a viscid, olive-colored slime. They eat only the cuticle of the leaf, thus causing it to turn brown and sere. They mature in three or four weeks, pass down the tree and enter the earth, where they pupate, the flies of the first brood appearing late in August, those of the second, late in May or early in June. These insects are true saw-flies. As the slugs are slimy, it is easy to "doctor" them, to death, with road dust or lime.

FIG. 36. *June Bug.* (Gymnetis nitida.)
a, larva; *b*, pupu; *c*, male beetle; *d*, mandible; *e*, antenna; *f*, leg; *g*, maxillary palpus; all the latter belong to the larva.

CHINCH-BUG: see article Wheat.

CODLING MOTH: see page 26.

CURCULIO. For the *plum curculio*, Fig. 30, see Plum. This insect also attacks cherries and peaches.

Apple Curculio: see page 28.

Oak Tree Curculio. This species, which is of a reddish or rusty color, is about one-fifth of an inch long, and is distinguished chiefly by having small spines at the front angles of the thorax. The larvæ inhabit the oak, burrowing beneath the bark. Another species inhabits the elm. In May, one can find these insects in all their stages.

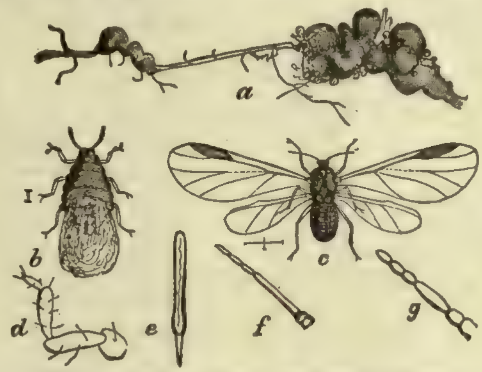


FIG. 37. *Apple-Root Louse.* (Schizoneura lanigera.)
a, the infested rootlet; *b*, a woolly larva; *c*, the winged insect, with the woolly matter all removed; *d*, leg of the perfect insect; *e*, the beak; *f*, antenna of the winged insect; *g*, antenna of the larva.

CURRANT WORM: see article Currant, page 316, and Gooseberry Saw-fly, below.

CUT-WORMS. Fig. 35 illustrates the larve and moth which infest beans, referred to more at length on page 72. There are several other species, of different genera and families, that also are cut-worms, injuring cabbage, corn, tomatoes, and even fruit trees and grape-vines. The latter kind climb the trees during the night, and eat out the tender buds. These can be caught in the evening with a mallet and sheet, as in catching the plum curculio; and they can even be prevented from gaining access to the tree or vines at all, by winding around the trunk or stem stiff, smooth paper about four inches wide, gathering it in tightly at the top with a cord and allowing the lower portion to stand out a little from the tree in the form of an inverted funnel. For larger trees tin boards may be better.

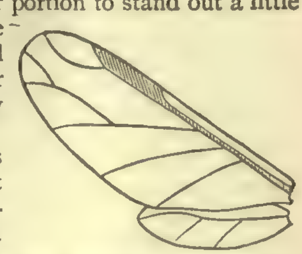


FIG. 38. *Apple-tree Aphis.* (Aphis mali.)
Wing magnified.

FALL WEB-WORM. This is someting like the tent caterpillar, differing mainly from it, in its general appearance, in being shorter and more hairy. It is not so destructive, and the ravages they do commit are too late in the season to be very serious in its results. They work upon all sorts of trees.

GOOSEBERRY SAW-FLY. This is a destructive insect, imported from the Old World, the larve of which

is a slug, eating off the leaves of gooseberry and currant bushes in May and June. The larvæ either go into the earth, in July, or become attached to the bushes and spin a cocoon of brownish silk. They remain as pupæ until the following spring. In procuring plants for setting out, examine the roots carefully or wash them thoroughly, so that no cocoons of this insect be imported to your plantation. During the first part of their breeding season, first of May, their eggs can be gathered, with the few leaves that receive them, and destroyed; but later in the season, when the "worms" become numerous, white hellebore or Paris green, as elsewhere recommended, can be used with good effect.

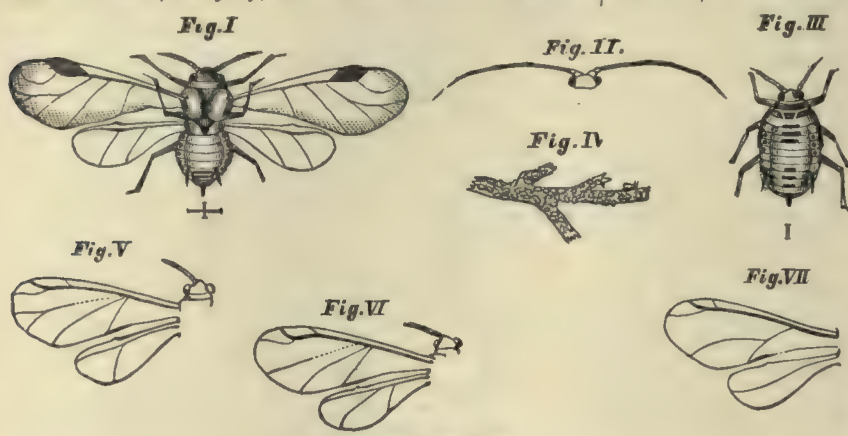


FIG. 39. *Plant Lice.*
I, corn aphis; II, head and antennæ of apple-tree aphis; III, wingless female of corn aphis; IV, portion of a corn root infected by the aphis; V, elm tree gall louse; VI, poplar gall louse; VII, wings of phylloxera.

GRAPE-VINE LEAF-HOPPER. This sprightly little insect is common some seasons. It is gaily robed in yellow, black and scarlet, hybernates in the mature state, and may be found in fall and winter just under the vines. The young look just like the parents, except in size and absence of wings. Remedy: As soon as they have become dormant in winter, rake over the leaves, and thus expose them to damp weather. The best time would probably be at the conclusion of a rainy spell in November, just as it begins to freeze up.

JUNE BUG. This is a true beetle, of a beautiful, velvety green color, with a broad margin of orange yellow around the wing-cases. The damage done by this "bug" is comparatively unimportant.

LADY-BIRDS. These are all "friendly" insects. See under the next general head.

LICE on Plants; PLANT LICE.

Apple-tree Bark Louse. This old enemy is not so destructive as formerly, owing probably to parasites or predatory mites; yet we must fight it some. It is sometimes called the scale louse, on account of the resemblance of its egg covers to scales, which are of the color of the bark, and are thus protected from birds. From August to May these innocent-looking scales cover 60 to 70 small eggs each, and in June the young lice appear, yellow in color, and so small they are scarcely visible. Remedy: Soft soap or strong soapsuds the last of May and first of June.

Corn Aphis. This species works not only upon corn, but also upon the apple-tree and other plants (Figs. I, III and IV in Fig. 39).

Elm Tree Gall Louse. This is the insect that causes most of the galls on elm leaves, which are of the form of a cock's comb, and hence the insect is also called "cock's comb gall louse." Fig. 41 shows the habits of a very different gall fly which works upon the elm. The seven generations of this peculiar insect constitute an interesting study. Fig. 43 is the wing of still another parasite of the elm tree whose larval home is a gall.

Larch Louse. This insect, which has no English name, works only on the cone-bearing trees, as larch, pine, juniper, etc. Fig. 44 gives a magnified view of the wing.

Maple Aphis. Fig. 42 is a magnified view of an aphis or louse which works upon the leaves of soft maple. The general color is light gray, varied white and ash brown; the insect is very active in its motions, often taking quite distinct leaps; slightly above

FIG. 40. *Elm-Tree Gall Louse.* (Glyphina ulmicola.)
a, leaf showing galls from above and beneath, natural size; *b*, impregnated egg, surrounded by skin of true female; *c*, newly born young of second generation, ventral view; *h*, its antenna; *d*, pupa of same, dorsal view; *e*, winged female; *f*, her antenna; *g*, antenna of stem-mother—all enlarged.

medium size. Although these insects are not numerous on any one leaf—the young sometimes forming small colonies, but adults always scattered—yet the

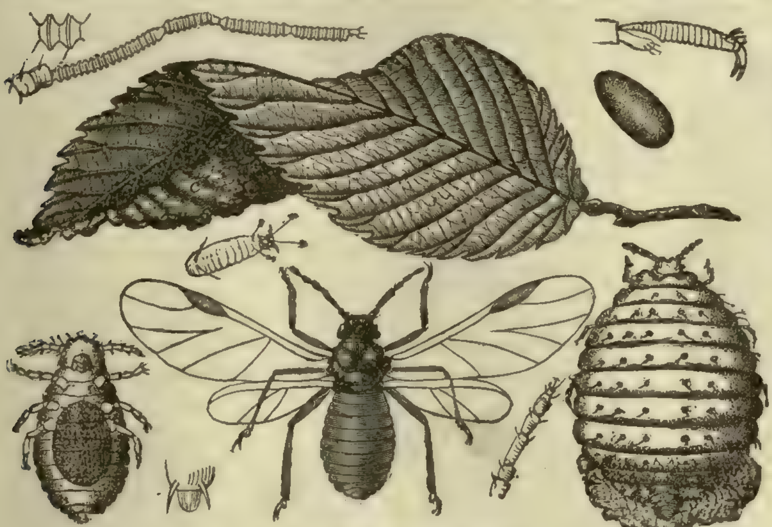


FIG. 41. *Schizoneura Americana.*

effect of their operations is often very apparent, giving the leaves a shriveled or sickly appearance. It is possible, therefore, that this species may, under favorable circumstances, develop to such an extent as to seriously injure the soft maples.

Maple-Tree Bark Louse. Early in May the sidewalks of a village or the ground underneath soft maples will be found covered with spots similar to honeydew, the lower limbs and opening leaves presenting a sticky sensation to the touch, which continues to be noticeable more than a week before the deposit of eggs commences. This is caused either by the many punc-

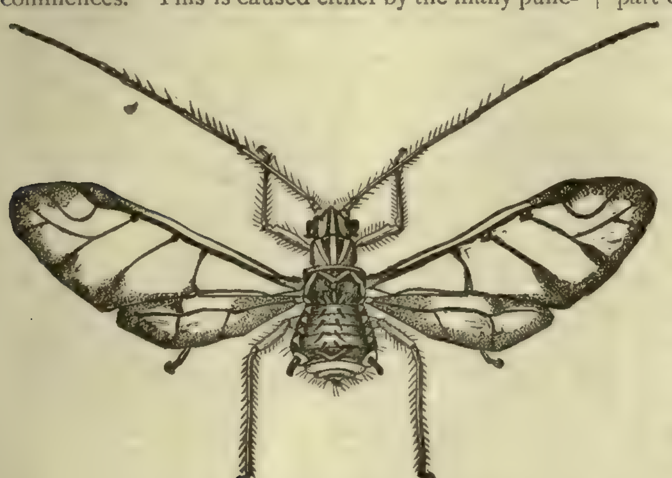


FIG. 42. *Maple Aphis.* (Siphonophora acerifoliæ.)

tures made in the bark of the tree, the sap coming out at these points, or, as is more natural, issuing from the insects themselves. The best way to kill these insects is to apply either soap and water, or a solution of tobacco, or white hellebore, 1 pound to 20 gallons of water. Their natural enemy is the Chalcis parasite, described a few pages further on.

Pear-Tree Louse, Jumping. This infests pear trees from May to October in the Northern States, and from April to November in the Southern. After pairing in early spring, the female lays her eggs in great numbers, near each other, on young leaves and blossoms, or on the newly formed shoots. They are oblong, yellowish, and look somewhat like grains of pollen. The young insects are dark yellow, change their skins and color repeatedly, acquire wing scales or rudimentary wings, fix themselves to the bark in rows, suck the juice until they are full grown, then disappear among the leaves until they appear in the winged form. They do not belong to the numerous aphis family, but have the appearance of true aphides.

Poplar Leaf Gall Lice. We give cuts of four species of these. Fig. 48 represents a kind that forms swellings or galls about the size of a bullet, so often seen on the leaves of the cottonwood at the point where the blade joins its stem. The wing venation is shown by Fig. VI, in Fig. 39, page 856.

Fig. 49 represents a species which works upon cottonwood and balm-of-Gilead throughout the West and Southwest. While the gall normally occurs in the position and of the form here represented, it may occur on any part of the leaf-stem, and the opening may be more or less oblique, or be a mere circular hole. Sometimes two and even three coalesce; but the lip-like bulging is constant. The species represented by Fig. 50 prevails throughout Colorado and Southern Kansas. The interesting gall which it forms might be called "bead-like cottonwood gall." The particular kind of cottonwood it is partial to is the narrow-leaved variety of Populus balsamifera. The galls constitute a series of pale yellow oval swellings each side of the mid-rib, in the distance appearing like unripe cherries. They are sometimes tinted with red, and sometimes there are three rows of them. They are formed by the folding under of the sides of the leaf, and the bulging of the same around the insect, which is always

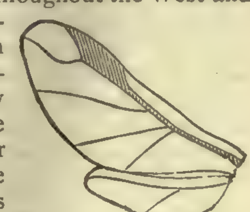


FIG. 43. *Wing of Tetraneura ulmi.*

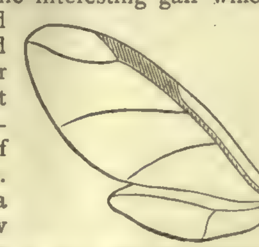


FIG. 44. *Wing of Chermes laricis.*

found solitary. The Pemphigus of Fig. 51 produces the gall of Fig. 52, on the tips of the twigs of certain cottonwoods, and occasionally on balsam poplars, which somewhat resembles the flower of the double

FIG. 45. *Maple-Tree Bark Louse.* (Lecanium acericola.)
a, appearance of their work; *b*, back view of female; *c*, ventral view; *d*, beak.

cock's-comb of our gardens. It turns black in winter, giving the tree a singular and rather unsightly appearance after the leaves have fallen off. The winged insect generally makes its appearance in September; the body is black, and about one-tenth of an inch long; the expanded wings measure rather more than one-third of an inch from tip to tip.

Figs. 53, 54 and 55 are illustrations of an "aphis," which as yet has been found only on the Spanish needle, and as such cannot be strictly classed among

FIG. 46. *Maple-Tree Bark Louse.* Male.

injurious insects; but it belongs to a family which is noted for its sap-sucking abilities. The figures here given will aid the beginner in the study of this class of insects. Species of Siphonophora are found on almost all classes of plants.

Sumac Gall Plant Louse. This species of Pemphigus forms tomato-shaped galls on the leaves of different kinds of sumac, which usually arise from the mid-vein at or near the base. The shell of these galls is very thin, and the winged lice are found inside, in September, in large numbers.

Willow Aphis, Spotted. This insect is found in October and November, in colonies, on the under side of the branches of the gray willow; and occasionally, but apparently by accident, on the trunks of small nursery apple-trees. The winged individuals measure about one-sixth of an inch to the tip of the abdomen, the wings expanding about half an inch. The insect is black. The curved line to the right in the cut is a crude rep-

FIG. 47. *Jumping Plant Louse of the Pear Tree.* (Psylla piri.)

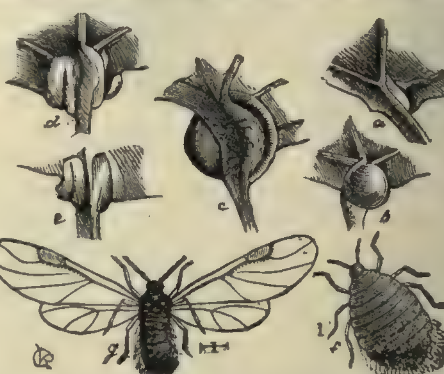


FIG. 48. *Poplar-Leaf Gall Louse.* (Pemphigus populi-caulis.)
a, the incipient gall on the under side of the leaf; *b*, the corresponding bulge on the upper side; *c*, the fully formed gall, showing the lips slightly separated, so as to permit the escape of the mature insects; *d* and *e*, incipient double galls, one being located on each side of the mid-rib; *f*, tne wingless female, with the cottony secretion attached; *g*, the winged insect. The marks at the sides of *g* and *f* indicate the natural size.

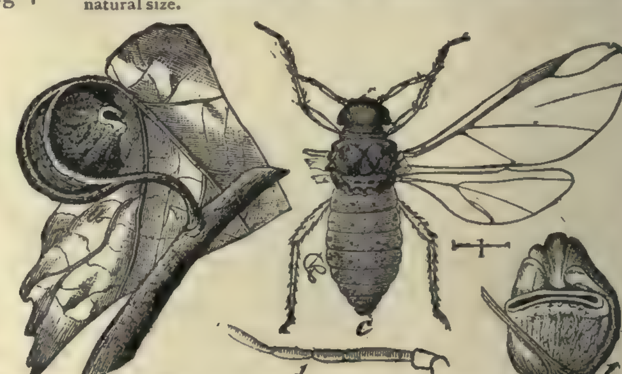


FIG. 49. *A Poplar Gall Louse.* (Pemphigus populi-transversus.)
a, gall; *b*, under side of same; *c*, winged female; *d*, antenna.

resentation of an enlarged antenna; the hair lines above indicate the exact dimensions of the insect.

Fig. 59 well outlines the veins of the wing of a plant louse of the genus Schizoneura. These wing markings are the most obvious points of distinction between the numerous genera and species of plant

lice. Owing to the many enemies which plant-lice have, they rarely do great damage. Sometimes they

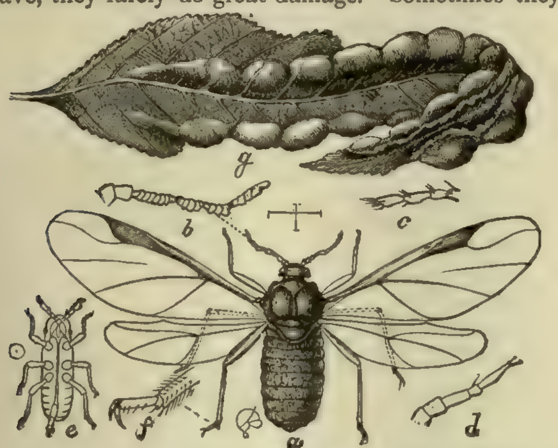


FIG. 50.—*A Poplar Gall Louse.* Pemphigus populi-monilis. *a*, winged female; *b*, antenna; *c*, antenna of the young louse; *d*, antenna of young after the first moult; *e*, young from winged female; *f*, leg of winged female; *g*, galls.

come out in great number upon a few plants or a tree or two one season, and the next season not one can be found in that locality.

Whale-oil soap, soft soap, strong soap-suds or other alkaline washes constitute the universal remedies for plant lice.

FIG. 51.—*A Poplar Gall Louse, winged female.* Pemphigus vagabundus.

The *Hormaphis spinosus* forms a gall on the stems of the witch-hazel, which gall is a deformation of the flower-bud, the puncture of the architect causing premature development, by which the calyx, bractlets and petals are all changed into elongate bracts, more or less pointed terminally, and more or less completely soldered together at bases, so as to form a thin wall. In August the gall

FIG. 52.—*Gall of Preceding.*

is green and crowded inside with lice in all stages of growth, from the newly-born to the pupa and winged female, intermixed with flocculent matter and watery globules, the insects themselves being rather evenly covered with a fine white powder. Later in the season, the tips of the bracts become blunter, and the

FIG. 53.—*Spanish Needle Louse.* Siphonophora coreopsidis.

gall becomes browner, and recalls externally the fruit-pod which would have developed the ensuing year. It is now perforated at some point, generally near either the top or base, and through the aperture the insect makes its exit or may be noticed doing so. The young from the winged female are quite characteristic, being strongly granulated, and, as they are found as late as the end of October, they probably hibernate on the permanent parts of the tree. The sexed individuals and the stem-mother are yet unknown.

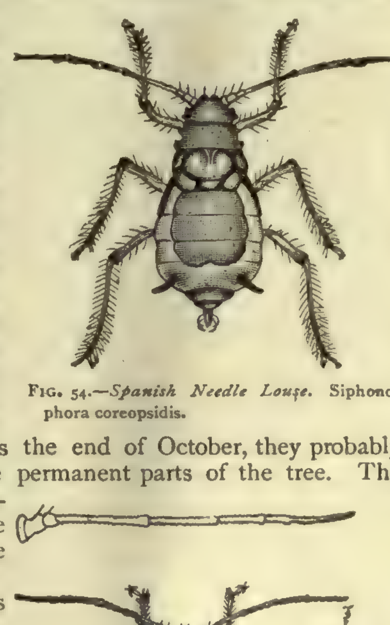


FIG. 54.—*Spanish Needle Louse.* Siphonophora coreopsidis.

The species was first described in 1867 by Dr. H. Shiner, of Mt. Carrol, Ill., who erected a new genus for it and another well-known species on the same plant, not aware that the genus had been previously characterized by Baron Osten Saken, in in 1861.

FIG. 55.—*Spanish Needle Louse.* Siphonophora coreopsidis.

LOCUSTS, or GRASSHOPPERS. What have generally been hitherto called "grasshoppers," scientists insist shall be called "locusts;" and the most famous of these is the Rocky Mountain (Fig. 60), which does so much damage west of the Missouri river, sometimes darkening the air with their great numbers and destroying vast areas of herbage. They eat everything green, from the leaves of the trees down to the smallest spear of grass.

The red-legged locust (Fig. 62) is next in abundance. By closely comparing Figs. 61 and 63, one can notice the specific difference between the two locusts. Fig. 64 represents the largest species of locust throughout the older States, which is known not to be very numerous. Probably his large size attracts the attention of poultry and wild birds, which combine to keep that species of "grasshopper" limited in numbers.

Fig. 65 is an engraving of a large species, of a reddish brown color, with a slight vermilion tint, and sundry stripes.

Fig. 66 represents a common species throughout the country, although never appearing in such numbers as some species of Caloptenus. The larvæ and pupæ, and even the perfect insects, are occasionally observed during warm days in winter. This species appears early in spring and continues throughout the summer. There are three varieties.

Remedial Agencies. Fortunately, there are several natural agencies which have a tendency to prevent their increase. Dampness is undoubtedly the most potent natural agent in keeping them in check. Although they may have hatched out in excessive numbers, yet if a rainy season follows soon afterward, they will to a very large extent be destroyed, and the invigorated vegetation will bid defiance to the feeble attacks of those that remain alive. Like other insects, their breathing apparatus consists of a series of tubes that permeate the body, connecting with opening or breathing pores along the sides of the body one on each side of a segment; the moisture taken in by inspiration produces disease, or at least in some way prevents the free passage of the air and thus lessens the vitality.

The locust mite (page 866), the blister beetle (page 848) and some other insects pray upon locusts.

MOTH, or CLOTHES MOTH. This little moth expands (from tip to tip of wing) about half an inch, but in length of head and body is less than one-fourth of an inch. Its color is a light buff, with a satin-like luster. The wings are long, narrow, pointed and beautifully fringed. The larva ("worm") is white, with a yellow head, has, like nearly all caterpillars, sixteen legs, and is always surrounded by a flattened, cylindrical case, usually gray or whitish in color; though this depends on their food. The ends are open, that the larvæ may reach forth to feed, or peer forth, which they are free to do when disturbed. The pupa, or chrysalis, is somewhat curved, and has a rounded head. The antennæ, wings and legs are folded beneath the body, and reach nearly to the end of the body. The pupa case or cocoon is similar to the larva case. The moth comes forth as early as the last of May, and may be seen from that time till the close of summer. The tiny, lustrous, buff-colored bodies are easily detected, as they rest with wings folded close about their bodies in the deep crevices of our parlor furniture, or among the folds of our garments, or even more plainly as they flit across our rooms. These moths pair, after which the female seeks out our furs and woolen or silk apparel, her minute size enabling her to enter drawers, closets and trunks, where she distributes her eggs with an eye to the good of her prospective young, if not to our good. The larvæ soon appear, and may be found at home the summer through, comfortably fixed up in their little tents and working their miserable mischief, all unsuspected by the unwary housewife, who learns too late of their previous presence, by discovering that her most choice possessions are totally ruined. In spring and summer the chrysalids will appear, soon to be followed by a new return of the pretty moths.

Remedies. Woolen garments and furs should be put away in trunks, with several pieces of camphor gum as large as hickory-nuts packed in with them, or they may be put into closed paper bags and pasted up so that no holes, ever so small, will remain open. Even in this case a little camphor gum will render assurance doubly sure. Infested garments or furs should be closed as nearly air-tight as possible. The vapor will kill the insects. Then prepare as given above. For furniture and carpets heavy paper, wet with carbolic acid or spirits of turpentine, will kill larvæ already at work. This should be placed under the edge of the carpet, where the mischief is generally done, and in furniture, crowded back in deep folds.

It would be well to saturate the interior of the furniture with a strong solution of carbolic acid. Our best furniture and furs have a good quantity of this substance in the undissolved state fastened inside them when made. Russian leather, cedar bark or boughs, tobacco leaves, and even red pepper are said to prevent the moths from laying eggs. It will be well, then, to place these in exposed situations. Manufacturers of carriages wash the woolen linings of their carriages with a weak solution of corrosive sublimate, which is very sure destruction to all insects. Some persons, with some success, take a wet sheet or other cloth, lay it upon the carpet, and then run a hot flat-iron over it, so as to convert the water into steam, which permeates the carpet beneath, and destroys the life of the inchoate moth. They have found this very successful, and as it can be done without taking up the carpet, and the whole surface gone over in a comparatively short time, it is regarded as one of the most efficient means of protection they have.

Every careful housekeeper will certainly examine her carpets and furniture each fall and spring, brush out all the creases, give all a good airing, and if there is any trace of these evil-doers, will practice the above remedies.

PARALLEL LONGHORN. This a species of twig-pruner, doing a little damage to apple-trees, but more

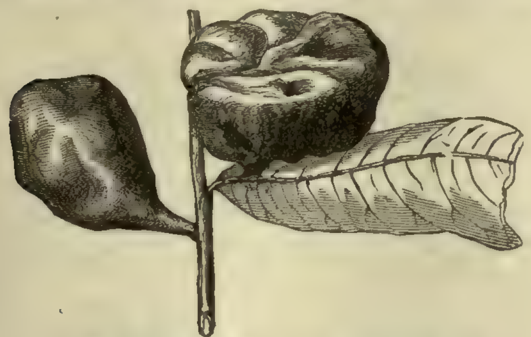


FIG. 56.—*Sumac Gall Plant Louse.* Pemphigus rhois.

to oak. It deserves no further mention, except for scientific purposes.

PEAR TREE SLUGS: see Cherry and Pear-Tree Slugs.

PEA WEEVIL. This little insect, though doing little damage to garden peas, for in green peas it is not only too small to essentially change the flavor, but even to attract the eye, but in field crops, where peas are raised to feed after they are fully matured, there is very serious injury; for this little weevil, so generally distributed, and so persistent in its yearly attacks, consumes, while yet a larva, all the nutritious material of the pea, leaving only the germ and a mere shell outside.

FIG. 57.—*Spotted Willow Aphis.* Lachnus dentatus.

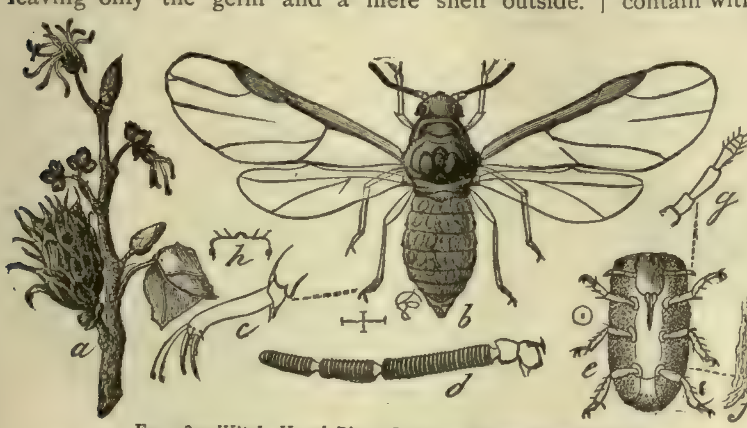


FIG. 58.—*Witch Hazel Plant Louse.* Hormaphis spinosus.
a, gall; *b*, winged female magnified; *c*, foot; *d*, antenna; *e*, young from winged female; *f*, magnified section of same; *g*, terminal joints of antenna; *h*, frontal tubercle on larva.

Hence, affected peas will grow, but, of course, with bated vigor, as the needed starch pabulum is wanting in those early days, the precarious time with all life; but to feed, they are almost entirely useless.

The little brown weevil, with the wing-covers so short that some light markings, somewhat resembling a letter T, are seen just back of them, comes through the winter in the peas, having a little opening, a door of exit, already prepared, where they not infrequently remain even to the day of sowing. They are seen thick as bees above the ground where peas are being sowed. Just as soon as the pods are formed and the seeds set within them, the weevil, big with eggs, if not with mischievous intent, pierces the pod opposite each pea, and inserts an egg within each puncture, so that every pea may

FIG. 59.—*Wing of Shizoneura vagans.*

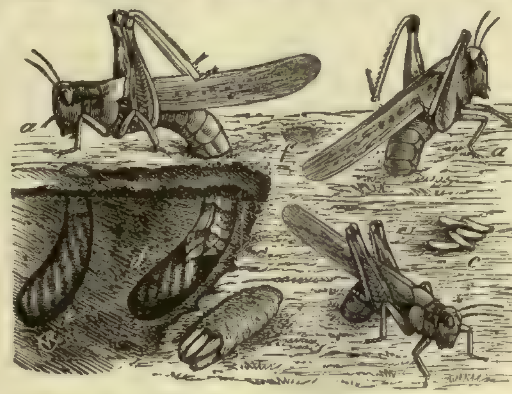


FIG. 60.—*Rocky Mountain Locust.* Caloptenus spretus.
a, *a*, *a*, females in the act of depositing their eggs; *b*, an egg pod with one end open showing the eggs; c, eggs separated from the pod; *d* and *e* show the egg-pods in their usual position in the earth; *f* shows where a pod has been deposited and the hole closed.

contain within the seed of its own destruction. The larvæ, which soon hatch from these eggs, though grubs, being the young of beetles, are legless, and hence resemble maggots,—the larvæ of two-winged flies, which name is frequently applied to them. These larvæ find the young, tender peas rich feeding, and by the time the peas are large enough for table use, are sleek and plump, and can easily be seen with the naked eye; and with a glass, their good feeding qualities are quickly discerned, as their tender skins seem ready to burst. By the time the peas are hard, having already eaten a hole through the shell, thus showing a foresight not rare among insects, they assume the pupa state, and change to imagoes before the time for sowing or planting the next spring.

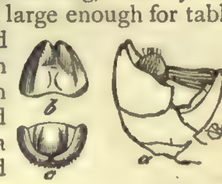


FIG. 61.—*Rocky Mountain Locust.* Tip of the male abdomen.
a, lateral view of the terminal segments; *b*, under side of terminal segment; *c*, upper side of same.

Remedies. As these pestiferous insects are in the

peas in the winter and in the spring, if the same be kept over one year, in perfectly close barrels, bags, cans, or bottles, of course the insects thus confined will all die. Hence, if these pea weevils are sufficiently annoying to cause disturbance, there can be a most effectual estoppel put upon their mischief by thus putting all our peas in close vessels, any time in the winter, and keeping them thus close for one season. If all would do this,—and we must have concerted action in this insect warfare,—we should soon be rid of this enemy. But the evil will be mitigated if we practice the above simply as individuals; for if the insects do find their way to our fields from those of our careless neighbors, they will doubtless come in far less numbers, and those that do come will very likely be too late to do damage, while we may escape entirely.

FIG. 62.—*Red-Legged Locust.* Caloptenus femur-rubrum.

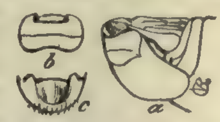


FIG. 63.—*Red-Legged Locust.* Tip of male abdomen. Letters have same reference as in Fig. 61.

FIG. 64.—*Caloptenus differentialis.*

PHYLLOXERA. This little insect, hardly large enough to attract the attention of any but the cautious observer, is a native of America, and has, within a few years entered Europe, where it does immensely more damage than in this country. The louse is of a dull orange color; it punctures the leaves on the under side, causing the surface to be covered with excrescences, or small galls (Fig. 72), which greatly deform the leaf; in these galls the eggs are laid to the number of 300 or 400, which soon hatch, and the young lice (true aphides) go merrily forth in their bright yellow garb, and repeat the work of their parents. For four or five generations the lice are wingless, and *all females!* They attack but a few varieties of the grape, especially the Clinton. As fall approaches the the galls become deserted and the young descend to the roots, where they hibernate. As these gall lice will readily take to the roots and flourish if removed to those vines where the galls are never found, it is probable that some lice pass from leaves to roots during the summer. It is the root form of this louse that does the most injury to the vine. The young of this form are not distinguishable from those of the galls, but the mature forms are covered with warts. Some of these assume a greenish cast, become larger at the head end of the body and are without wings. The others are always bright yellow, always of the oval form of the young, and finally develop stubs of wings, which grow to full size. They come forth from the earth as pupa, and then cast their skin for the last time. They are still yellow, but have lost their tubercles. The winged forms are most abundant in August and September, though they may be seen from July till October. The longer ones lay eggs from which come the true male and female: the latter lays one egg, and these all die off in the fall, so that the insects pass the winter either as eggs or as larvæ.

FIG. 65.—*Acridium Americanum.*

FIG. 66.—*Tragocephela viridifaciata.* *a*, pupa; *b*, perfect insect.

FIG. 67.—*Stenobothrus maculipennis.* *a*, perfect insect; *b*, pupa; *c*, larva.

FIG. 68.—*Hippiscus phœnicopterus.*

For prevention of the ravages of this insect, grafting susceptible varieties on such stocks as the Clinton, Concord or Israella is recommended. In procuring vines, it would be a safe precaution to dip the roots in some insecticide, as a strong solution of whale-oil soap, before setting them. It would be well, too, to mix soot in the soil, as that is obnoxious to the the lice.

FIG. 69.—*Clothes Moth.* Tinea.

The leaves affected with galls should be collected and destroyed early in the season. Submersion for 20 or 30 days has been found effectual in France in killing the root forms. Wherever this can be done it should be brought into requisition in autumn, immediately after the season's growth is complete. It is said that at this season the vines will not suffer, even if submerged for a time sufficient to destroy the lice. Carbolic acid powder and soot are highly recommended. By mixing these with the soil the lice are said to be destroyed. Bisulphite of carbon, which we use so successfully in destroying museum pests, and which recently gave so much hope in France, is now given up as too expensive, too laborious of application, and not thorough in its effects, owing, doubtless, to inability to reach the lice in making the application. Potassic sulpho-carbonate, to be had only from the chemist's laboratory, is a late-discovered remedy against Phylloxera. It is placed on the earth beneath the vines and carried to the roots by the rain.

FIG. 70.—*Parallel Longhorn.* Elaphidion. *a*, larva; *b*, twig split open, showing the enclosed pupa; *k*, the severed end of the twig; *c*, beetle; *i*, basal joints of the antennæ, showing the characteristic spines at the tip of the third and fourth joints; *j*, tip of elytron; *d*, *e*, *f*, *g*, *h*, head, maxilla, labium, mandible, and antenna of larva.

FIG. 71.—*Pea Weevil.* Bruchus pisi. *a*, bug magnified; *b*, pea infested; *c*, natural size.

PRIONUS. Fig. 73 represents one of our largest beetles, and may be readily distinguished by the following characteristics: It is of a long oval shape, varying in length from a little over one inch to nearly one inch and three fourths; the width across the wing-cases is nearly one-half the length. The body is considerably flattened, and the thorax, which is about twice as wide as it is long, has three teeth on each lateral margin, the middle tooth being the most prominent. The antennæ, which are about half as long as the body, are serrate, but these serratures are not extended into long sharp teeth, as in the other species. They are about twelve-jointed. The color is almost uniform mahogany-brown; sometimes quite black. The larva, or grub, is of a creamy white color, with a pale bluish line along the back; the first segment is large, being as long or longer than the next three combined; it decreases gradually in size from the third segment backward to the end; under side somewhat flattened; head brown; legs minute. When fully grown it is nearly three inches long, and as large as a man's thumb. Dr. Harris says they live in the roots of the Balm of Gilead, Lombardy poplar, and probably in those of other kinds of poplar also. It has been observed by various persons, boring into and hollowing out the roots of grape-vines. It also occasionally attacks the roots of apple and pear trees, either boring into or gnawing them so as to seriously injure the trees.

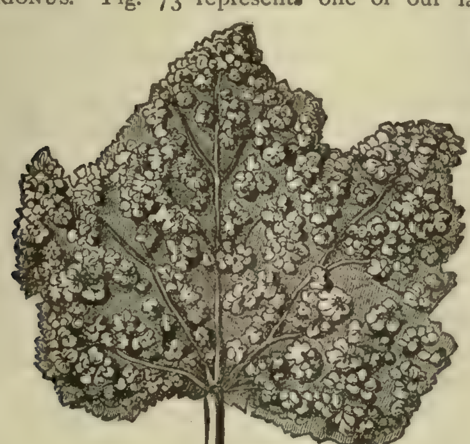


FIG. 72.—*Work of the Grape Phylloxera.* Phylloxera vastatrix.


FIG. 73.—*Prionus laticollis*, female.

FIG. 74.—*Squash Bug.* Coreus tristis.

RADISH FLY. (Anthomyia raphani). It is the maggot of this fly that early in the spring eats all varieties of greens of the mustard family. The flies look like the onion flies, are small, ash-colored, and lay their eggs on the stem close to the ground. On hatching, the young larvæ descend and feed on the roots, forming grooves all over the surface, which induce decay. In June they are grown, developed and lay eggs again. Remedies: Water of the temperature of 180°; late planting; planting on clayey soil; considerable distance between successive radish beds, etc. None of these, however, are as successful as desirable.


FIG. 75.—*Tomato Worm.* Macrosila quinque-maculata.

ROSE-CHAFER (Macrodactylis spinosa.) This pesky old beetle is injurious to the interests of man more on account of his

depredations upon the rose. Its history and habits closely resemble the May beetle, already described. The chafer appears in June and July, eats most

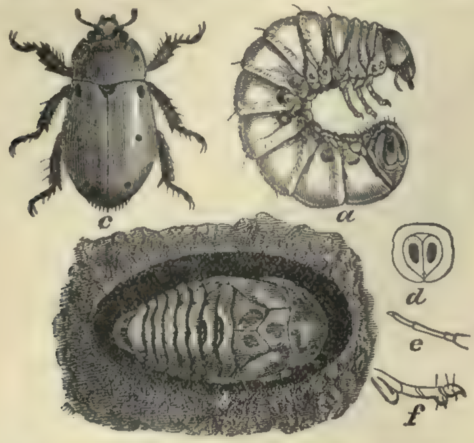


FIG. 76.—*Spotted Vine-Chafer.* Pelidnota punctata.
a, larva; *b*, pupa; *c*, beetle; *d*, tip of abdomen of larva; *e*, antenna of same; *f*, leg.

ravenously, especially of rose, grape and cherry leaves. After this wedding feast is over, the females lay their eggs in the ground. The grubs feed on the roots of the plants, but are not sufficiently destructive to attract attention. Remedies: Jarring them down as curculios, white hellebore, or Paris green.

FIG. 77.—*Nut Weevil.*

SQUASH BUG and SQUASH-VINE BORER: see article Squash.

TETTIX. This is another "grasshopper," or locust, with no common name. It is generally of small size, many being less than half an inch in length, and few, if any, exceeding an inch.

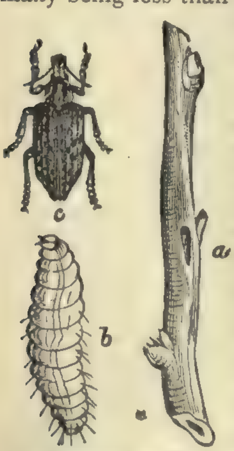


FIG. 78.—*New York Weevil.* Ithycerus Noveboracensis.
a, infested twig of apple-tree; *b*, larva; *c*, perfect insect.

TOMATO WORM: called also "tobacco worm," "five-spotted sphinx," etc. This is the largest green worm seen in the garden, and is familiar to every one. The cut (Fig. 75) represents also the pupa and the moth. The latter is often taken, at a little distance, for a humming-bird, as it sucks the sweets of flowers with its long, watch-spring-like proboscis. The only remedy for these comparatively few and innocent worms consists in crushing them to death one by one by the hand.

TWIG PRUNER: see Parallel Longhorn.

VINE-CHAFER, SPOTTED. This is a large, oval-shaped beetle, about one inch long and half an inch or a little more in width; of a shining brownish yellow or clay color above, with a small black spot on each side of the thorax. Fig. 76, at *b*, are shown the walls around the pupa, composed of wood and excrement. The larva is a large, clumsy grub, bearing a close resemblance to the common white grub of our meadows. It appears to feed chiefly on the decaying roots of different herbs and trees.

FIG. 79.—*White Pine Weevil.* Pissodes strobi.
a, larva; *b*, pupa.

WEEVILS. The weevil of Fig. 77 attacks the hazel-nut, and in its larval state is often found inside the nut. The beetle is of a dark brown color, but has a dense covering of yellow hair on the wing covers, and a sparse covering of such hair on the thorax, so that the insect has a rusty-yellow appearance.

FIG. 80.—*Calosoma calidum.*

The *New York Weevil* is injurious to the apple-tree. It should be jarred off the tree as curculios are and destroyed. The infested twigs have to be cut off and burned. See page 28.

The *White Pine Weevil* is of a rusty brown color, the thorax being darker than the wing-cases, with a minute white dot usually present on each side. It often proves very destructive to several species of pine. The eggs are deposited on the leading shoots of the pine, probably immediately underneath the outer bark. The larves hatched there bore into the wood, where they finally pupate, having taken care previously to gnaw a passage to the outer bark to allow an escape for the beetle, which emerges in early fall. The best remedy is to cut off the infested shoots in summer and burn them.

WHEAT MIDGE: see Wheat.

Insects, Friendly. These are such insects as prey mostly or exclusively upon other insects which are injurious to cultivated plants. We cannot propagate and rear them, but when we find a nest, cluster or swarm of them anywhere, we can forbear to destroy them. The beautiful beetle in Fig. 82 preys upon the canker worm, the Colorado potato beetle and the May beetle. It is about an inch long.

FIG. 81.—*White Pine Weevil.*

FIG. 82.—*Calosoma calidum.*

The CHALCIS PARASITE is a lately-discovered insect which preys upon the maple-tree bark louse. The natural size is indicated by short hair lines in the cut (Fig. 83). By the use of a little pocket lens, costing only $1, it can be readily distinguished.

Fig. 84 represents a genus of which there are several species in this country.

The HARPALUS of Fig. 85 is a very common beetle, often found under stones, logs, etc., and frequently enters the house at night when there is a light. The larves feed upon the plum curculio and other insects.

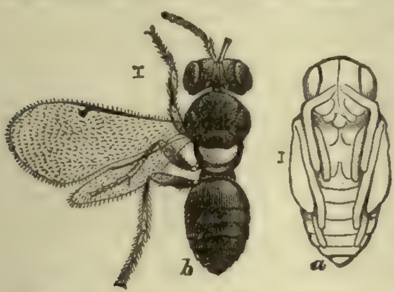


FIG. 83.—*Chalcis Parasite.* Platygaster lecanii? *a*, larva; *b*, winged insect.

LADY BIRD, or LADY BUG. The cuts below (Figs. 86 to 93) illustrate several species of the most useful insect to man. Almost every person is familiar with the little beauties. While they do no harm anywhere, they eat the eggs and young of almost all injurious insects. Fig. 87 is a larva of one species, which like some others as they develop, have rows of tubercles or spines. In growing up they


FIG. 84.—*Golden Eye.* Chrysopa. *a*, eggs; *b*, larva; *c*, cocoons; *d*, perfect insect.

gradually assume the colors indicative of their specific differences. When they have completed their growth they shorten their length, the back becomes more convex, and they fix themselves by the tail to the bark, twig, or leaf, enter the pupa, or chrysalis state, from which in a short time they emerge as fully developed lady-birds. These little bugs are very voracious in both the larval and developed form. Half a dozen of them will clean a currant or rose-bush of lice in three or four days, or less time.

LOCUST MITE. This is one of the most efficient aids in keeping the locusts in check. When first hatched it is of an orange, or pale reddish color, ovoid in form, with six comparatively long and apparently cumbersome legs; it is then very minute. When it reaches in the process of growth what may be called the full-grown larval state, it is very different in form; it is now more elongated and cylindrical, with two transverse constrictions; to use a rather ludicrous comparison, it resembles a microscopic potato. When it has reached the perfect state, it is of a deeper red, varying from orange red to scarlet. It is somewhat triangular in form with the angles rounded, being broadest in front and narrowing to the rounded posterior extremity, thickly covered with short hairs; has eight legs. The male differs from the female in being shorter, and comparatively broader in front.

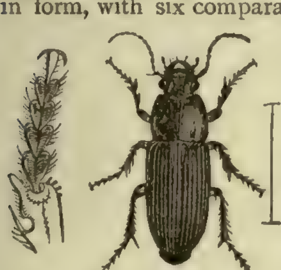


FIG. 85.—*Harpalus Pennsylvanicus.*

SYRPHUS FLIES. For the root-louse Syrphus fly of Fig. 94, see page 27. The species somewhat resembles the common house-fly in size and shape, but are much handsomer, being usually of a bright yellow color, with bands and spots of black; the abdomen is flattened, and usually marked with bands or partial bands of black. They are known in some sections as "corn flies," in others as "sweat flies," etc., as they are more numerous on hot days, and are often seen in great abundance when corn is in bloom, hovering around the stalks, poised in the air apparently motionless. They drop their eggs one in a place, upon the leaves and twigs which are infested with plant lice, led by instinct to know that these will form appropriate food for their young, although they as perfect insects feed on the sweets of flowers and other similar food. The larvæ are usually of a transparent greenish color, and sometimes more or less clouded or spotted with other colors. They have no distinct head, not even eyes, and are of a long wedge shape, blunt and broadest behind. In feeding it elongates the front part of the body, feels around until it finds an aphis, grasps it by its mouth, raises it in the air and sucks all the juice out of it.


FIG. 86.—*Spotted Lady-Bird.*


FIG. 87.—*Convergent Lady-Bird.* Larva and pupa enlarged.

Insects, Classified Remedies for. 1. Give poison with their food. 2. Kill by applying irritants or poisons to the body. 3. Kill by mechanical means. 4. Prevent the insects from reaching the food-plants. 5. Prevent egg laying. 6. Capture and destroy. 7. Vary time of planting. 8. Practice thorough culture. Let us now consider these several methods more in detail.

USE OF POISONS. It will be remembered that most of our insect pests are mandibulate; and as all such crop and eat their food, we at once see that to exterminate the pests we have only to scatter some insect poison upon the food plants. Hence all insects that eat the foliage from our trees or vines, or even eat the cuticle of the leaves as do many slugs and caterpillars, may be killed by this first method. We have only to name the best poison, and the most practicable means to make the application. Paris green takes first rank as an insecticide. From its virulency as a poison its use cannot be made universal. On vines and fruit trees, it should not be used if the tree and the shrubs are in fruit, except very early in the season. The color of Paris green, as also its insolubility, are greatly in its favor. From the first it is not liable to be mistaken for some harm-


FIG. 88.—*Spotted Lady-Bird.* Hippodamia tredecim-punctata.

less substance, and accidentally taken in medicine or used in cooking; and from the second it is powerless to poison the soil.

Another arsenical poison, arsenite of lime, received from Hemingway & Co., London, and called by them London Purple, has been tried with good results. This substance is much cheaper than Paris green, has a somewhat less favorable color, as it would be easily mistaken for some of the spices; but as it is readily soluble in cold water, its use cannot be recommended in the place of the very insoluble Paris green, except, perhaps, in some very rare instances. Paris green is specially desirable in ridding our shade trees and shrubbery of caterpillars and slugs which may threaten their destruction, in exterminating insects like the potato beetle, which feed upon such parts of the plants as are not used for food, in fighting canker worms and other similar insects which attack our orchards before the fruit is much grown, and always in preserving trees and vines not in bearing.

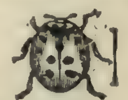


FIG. 89.—9-*Spotted Lady-Bird.* Coccinella 9-notata.

These substances may be applied in the dry form, or mixed with water. In the dry form they may be mixed with flour in the ratio of 1 to 8, or with plaster in the ratio of 1 to 50. If the first mixture is used, it should be applied when the vines are dry, and the least possible amount used. The second may be best used when the dew is on, and a good quantity will not injure the plants. The first mixture is less apt to be washed off by heavy rains; the second is safer in careless hands. The application is best made when there is little or no wind.

FIG. 90.—*Trim Lady-Bird.* Coccinella munda.

In water about a tablespoonful of the poison may be used to two gallons of the liquid. As this is only a a mixture, and not a solution, care is requisite that this poison may not all settle to the bottom of the vessel. Frequent stirring will prevent this. We would advise the use of the above to extirpate the potato beetle, the cucumber beetle,—where it must be used with the greatest care so as not to injure the vine,—the canker worm, leaf rollers and the slugs and caterpillars that defoliate our evergreens, shade trees and shrubbery. On the border of a threatened oat field it might bring death to the army worm and relief to the crop.

FIG. 91.—*Twice-stabbed Lady-Bird.* Chicolorus bivulnerus. Larva and Beetle.

White hellebore is a less dangerous poison and in many cases as efficient as Paris green. This is a vegetable poison and is made from the root of the *Veratrum album*, a plant which grows abundantly along the slopes of the Alps. The powder is cheap, costing only 40 cents per pound, while an ounce to two gallons of water will prove a deadly mixture to many of our pests. This is specially useful in combating the various slugs which attack our strawberry vines, raspberry, gooseberry and currant bushes, and evergreens. We emphasize its desirability in fighting the ubiquitous currant slug, which is aiming, with some show of success, to rob us of our currants, which means our best jelly and jelly cake. These blighting slugs do not all hatch at once, but come forth in successive broods, from the middle or last of May even to July. Hence several applications of the poison must be made, as many as the presence of the insatiate destroyers demands. Ignorance or neglect of this fact has led some to lose faith in this remedy.

Copperas in strong solution is a less efficient insecticide. Persian insect powder, Persian camomile, or pyrethrum, from Persia and Caucasian India, is said to be an efficient poison and may well be tried in our experiments to rid our plants, our carpets and furniture and our domestic animals of noxious insects. A teaspoonful of pure Persian chamomile heaped in a little cone and burned in a medium-sized room that is not ventilated during the burning, will kill every fly in it. If it fails to do this the powder is not genuine. To test its purity, put a little in a bottle with a dozen flies; when the bottle is closed they will go into spasms and die almost instantly if the drug is what it should be. "Persian insect powder," like other things, is sometimes adulterated; it will also lose its strength if kept open too long. Druggists mix it with other ingredients for various purposes. Borax is a valuable addition when cockroaches are to be disposed of, but for flies, mosquitoes and bed-bugs the pure powder must be used. It costs from 70 to 80 cents a pound, has a bright, buff color, is light, burns readily, and gives a rather pleasant, tea-like fragrance. It is the powdered leaf of a harmless flower growing in Caucasian Asia, where for centuries it has been used to keep the insect world in subjection. It acts on their breathing apparatus, evidently producing vertigo, respiratory spasms and paralysis, but is perfectly harmless and not particularly disagreeable to human beings. Of course, a little curl of blue smoke can't be expected to kill the flies over all creation or even in a large airy space. It will weaken the ambition of all those which come within its influence, but to produce death the effect must be concentrated.

FIG. 92.—*Larva of a Coccinella.*

In rooms where windows and doors are opened the burning powder will keep out unwelcome insect intruders. In a house protected by screens, the flies already in may be most conveniently disposed of by using the dry powder with an insect gun, which costs about 25 cents. Puff the powder into a close, warm room until the air is filled with it; then shut the door and return in half an hour. If every fly in it is not either dead or dying, throw away your powder, and send to a reliable dealer for that which is good. Pure Persian insect powder never fails in

FIG. 93.—*Young Locust Mite.* Trombidium locustarum.

its effect. For bed-bugs puff the powder with the insect gun into all the cracks and crevices where such vermin harbor; leave the room undisturbed for a few hours, closely shut meanwhile; they will walk

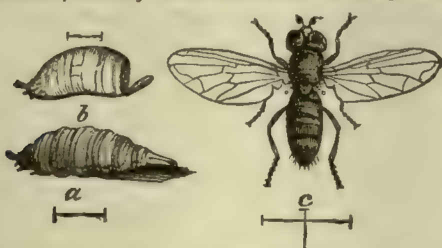


FIG. 94.—*Root-Louse Syrphus Fly.* Pipiza radicum. *a*, larva; *b*, pupa; *c*, perfect fly.

out and surrender at discretion; a semi-annual application will prevent all further trouble. Dust your house-plants, your pet dog and your poultry with insect powder, but don't undertake to kill spiders or you will be disappointed.

Tar water is good to destroy and drive away insects on plants. So is gas-coal tar. To apply the latter, put 4 or 5 gallons gas-coal tar in a barrel; fill up half full with water, and stir well, so the water will become impregnated with the tar; after the tar has separated from the water sprinkle the latter on your potatoes, cucumbers, rose bushes, cabbages, etc. Care must be taken that the water be not too strong.

FIG. 95.—*Syrphus Fly.* *a*, larva; *b*, part of a segment highly magnified.

Though we are powerless to poison the food of sucking insects, we are still able to administer death by the application of external poisons. The best substances for such are a weak solution of carbolic acid, a strong suds either of whale-oil or common soft soap and tobacco water. The addition of a half teacupful of crude petroleum to two gallons of either of the above makes them the more effective. These substances are peculiarly efficient in fighting slugs, cabbage worms,—in which cases they may also have acted as internal poisons,—lice on house plants,—where much care is required, especially with the tenderer plants, or they will be injured by a too strong fluid,—plant lice, bark lice,—which latter are most susceptible just after hatching,—and the many lice and ticks which infest our domestic animals. In these last cases carbolic acid solution is very valuable, and should be freely sprinkled about the kennels, stables, and poultry houses. The tobacco water and kerosene are also very excellent. Persian insect powder is also recommended highly by many dog and chicken fanciers, for the destruction of vermin in kennels and poultry houses.

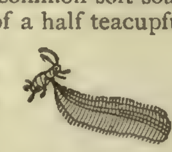


FIG. 96.—*Syrphus* larva feeding on a plant louse.

Lime, ashes, and even road dust are destructive to some of the more tender-skinned insects, especially to such as secrete a slimy, viscid substance which covers their bodies, as do some of the slugs. Such treatment is quite satisfactory in case of the pear and cherry tree slugs. Dusting the plants with lime and ashes is often recommended as preventing the ravages of the various leaf-eating beetles. We have found these unsatisfactory.

To drive away all sorts of insects about a kitchen or cupboard, let two or three bottles of ammonia stand unstopped in the place.

DESTRUCTION BY MECHANICAL MEANS. Many insects from their large size, like the tomato worm, and grape-vine sphinx, and others from their gregarious habits, like the tent caterpillar, fall-web worm, and red-humped caterpillar, are easily reached and crushed with the hand. A glove may make the work more pleasant, but no more thorough. All the above except the first may be dispatched by use of a musket loaded with a light charge of powder, or by a torch at the end of a long pole, though not without danger to the trees attacked. Other insects, like the borers and radish and onion maggots, are so out of reach that poisoning is impracticable. The first may be dug out and crushed, or crushed with a wire, while scalding with boiling water has been practiced successfully in destroying both the borers and the maggots.

Many cut-worms, from their habits of climbing trees and vines in search of the tender buds which they destroy, or plants to cut them off, are easily foiled by the gardener or pomologist. A band of tin about vine or tree is an impassable barrier to these terrible destroyers, which spend the day in the earth and go forth to their evil work when night and darkness serve them as a shield. Sized paper about cabbage and tomato plants, held close by a mound of earth, are an equally efficient barricade to the garden cut-worms.

PREVENTING EGG-LAYING. To nip evil in the bud, has been the study and desire of philanthropists ever since the primal temptation. To secure against the egg-laying of injurious insects, is one of the ways. The best, if not the only, way to accomplish this, is to render the plants obnoxious, so that the female insect shall pass by on the other side. Thus, washing the fruit trees, especially young apple-trees, with soft soap early in June, and again early in July, keeps the borers from egg-laying; and this is most desirable in orchard culture. Carbolic acid and kerosene mixtures, and even strong soap-suds either of whale-oil or common soft soap, are valuable to repel the peach and squash-vine borers, the radish, onion and cabbage flies, and cabbage butterfly; and we have much reason to think that frequent drenchings of an apple-tree with strong soap-suds is an absolute protection from the codling moth.

HOW TO DUST OR SYRINGE PLANTS. For dusting plants with Paris green, hellebore, etc., there are several patented machines, though we have yet to see a more convenient or easily managed appliance than a simple bag of muslin tied to the end of a broom-stick. To prevent waste while filling, this should be placed in the vessel which holds the powder, or in some other

vessel,—a common milk-pan serves admirably. To sift the powder upon the plants we have only to jerk the bag containing it, above them, gauging the force according to the amount of the substance which it is desired to apply. On small plants, like young potato vines, we think this the most economical method of applying the poison. To use the liquid mixtures or solutions in a small way on low vines or shrubs, a common sprinkler with a finely-perforated rose serves well, and requires no expense, except, perhaps, for a new nozzle, as the usual nozzles are too coarse. For syringing trees, shrubs, flower beds, and house plants, we know of nothing comparable to Whitman's fountain pump. This little engine is so easily worked that a child can use it, and yet will throw a stream 20 or 30 feet high. The Johnston pump throws water faster than Whitman's, though not quite so far. This is a fine engine, and sells for $8. The Whitman fountain pump will not work well if pointed much below the horizontal, hence is not useful in sprinkling potato vines. It retails at $7.50. Lewis' syringe is an improved squirt-gun of the kind made and used by children to amuse themselves. Replace the small alder tube with one of tin or brass, that holds three or four quarts, and the cloth-wound piston by one of rubber, and you have it. It costs but $1, and works well. In case of field potatoes, Ruggle's exterminator is probably the best. With this machine an acre can be sprinkled in an hour. It consists of a large tank which holds the liquid. This, when in use, is strapped upon the back of the person using it. An agitator which works inside the can keeps the mixture well stirred. This is moved by a strap which is fastened to the operator's arm. From either side of the bottom of the can, pass two rubber hose, each terminating with a fine rose. These are held, one in either hand, so that two rows are sprinkled at once. By raising or pressing the hose the flow is stopped. The only objection we find to the use of this is on the score of economy; though if the vines were close together in one direction, this would be small. For sprinkling potato vines in a large field, this is the best instrument we have seen. It retails at $6.50.


FIG. 97.—*Flea.* Pulex irritans.

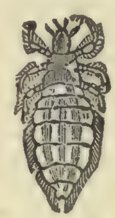


FIG. 98.—*Head Louse.* Pediculus capitis.


FIG. 99.—*Body Louse.* Pediculus corporis.

TRAPPING NOXIOUS INSECTS. Many insects, if disturbed, will fall to the earth. Therefore, if we jar the trees or bushes which lodge the pests, after placing a sheet underneath, we may easily catch and destroy them. By this means the plum curculio can be cheaply destroyed, and one of our most valued fruits saved from almost certain destruction. The grape curculio, the blister beetles and the rose chafer can be all caught in like way. In large plum orchards it pays to have the sheet stretched upon a frame in the form of an inverted umbrella, and carried by a wheelbarrow or cart. A slit permits this to pass immediately under the tree. The jar must be sharp, and to prevent injury to the trees or limbs, spikes should be driven in, and these, not the trees, should be struck with the mallet. Some insects are wont to hide under boards, chips or rubbish. The plum curculio, early in the season, and the squash bugs and cut-worms are examples. Hence, if chips be placed under plum trees in May or June, they will be appropriated for shelter and protection during the day, as the insects are nocturnal; and when thus hid, the curculio may be easily gathered and destroyed. Neglect to gather them in before four o'clock in the afternoon makes the experiment only partially successful, as some may have gone to the tree to be on hand for the night's banquet. Squash bugs are also nocturnal, and may be captured by placing old boards or wilted leaves on the ground among the vines. The similar habits of the cut-worms suggests a similar trap. In this case some fresh-mown grass is better for a trap. This placed in a cleanly kept garden a few evenings in succession before setting the plants, will attract the marauders in quest of the growing plants. The next day the grass may be removed and the caterpillars crushed. The successful practice of any of the above methods makes perfectly clean culture imperative in orchard and garden.


FIG. 100.—*Horse Fly.* Tabanus atratus.

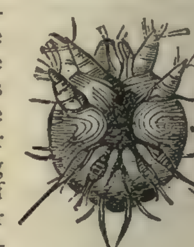


FIG. 101.—*Itch Mite.* Sarcoptes scabiei.

Many insects, when full-fed as larvæ, seek some crevice or other place of concealment in which to pupate. This habit of the apple worm—larva of the codling moth—has furnished us with the only successful method yet practiced for its overthrow. If cloth or thick paper bands be placed about the trees; they may be fastened with a tack or string; these will, in the absence of rubbish about the trees and rough bark scales on the tree-trunks, attract nearly every larva that passes from the fruit. Some will leave the hanging fruit and crawl down to the band; others will escape from the fallen apples and pass up the trunk till the band is reached, when they will crawl underneath, spin their

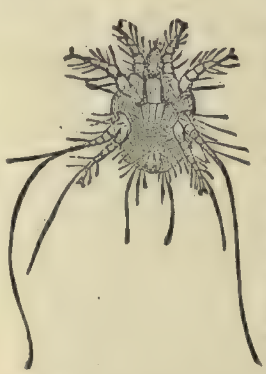


FIG. 102.—*Itch Mite of the Horse.* Sarcoptes equi.

frail cocoons, and become chrysalids. The bands should be in place by June 25, should be examined by July 10, and thus, on every 10th day till August 1, and again after the fruit is gathered. The best way to kill the insects is to loosen the bands and crush with the thumb. Four cents a tree would cover all expense, and by co-operation of all in a neighborhood it might be made even less.

Many insects, like the chinch bug, the squash bug, etc., hibernate in winter, crawling for protection under or into rubbish heaps, under corn-stalks left in the field, etc. Burning up all such heaps in winter will not only cremate these pests, but add to the farmer's reputation for neatness. It is well-known that the chinch bugs and army worms, after devastating one field, march with merciless tread to another. Deep furrows or ditches are sometimes made about the threatened field, with steep side toward it, and as this becomes full of the migratory pests, straw should be added, and all burned together. Trapping the codling moth in the cellar by having the windows closely screened in May and June, and forcing them to tarry and die where they are impotent to do harm, is a wise precaution which should never be neglected.

Destruction of Eggs. The eggs of most insects are too small and inconspicuous to be easily gathered. In a few cases, however, this is a practical method. The clustered brown eggs of the squash bug underneath the leaves are quickly seen. The yellow clusters of the potato beetle are conspicuous. The concentrated rows of the currant saw-flies' eggs, along the veins of the leaves, are quickly discovered by the minute holes cut out by the earliest hatched slugs. The little green eggs of the cabbage butterfly, though obscure, are quickly seen with a little practice, and their riddance from small cabbage plants would afford useful employment for children. In some cases early sowing of grain will help to avoid insects. This is true of the wheat midge. Late sowing or planting is sometimes successfully practiced with the Hessian fly, the cut-worms, the pea weevil and the radish fly.

Good Culture. It is almost superfluous to state that thorough culture, which means a systematic rotation of crops, ample fertilization and deep tillage, will do much to insure against calamity from insects. Many insects choose the weakest plants, and it is a principle broad as nature that the strong will survive calamity while the weak go to the wall. Grow only vigorous varieties, keep much stock, which means much manure. Apply this wisely, and then till thoroughly, and you will do much to solve this whole question.

Insects, Parasitic. In all the vast realm of insect life, there are no species so justly abhorrent and so miserably disgusting as the external parasites on man and the lower animals. Their very look is repulsive, their habits intolerable,—in sooth they are fit companions of the dirt and filth which ever serve as the kindly foster mother to these most repellant of animals. Well may the neat housewife start aghast at the sight of the nasty bed-bug, or blush with shame and confusion at the news that her own fond kin are nourishing those repulsive pygmies, head lice. The thrifty farmer also dreads the presence of these terrible, bloodthirsty minions on his kine, for he knows that the prosperity of his animals is well nigh impossible if they must give of their substance to nourish these noxious pests of the barn and poultry house.

Fleas. As the immature fleas live upon the organic matter of dirt and filth, these animals can only thrive as the companions of untidiness and neglect. With filth and neglect, the dog, cat and hen-fleas will put in an appearance; and it is an unwelcome fact that these latter are nothing loth to take a sip from our own precious blood when opportunity offers.

The dog-flea is so named as it prefers to satiate its bloodthirsty appetite from the dog. If dogs are permitted to harbor these annoying pests, the latter will gain admittance to houses, will hide in carpets, mats, etc., and anon, as occasion permits, will slake their thirst with human blood. "Biting as they run," they quickly inflict their painful wounds on various parts of the body. The color of the dog-flea is dark chestnut, darker than the human flea, and unlike the latter, it has sharp spines projecting from the lower lateral borders of the head and the posterior edge of the first thoracic ring. The small, oval white eggs are laid on the animal, or in the dust of the kennel. The larvæ are footless maggots with lateral hairs, and live in dust and dirt, where they feed upon the organic matter which these contain. They mature in about two weeks, when they spin their cocoons, in which the inactive pupas may soon be seen. In two weeks more the mature fleas hop forth. There are several broods in a season. They pass the winter certainly as imagos or mature fleas, and perhaps in other stages.

The cat-flea is very similar and perhaps identical with the dog-flea.

The hen-flea infests the poultry house and attacks the hens. Other species live on pigeons, bats, etc. All of the species will test the quality of human blood, if opportunity offers. The fact that larval fleas love and only flourish in the dust and dirt accounts for the lively appearance of the dust often noticed in poultry yards and about gardens, where the dogs, cats and poultry lie or roll. From being seen in such localities, the mature insects are sometimes called sand-fleas.

Itch Mite. Fig. 101 gives a magnified view of the almost microscopic insect which produces the itch on the human being, and Fig. 102 the creature that works similarly on the skin of the horse. They live, feed and reproduce their kind in small, subcutaneous galleries which their own feasting produces. The intolerable itching which they produce causes the person or animal to scratch and break the skin, producing pustules. The easiest remedy is a solution of sulphuret of potassium, 2 to 4 ounces to a gallon of water. The same is also the best remedy for the face

mite, much smaller than the preceding, and lives in the pimples or diseased follicles about the nose and chin.

BED-BUG. Among "wingless flies" we have, as external parasites, the nasty, disgusting and too common bed-bugs and the even more repulsive lice. As we are not treating here of the human parasites, we will only say that the bed-bug is exceedingly tenacious of life, as it has been kept in a bottle for years without food, and through all this long fast seemed to lose none of its activity or appetite. The best remedy for bed-bugs is a free use of the thoroughly rectified benzine. This will not injure bedding, and is quick death to all the bugs that it touches. It should be poured into all suspicious crevices. Old houses that harbor these obnoxious pests should be closely shut up, and then thoroughly fumigated with burning sulphur, which becomes a fitting insecticide for the bugs. It would be better if the house were entirely empty during this operation. Thorough ventilation should succeed the fumigation.

LICE. The lice of man and other animals are wingless bugs. The head and thorax are small and narrow, the latter indistinctly segmented, while the abdomen is flask-shaped, with nine rings, often plainly marked. The eyes are simple and very small, the antennæ five-jointed and prominent, while the tarsi or feet are two-jointed, the last joint of which is modified into a hook for grasping the hair. The sucking-tube of lice—the cause of the hardest scratching in the world—is very complex and curious. The whole of this organ, when not in use, is drawn into the head. So all lice are criminals in the sight of the law and subjects for conviction, on the ground of bearing concealed weapons. The lower lip is thrown out, as we would push out the finger of a glove that was drawn in upon drawing the glove from the hand. Inside of this there are numerous hooks, which, when the tube is rolled out to its utmost, attain the outside and point back like the barbs of a fish-hook. When these barbs are pushed through a sweat-pore, each hooks on to the wall. We thus understand the tenacious hold which characterizes a louse while at dinner. When, preparatory to sucking, the hooks have been duly adjusted, two other tubes, one within the other, spy-glass-like, are extended, the maxillæ forming the inner or terminal point of the extension, and the mandibles the remainder. The whole proboscis has been compared to an elastic probe. This is forced into the skin till it pierces the blood vessels, when by the forcible action of the strong muscular sucking-stomach, these irrepressible blood-suckers are enabled to take a quick meal.

There are three species of lice that disturb the peace and quiet of the human family. The head-louse is the most common. It is said that in olden times it was thought no disgrace, but fashionable and desirable, to harbor and nourish these crawling pygmies of the head; now they are only common among such people as neglect personal neatness. The most cleanly person may be so unfortunate as to possess specimens not pinned in an entomological cabinet, but he will soon banish them according to the fashion well understood in all civilized society. The gray-back, or body-louse (Fig. 99) is not confined to the head, and was the irritating pest of our brave soldiers in the late war. It is apt to be a source of annoyance in lumber camps and on ship-board. This species is so like the head-louse in appearance that, were not the habits so different, we might almost regard them as identical. The crab-louse receives its common name from its close resemblance in form to the crab, and its specific name from the region of its attacks (Phthirius pubis).

Both of the last-mentioned may be banished by the use of a little mercurial ointment, which is a poison and should be used with care, or of kerosene and sulphur, which are to be applied to the part of the body attacked. As the eggs will continue to hatch for a time, the application will need to be repeated at intervals of six or seven days for two or three weeks. Cleanliness is the great preventive, which in this case is certainly better and vastly more pleasant than cure.

BIRD LICE. These lice, although the sucking-tube is replaced by jaws, are, nevertheless, degraded Hemiptera, or bugs. The species are very numerous. Nearly all birds have one or more species to annoy them, while the hen has five or six.

Remedies. The washes already described for fleas are also efficacious in destroying lice. If the decoction of tobacco, or the kerosene and water, is to be used in cold weather on cattle or calves, especially the latter, they should be kept in a warm room, or well-blanketed until thoroughly dry. If an ointment, made of sulphur, lard and kerosene, be applied to the heads and under the wings of fowls that are annoyed with lice, the latter will soon disappear. The nests should be sprinkled with sulphur, the roosts washed with kerosene, the house and yard sprinkled with carbolic acid solution, and the poultry house frequently whitewashed. Persian insect powder dusted upon or rubbed into the hair and feathers of animals attacked by lice, will destroy the pests without harm to the animals. Ointments may be easily applied with the common brushes used in grooming horses. No good farmer or fancier will allow his animals to suffer from these enervating parasites if he but knows of these cheap and effective remedies. A little care will work entire prevention, while but a little labor is required to work a radical cure.

SPIDER-TICKS AND MITES. Many will remember an old-time disease, happily very rare in our times, which, as surely as the traditional peck of dirt, would come to make its seven years' sojourn, not only in the best of families, but even as the guest of the fairest. This disease, very appropriately christened the itch, of those—ought we say "good old times?"—was caused by the irritating presence of a wee animal, the itch mite. A near relative causes the mange, or scab, of our domestic animals, which are more polite terms for the same thing, the itch. The "red spider,"

or "red louse," of our poultry houses, and the large ticks, whose bite is so painful to ourselves and the lower animals, are also near relatives.

SPIDERS. These tormenting pests are not true insects, but are a family of themselves. They have only two divisions of the body, head and abdomen. Their eyes are simple; they are without antennæ, and when mature always have eight legs.

The mites have rounded, non-articulated abdomens, can suck as well as bite, while many have at first but six legs. The habits of mites are very varied. Some, like those in question, are parasitic; others, like the wee red spider, are very destructive to plants on whose juices they subsist. Still others, like the cheese and sugar mites, are destructive to the articles which give them their names. They are often met singly and as often in great numbers.

TICKS. The largest of these animals are the ticks which are often found on cattle that feed in the woods. Nor do the "wood ticks" confine their bloodthirsty attacks to our domestic animals, as many of us well know by painful experience. Often, as a boy, did we have to pay a painful penalty for those delightful strolls in the grand old forests, laid on by one of these same ticks. One feels the darting pain, and upon immediate examination, finds the cruel tick deeply buried and so firmly anchored that the attempted liberation tears the head from the body. Both their jaws and their tongue are covered with teeth, each of which takes hold to prevent the extraction of its possessor. The ticks at first have but six legs. They are not enough of a pest in the Northern States to warrant a further consideration at this time.

The red mite which attacks our poultry in such alarming numbers, is soft-bodied, oval in form, and, though very small, is from its crimson hue easily discerned without a microscope. The young have only six legs. We have found by actual experiment that they could inflict quite a painful bite, even upon our own persons. They may cause horses much annoyance when the horse stable and hen roost are one and the same. The ointment made of sulphur, lard and kerosene works a speedy cure of this evil among the poultry. We have no doubt but that this same ointment or the kerosene wash would rid larger animals if attacked by these liliputian pests. Other species attack turkeys, pigeons and even the cage birds of our houses.

The mange in horses is only another term for itch. It is caused by a small but visible mite, which often swarms on horses. Other species cause the scab in sheep and in cattle.

Remedies. The kerosene wash, made quite weak, is effectual. The ointment made of kerosene and sulphur is another good remedy.

TRICHINÆ. If any one examines a piece of pork containing trichinæ, he will notice that the flesh presents an unusual appearance, as if it contained vast numbers of little grains. An examination with a magnifier will show numerous little bodies, which taper at each end among the fibers of the muscles, and within each of these bodies is a small worm coiled up in a spiral form, as in Fig. 103. If a piece of such flesh be eaten, it is digested and the enclosed worms are set free within the stomach of the person.

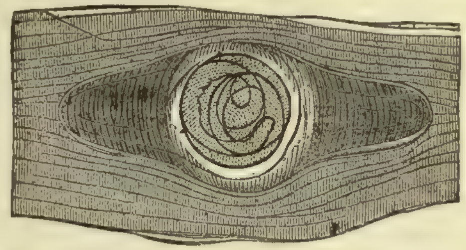


FIG. 103.—*Trichina spiralis*, in a piece of pork, magnified.

The worm at once develops to its full size, which is about 1-28th of an inch in length, and becomes sexual. It both produces its young alive and from eggs, and is very prolific. The young worms, and very minute they are, pierce and pass through the walls of the stomach and intestines, and make their way to all parts of the body. When they have located themselves in the muscles, they become "encysted," or enclosed by a sort of membrane, or sac. In time this often becomes hardened by a deposit of lime, and being quite white, is quite often conspicuous. These minute cysts are about 1-20th of an inch long, and 1-100th of an inch broad, and contains the worm coiled in a spiral. Being in size hair-like, its name *Trichina* is formed from the Greek word for "hair," and its specific name *spiralis* refers to its manner of coiling when dormant. It is estimated that a cubic inch of flesh may contain over 80,000 of these cysts. It may be readily imagined that these myriads of minute worms, in piercing the stomach and intestines, and making their passage throughout the muscles of the body, must cause great pain, and the presence of all these foreign bodies in the muscles produce serious illness. The disease caused by them is called *trichinosis*, and sometimes *trichiniasis*, and is most frequently fatal. If the patient recovers, he carries the encysted trichinæ in his muscles through life. This parasite is brought into the human body only by the eating of infested pork. The animal's flesh becomes filled with encysted trichinæ, which remain dormant until they find themselves in the human stomach. Practically there is little or no danger from trichinæ if pork be thoroughly cooked. The cases in this country, at least, have all been traced to the European custom of eating uncooked ham, sausage, etc. In boiling, the pieces should not be large, else the trichinæ in the middle will not be killed.

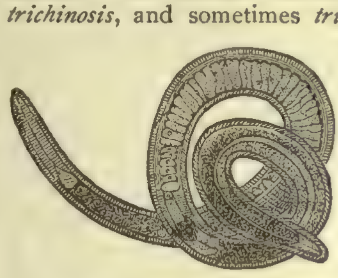


FIG. 104.—*Older State of Trichina.* Highly magnified.

Insect Bites. When a mosquito, flea, gnat or other noxious insect punctures the human skin, it deposits or injects an atom of an acidulous fluid of a poisonous nature. The results are irritation, a sensation of tickling, itching, or pain. The tickling of flies we are comparatively indifferent about; but the itch produced by a flea, gnat, or other noisome insects disturbs our serenity, and like the pain of a wasp or bee sting, excites us to a remedy. The best remedies for the sting of insects are those which will instantly neutralize this acidulous poison deposited in the skin. These are either ammonia or borax. The akaline reaction of borax is scarcely yet sufficiently appreciated. However, a time will come when its good qualities will be known and more universally valued than ammonia, or as it is commonly termed, "hartshorn." The solution of borax for insect bites is made thus: Dissolve one ounce of borax in one pint of water that has been boiled and allowed to cool. Instead of plain water, distilled rose water, elder, or orange-flower water is more pleasant. The bites are to be dabbed with the solution so long as there is any irritation. For bees' or wasps' stings, the borax solution may be made of twice the above strength. In every house this solution should be kept as a household remedy.

Instinct, inward impulse. It is a guide to physical welfare, propagation of the species, etc. The tendency of modern teachings is that we should heed our instincts more strictly than we do. We have as a race neglected them so long that we scarcely know how to obey them; and to learn this simple thing requires more unlearning of bad habits of thought than positive ideas. Wisdom consists infinitely more in the abandonment of wrong ideas than in obtaining right ones. Most of what we call common sense are simply instinctive or intuitive ideas; and nearly all persons imagine that they have learned by experience what they really have "evolved from their own inner consciousness."

Insurance. A contract whereby, for a stipulated consideration, called premium, one party undertakes to indemnify another in case of certain losses. The party undertaking to make the indemnity is called the insurer or underwriter, and the one to be indemnified, the assured or insured. The instrument by which the contract is made is denominated a policy; the events or causes of loss insured against, risk or perils, and the thing insured, the subject or insurable interest. The fundamental principle of insurance is mutual support in case of loss, so that the loser will not loose all, but have something with which to continue successfully the battle of life. The contributions to the general fund to provide against loss are "premiums."

Fire Insurance. The importance of maintaining a considerable, if not full, insurance on farm property, residences, furniture, barns, stables, produce in store, implements and stock, is too much under-rated, even by ordinarily prudent farmers. While their property is wholly relieved from liability from damage by the spread of fire from the houses of others, so common a peril in cities, it is subjected to far greater liability to complete destruction from the lack of means to extinguish fire, and from the increased difficulty of collecting help where neighbors are so remote. The farmer's risk in the country may be on the whole less than that of a business man in the city, but so will the insurance be less; and in any case the risk will always be sufficient to make insurance, to a considerable proportion of the total value, a matter of wise precaution. He is very unlikely to spend any money to a better purpose. Grain, stored in barns or cribs, is frequently the heaviest loss in case of fire; for if it is not burned it is sure to be too much damaged to be marketable. Even when stacked in the field it may be prudent to protect it by a "policy," for it is by no means safe from thieves, or lightning, or, if near a railroad, from the sparks of locomotives. The difficulty of rescuing live stock of all kinds from burning buildings is well known; hence the necessity of insuring them also. In taking out a fire policy, see that it insures against lightning, as well as fire. A building may be burned at any time, involving the loss of accumulated property of many years, and but few farmers can afford to run such a risk. All can afford to, and should have, their buildings insured in some good company. The person holding a policy is always more watchful—observing the wise precautions enjoined by the insurance company. Explosive oils will not be used, or if employed they will be with greater care. Smoking will not be indulged in upon the hay mow as frequently as when no policy is rendered void by such acts. Thus there is a double safety in being insured; and it pays, unless the owner is rich and can afford to be his own insurance company; and even then it may be wise to have one's property insured.

Marine Insurance. Farmers sometimes take the risk of shipping their own products, especially if they are in the vicinity of navigable lakes and rivers, and save the profits which "middle-men", or commission merchants, make. Such risks usually cover "perils of the sea, fire, barratry, theft, piracy, arrests and detentions." "Barratry" is a rather obscure risk, but it is defined to be any "wrongful act done against the insurer by the master, officers or crew." The modes and terms of insurance against marine risks vary with the circumstanses of every case. The premium is proportioned to the probable perils of the voyage.

Life Insurance. This is the simplest of all forms of precaution against mischance, and is usually applied either to the protection of a family against want when the father dies, or to the protection of a creditor in case the debtor has no available property. The insured cannot, of course, be benefited by a policy which becomes payable only when he dies, but some companies, organized on the mutual system, allow a policy-holder to draw a certain sum, proportioned to the amount of his policy, after the regular payment of his premiums for a certain time. The parties to a life policy are usually the same as in fire or marine insur-

ance, the company and the insured; but very frequently a creditor, or any one having a pecuniary interest in the life of another, as a sister in that of a brother who supports her, will take a policy on the life of the person to whom that interest attaches. This third party is the real party in interest, and is called the "life-insured," while the person upon whom the policy is taken is called the "insured."

All forms of insurance are essentially alike, and all are so completely settled by the rules and conditions set forth in the policies that it would be useless to repeat or comment upon them here. In what companies, or upon what terms to obtain insurance, every man must judge for himself. Old and well-established companies are the safest, and they are generally represented in a community by solid men. Always read your policy carefully over before you take it, to see just exactly what it covers, and what precautions against fire it may require on your part. You will not then be so liable to be beaten out of your insurance by some technicality in case of the accident. It is obvious that the concealment of any material facts to the detriment to property or health in any sort of insurance will vitiate the policy, and thus free the company from any obligations to pay the stipulated amount should loss ensue.

That an insurance policy in a safe and reliable company, both on life and property, is an excellent investment few will deny. Man is very largely a "creature of circumstance," and liable to many misfortunes he cannot foresee, and from which he cannot escape. Houses and barns may be burned without any fault of the owner, and death is sure to come to every one. Although one may not be able to prevent either, he does have the power, to some extent, of protection against many of the evil results of these events, and thus lighten the burden. As a remedy for these ills the method of insurance was inaugurated. Men who have families depending on them for support, may, in time of health, make provision to a great extent by this means for their wants should death come to them, which it is liable to at any time.

Interest, allowance made for the use of money, or for an investment.

Compound interest is interest upon interest. This is scarcely ever allowed. The United States Supreme Court rule forbids it in calculating what is due upon a note. The rule reads as follows: "When a partial payment is made, apply it first to the discharge of the interest then due; if the payment exceeds the interest, the surplus goes towards discharging the principal, and the subsequent interest is to be computed on the balance of principal remaining due. If the payment be less than the interest, the surplus of interest must not be taken to augment the principal; but interest continues on the former principal until the period when the payments taken together exceed the interest due, and then the surplus is to be applied toward discharging the principal, and interest is to be computed on the balance as aforesaid."

The foregoing rule is based on the principle that neither interest nor payment shall draw interest, the aim being, as with legislatures and courts generally, to favor the debtor. The above rule, however, in some cases, would work against the debtor. For instance, suppose he gives his note for $2,000 at six per cent. interest, and he pays on it $10 a month, which just meets "the interest then due;" at the end of the year he would still owe the $2,000. But if he had invested the $10 each month at six per cent., he would have had at the end of the year $123.30 available for payment, by which time the interest on his note would have reached only $120, being a difference of $3.30 in his favor, and leaving his debt $1,996.70, instead of $2,000. Thus we see that the closer the payments are together the greater the loss of the debtor, who thus suffers a penalty for his very promptness.

The foregoing defect does not exist in what is called the Connecticut rule for calculating partial payments, as that allows interest on payments made before they are due. The rule, however, is somewhat tediously worded. The simplest rule is that which is known as the Vermont, or merchants' rule, and is often used throughout the United States when settlement takes place within a year after interest begins. Its principle is this: "Subtract the sum of all the payments with their respective interest from the amount of the principal for the whole time." But the most just rule is this: "Starting at the time interest begins, find the present worth by simple interest of each payment; deduct the sum of these present worths from the principal; the amount of the balance by simple interest, to the day of settlement, will be the sum then due."

"Present worth" is the sum which, at the prevailing rate of interest, will amount to the debt when due. The principle of this rule is, each payment discharges a part of the principal with its simple interest to the day the payment is made, making interest and principal due at the same time, instead of the interest all due first and the principal afterward.

To Calculate Interest. To find the interest for any number of days, the simplest rule is the following: For 6 per cent., multiply the amount by the number of days, divide by 60, and point off the two right-hand figures; thus, to find the interest on $326.50, for 25 days, at 6 per cent :

$$\begin{array}{r}
326.50 \\
25 \\
\hline
163250 \\
65300 \\
\hline
60)816250 \\
\hline
\$1.3604 \text{ Ans.}
\end{array}$$

For the interest at 7 per cent., add one-sixth to the last result; for 8 per cent., add one-third; for 9 per cent., add one-half, and so on.

While some persons prefer to work by rule, others prefer to use a table; and we therefore print one of the most convenient and comprehensive we have seen:

TABLE GIVING THE INTEREST AT 5, 6, 7, 8 AND 10 PER CENT. ON SUMS VARYING FROM 25 CENTS TO $10,000.

TIME.	Per Cent.	25c	50c	$1.	$2.	$3.	$4.	$5.	$6.	$7.	$8.	$9.	$10.	$30.	$50.	$100.	$500.	$1,000.	$5,000.	$10,000.
One Year..............................	5	1¼	2½	5	10	15	20	25	30	35	40	45	50	1 50	2 50	5 00	25 00	50 00	250 00	500 00
	6	1½	3	6	12	18	24	30	36	42	48	54	60	1 80	3 00	6 00	30 00	60 00	300 00	600 00
	7	1¾	3½	7	14	21	28	35	42	49	56	63	70	2 10	3 50	7 00	35 00	70 00	350 00	700 00
	8	2	4	8	16	24	32	40	48	56	64	72	80	2 40	4 00	8 00	40 00	80 00	420 00	800 00
	10	2½	5	10	20	30	4[illegible]	50	60	70	80	90	1 00	3 00	5 00	10 00	5[illegible] 00	100 00	500 00	1000 00
Six Months............................	5	⅝	1¼	2½	5	7½	10	12½	15	17½	20	22½	25	75	1 25	2 50	12 50	25 00	125 00	250 00
	6	¾	1½	3	6	9	12	15	18	21	24	27	30	90	1 50	3 00	15 00	30 00	150 00	300 00
	7	1	2	4	7	11	14	18	21	25	28	32	35	1 05	1 75	3 50	17 50	35 00	175 00	350 00
	8	1	2	4	8	12	16	20	24	28	32	36	40	1 20	2 00	4 00	20 00	40 00	200 00	400 00
	1[illegible]	1¼	2½	5	10	15	20	25	30	35	40	45	50	1 50	2 50	5 00	25 00	50 00	250 00	500 00
Three Months...................... ...	5	½	¾	1½	2½	4	5	6½	7½	9	10	11½	12½	37½	62½	1 25	6 25	12 50	62 50	125 00
	6	½	1	2	3	5	6	8	9	11	12	14	15	45	75	1 50	7 50	15 00	75 00	150 00
	7	½	1	2	4	5	7	9	11	12	14	16	18	53	88	1 75	8 75	17 50	87 50	175 00
	8	½	1	[illegible]	4	6	8	10	12	14	16	18	20	60	1 [illegible]0	[illegible] 00	1[illegible] 00	20 00	1[illegible]0 00	200 00
	10	¾	1½	3	5	8	10	[illegible]3	15	18	20	23	[illegible]5	75	1 25	2 50	12 50	25 00	125 00	250 00
One Month..........	5	0	¼	½	1	1½	1½	2	2½	3	3½	4	4	12½	21	41½	2 08½	4 16½	20 88½	41 66
	6	¼	½	1	1	2	2	3	3	4	4	5	5	15	25	50	2 50	5 00	25 00	50 00
	7	¼	½	1	1	2	2	3	4	4	5	5	6	18	29	58	2 92	5 83	29 17	58 33
	8	¼	½	1	1	2	3	3	4	5	5	6	7	21	33	67	3 34	6 67	33 33	66 66
	10	¼	½	1	2	3	3	4	5	6	7	8	8	25	42	83	4 17	8 33	41 67	83 33
Fifteen Days..........................	5	0	0	0	½	½	1	1	1½	1½	1½	2	2	6½	10½	21	1 04	2 08½	10 41½	20 80½
	6	0	0	0	1	1	1	1	2	2	2	2	3	8	13	25	1 25	2 50	12 50	25 00
	7	0	0	0	1	1	1	1	2	2	2	3	3	9	15	29	1 46	2 92	14 58	29 17
	8	0	0	0	1	1	2	2	2	2	3	3	4	11	17	33	1 67	3 33	16 65	33 30
	10	0	0	0	1	1	2	2	3	3	3	4	4	13	21	42	2 08	4 17	20 83	41 61
Three Days..................	5	0	0	0	0	0	0	0	½	½	½	½	½	1½	2	4	21	42½	2 08½	4 16½
	6	0	0	0	0	0	0	0	0	0	0	0	0	2	3	5	25	50	2 50	5 00
	7	0	0	0	0	0	0	0	0	0	0	1	1	2	3	6	29	58	2 92	5 85
	8	0	0	0	0	0	0	0	0	1	1	1	1	3	4	8	34	66	3 30	6 60
	10	0	0	0	0	0	0	0	1	1	1	1	1	3	4	8	42	83	4 17	8 33
One Day.	5	-	-	-	-	-	-	-	-	-	-	-	-	½	½	1½	7	14	69½	1 39
	6	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	8	17	83	1 67
	7	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	10	19	97	1 94
	8	-	-	-	-	-	-	-	-	-	-	-	-	1	1	3	12	22	1 10	2 20
	1[illegible]	-	-	-	-	-	-	-	-	-	-	-	-	1	1	3	14	28	1 39	2 78

EXPLANATION.—The upper figures of each column are the principals, or sums upon which interest is computed. The interest upon any principal here given is found in the angle made by per cent. and principal. For example: The interest on $30 at 7 per cent. for 15 days, 9 cents. To find the interest on sums and times not in the table, add such parts as are given. For example: If you wish to find the amount of interest on $17 for six months, at 8 per cent., find what it is for $10 for that time, and then for $7 and add these amounts together, which gives the desired result.

Interfering, in farriery, the striking of one foot against another, so as to break the skin or injure the flesh. A horse does this by setting the feet too near in line. The usual remedy is to throw the feet slightly out of line by raising the inside of the shoe, but the success is partial and varying. A good plan is to protect the legs with leather shields or boots.

Intestate, leaving no will as to the disposition of property. When one dies leaving no written directions as to the disposition of his property, he is called an intestate, and in all the States and Territories are laws describing the proceedings to be had in such cases, as well as in cases where children are left full orphans without any will left by the parents as to what should be done with them. The probate judge will give advice in these matters.

Inventory (in'ven-to-ry), a list of the goods in one's possession, generally with their values indicated.

Invoice, a written account of the particulars of merchandise shipped or sent to a purchaser, consignee, factor, etc., with the value or prices and charges annexed.

Iodine, a chemical preparation manufactured from kelp or sea-weed, and extensively used in many diseases. Iodine itself is of little value as a medicine; but when united chemically with iron, copper, mercury, lead, arsenic and potassium, it certainly is one of the most useful and indispensable of medical agents, given internally and applied externally.

In cases of poisoning by iodine the stomach should be evacuated, and afterwards drinks administered containing flour, starch, or arrow-root.

Iodine should seldom be prescribed for internal usage except by a competent physician. In the treatment of stock give to the horse and the ox from 20 to 40 grain doses; for dogs, use from three to six grains. An ointment of iodine is made as follows: Take one part of iodine to eight parts of lard. This is a good ointment to apply to soft swellings on the body of the horse, and should be applied by rubbing with the hand.

Iodide of Potassium. This is a chemical union of potash with iodine, and is used by most practitioners for producing the constitutional effects of iodine. The dose for man is from 2 to 10 grains or more, three times a day, given in dilute solution. It is used externally in the form of an ointment. This is a costly remedy for horse and cattle diseases, and in most cases can be done very well without. Its action is that of an absorbent, and it is therefore used in swelling of the glands, and other parts of the body, and it is one of the best drugs for scattering inflammation. To get its full benefit, it should be given in syrup or molasses, so that the iodine will not be lost, leaving the water only behind.

Dose. From twenty to thirty grains for horses and cattle, repeated three times in the day. For the dog, five grains.

Iodide of Arsenic. Highly recommended by some persons for glanders, farcy and purpura in the horse.

Dose. Five grains given once a day, in cut or mixed feed.

Iodide of Copper, a valuable remedy, but costly for stock. It should be used in cases of debility and loss of condition, mingled with cut or mixed feed.

Dose. From one to two drachms given twice or three times in the day.

Iodide of Iron. This is even more valuable than iodide of copper, and is given for the same purpose and in the same doses. To use the iodide of iron once, will insure its use again. Its high price is the only drawback. Iodide of iron enters into the powders and balls which are given to the English race horses whilst in the trainer's hands; a high recommendation.

Iodide of Sulphur. A valuable remedy in mange, and other skin diseases of stock, which may be given internally also, in the same diseases.

Dose. For horses, give three to four drachms in the animal's feed. For mangy dogs, give ten to fifteen grains once a day. Give it at night, as warmth assists its action very much.

Iodide of Lead. This is too weak for veterinary practice, but excellent for swellings on the body of man. It is used only externally. Iodide of lead is a beautiful yellow color.

Iodide of Mercury, Biniodide of Mercury, Red Iodide of Mercury, etc. This preparation of iodine is a medicine that the veterinary surgeon can not do without in the practice of his profession; for there is nothing that will so well meet his wants. Iodide of mercury is not used internally in any disease, as calomel contains the same internal action as that of the iodide.

It is used in all cases of induration and swelling of the glands of the neck; tumors, whether of bone or soft tissue; splints, spavins, ring-bones, wind-galls, shoulder-joint lameness, or thorough-pin, and will answer well for whatever purpose. The only objection to it, as a blister over an extensive surface, is its painful operation. The iodide of mercury is used as an ointment as follows: One part of the red iodide of mercury to eight parts of hog's lard, well mixed together. This ointment is to be well rubbed into the parts to be cured. Swelling will follow its action, but will subside in a few days, if one application be enough, which will be known if the enlargement has been broken or has disappeared. If not, apply in from five to six days again, scarcely rubbing so hard as at the first application, as the skin is more easily acted upon at this time. But whether one, two, or half a dozen applications be necessary, let sufficient time elapse before each succeeding application, so as not to prevent hair growing, thereby blemishing the part. Apply lard once a day between the applications, and occasionally wash the parts with water, not too warm, and lard or oil the part when dry. The horse's head should be tied up so that he can not get at the parts with his mouth. A few hours will be

long enough. Place plenty of soft bedding under the feet, so that by stamping, the horse will not break or hurt his feet. When the tumor, gland or other enlargement does not disappear or go away at once, surprise is sometimes expressed to see it totally go away, as if of its own accord. Thus the red iodide of mercury exercises a powerful influence, long after its use has been dispensed with. Iodide of mercury occupies, in external diseases, as prominent a position as the preparations of aconite do in internal affections, whether in horses or in cattle.

Several other preparations of iodine are made by the manufacturing chemists; such as iodide of gold and silver, which are of no use to the farmer or veterinarian.

Ipecac, or **Ipecacuanha,** a South American plant much used in medicine, for various purposes, the effects varying according to size of dose. About 20 grains of the powdered root, mixed in water, constitute an emetic—dose repeated at intervals of 20 minutes until they operate. With some persons, much smaller quantities are sufficient. Warm water is better than cold, as a means of administering. To stimulate insensible perspiration, doses of one grain, given every hour or half hour. As an alterative, in diseases of the stomach and bowels, it should be given in doses of ¼ to ½ grain two or three times a day.

Iron. Cast-iron, zinc or brass surfaces can be scoured with great economy of labor, time and material, by using either glycerine, stearine, naphthaline or creosote, mixed with dilute sulphuric acid. Kerosene is good to clean steel; and to clean and polish both steel and iron, rub on, with wash leather, a paste made of 1 part of soft soap to 2 of emery, by weight. The best way to remove rust from iron is to wash it with a solution of 1 part sulphuric acid to 10 of water. The iron should afterward be protected by dipping it immediately into hot lime-water, and letting it remain there long enough to become pretty warm, so that it will immediately dry after it is taken out. It is a still further protection to rub it with dry bran or saw-dust, or dry oil, if it is not designed to weld or cement something to it. For this purpose linseed oil is good, or any paint which has no water in it. Compositions have been specially invented to protect iron from rusting, but they are mostly expensive and to the farmer unnecessary. Or, dissolve half an ounce of camphor in one pound of hog's lard; take off the scum; mix as much black lead as will give the mixture an iron color. Iron and steel goods, rubbed over with this mixture, and left with it on 24 hours, and then dried with a linen cloth, will keep clean for months. Valuable articles of cutlery should be wrapped in zinc foil, or be kept in boxes lined with zinc. This is at once an easy and most effective method.

To distinguish wrought and cast iron from steel, file off a little spot bright, drop on nitric acid, and after a minute or two wash it off. If the place has then a pale ashy gray color, it is wrought iron; if brownish black, it is steel; if deep black, it is cast iron.

Solder for Iron. Melt together 2 parts of copper and one of zinc.

To Weld Iron, dip the ends of the two pieces to be joined in a borax composition, and heat them to a white or melting heat, when they can be easily beaten together into one piece. Welding powders have been invented, which may be had at some drug stores. They are supposed to be more effectual than the simple borax composition. The latter is made by melting together 10 parts borax with 1 of sal-ammoniac, pouring it upon an iron plate, and when cool, pulverizing it and mixing it with an equal weight of powdered quick-lime.

Iron as a Medicine for Man. In this capacity iron is nearly always in combination with other substances, in the form of oxides or salts. The oxides are generally known as simple iron rust, which readily forms on pure iron in water, and the salts are copperas, bromide, carbonate, chloride, citrate, tartrate, prussiate, iodide, phosphate, tannate, valerianate, ammoniate, etc. The clear iron is tonic and astringent, and the compounds have a great number of uses, but they are mostly astringent, or "styptic." The red color and vitality of the blood are supposed to be due to the presence of iron compounds. No person, however, but a thoroughly trained physiologist should prescribe or tamper with this apparently innocent substance.

Iron as a Medicine for Stock, is one of the most valuable remedies we have to recommend in many of the most important diseases of all the animals. This fact is readily seen when it is stated that iron is a constituent of the blood of all warm-blooded animals; and without iron being in proper quantity in the blood of an animal it cannot be healthy. In fact, iron is an elementary principle, essential to health. Metallic iron is rarely used in veterinary practice, except to be in the form of iron filings, given by some persons in the case of worms in horses. The sulphate is just as good for this purpose. Iron filings are much used in the weakly and sickly female. To prevent the filings from oxidizing, or rusting, they are put into a tube similar to a gun-barrel, at a strong heat, and are then plunged into cold water, which give them a sky-blue color; the finer the blue the better the medicine. For the valuable dog, the iron filings, in this form, may be given in from five to ten grain doses. The following preparations of iron will be used for the horse and ox:

Carbonate of Iron. This preparation of iron is only used in veterinary practice for the dog, on account of its mildness.

Sesquioxide of Iron, Rust of Iron. This form of iron is used by veterinary surgeons only in poisoning from arsenic, as an antidote by forming in the stomach an insoluble arsenite of the protoxide of iron.

Sulphate of Iron, Green Vitriol, Copperas,

is one of the best and cheapest preparations of this valuable metal that can be used in diseases of horses and cattle. In medicinal doses the sulphate of iron is tonic and astringent; therefore, it is used in cases of weakness, want of condition, looseness of bowels, swelling of the legs, body, sheath, breast, etc. In pleuro-pneumonia in cattle, after the fever has abated, nothing will restore and prevent effusions of serum, or fluid, in the chest, like sulphate of iron; and effusions in the chest of cows, and other neat cattle, is the cause of very many deaths. The effusions are from connecting links between the lungs and sides, from which adhesions take place in that disease and from which the animal can never be restored to good health, although it may live for a year or two. How important, then, is a medicine offering so much hope! In addition to the diseases just named, sulphate of iron is the medicine to be used in all cases where the powers of life are low and depressed. In red water in cattle, bleeding internally in all animals, dysentery, purpura, scarlatina, and in debilitating diseases generally, no medicine offers so much as the sulphate of iron, or copperas. This should not be given while inflammation and fever lasts; it is time enough to give it after all irritation has subsided. It should always be combined with a vegetable tonic, such as gentian or ginger.

Doses. For horses and cattle, the dose is two to three drachms, with the same quantity of powdered gentian, two or three times in the day, to be given, mixed in a quantity of cold water. Drench out of a bottle. If the animal does not eat it readily, mix it with cut or soft feed.

Perchloride of Iron. Whether in a fluid or solid state, this preparation is valuable for bleeding wounds, to stop the flow of blood, which it will readily do if properly applied, and the blood vessel that is wounded is not too large. It should be applied with a soft brush or pledget dipped in it and laid over the wound, and kept bandaged. Perchloride of iron should be kept on every farm for this purpose. It should be kept in a glass-stoppered bottle to keep it pure.

Irrigation. This method for supplying lands with the necessary moisture for the growth of crops, where rain-falls are deficient, is of very ancient origin. The ancient Egyptians, who were perhaps the first to practice it, learned it from witnessing the effects of the annual overflowings of the Nile, and have practiced it upon tracts adjacent to the flooded ones from a very remote period to the present day. The ancient Romans, though not urged by any neccessity to irrigate regularly, well knew the value of irrigation. It also seems to have been practiced from an ancient period in China, India, Persia and Arabia. Indeed the Chinese historians, with the bold mendacity which characterizes most of their archæology, even pretend that it was practiced in "the Celestial Empire" at a period long prior to the date of the deluge. It became important to the Mormons when they first settled in Utah, and by its aid they have made Salt Lake City, planted in a barren sandy valley, to blossom as a garden of flowers. In most parts of this country the rain-fall is sufficient to furnish moisture to vegetation, and irrigation is not practiced; but in some localities it is employed to increase the product of meadows. For this purpose it can always be made profitable where a sufficient fall and flow of water can be obtained. All waters are suitable for this purpose excepting such as contain an excess of some mineral substance that is deleterious to vegetable life, such as the drainage from peat swamps, from saline and mineral springs, and from ore beds of various kinds. Hard spring water is better than soft, and of river water that which contains the larger share of sulphate and carbonate of lime is the most valuable. Waters which are charged with fertilizing substances that have been washed out of soils by recent floods are admirably suited to irrigation. Dana estimates the quantity of salts (in solution) and geine, or humus, which were borne seaward past Lowell, on the Merrimac river, in 1838, as reaching the enormous amount of 840,000 tons—enough to have given a good dressing to 100,000 acres of land. Such waters as have flowed out of the sewers of cities, past slaughter-houses and certain manufactories, and received the rich vegetable food thereby afforded, are the most beneficial when applied to vegetation. Meadows thus irrigated in the neighborhood of Edinburg, have rented at the large sum of $250 per acre.

Irrigation is largely practiced in Colorado for the purpose of raising grain, grass and vegetables. The water is conveyed from streams that flow from the Rocky Mountains, and is distributed over the country by means of capacious ditches, constructed by organized companies. It is taken from these large conduits and flowed upon the lands of the farmers by means of smaller canals, the flow of water being regulated by gates. This system enables the Colorado farmer to grow luxurious crops of grain, grass and other products, wheat often yielding 35 bushels to the acre.

Water deposited on grass land by irrigation should not be allowed to remain standing till it becomes stagnant, because it kills the grass, and promotes the growth of a race of sour and worthless aquatic plants; although, in those regions where the winters are not severe, water may be kept in the fields during the entire season of the frosts. This prevents its access to the ground, and on the approach of warm weather the grasses at once start into life, and give an early and abundant yield. But in general this system cannot be successfully practiced.

The water is admitted at proper intervals, freely during the spring and early part of the summer, when vegetation is either just beginning or going forward rapidly. Let it flood the surface thoroughly, and then shut off the water for a time. In very dry weather this may be done with advantage every night. Continued watering under a bright sun is an unnatural condition with upland grasses, and could never be long continued without proving fatal to them. Nei-

ther should the water be applied after the grasses have begun to ripen. After the grass is cut the water may be again let on to flood the meadows. Pastures may be irrigated at proper intervals throughout the year.

How to Irrigate. Where and how to obtain the water for irrigation is the most important question connected with this kind of fertilization. A fall from the reservoir is necessary, and if the water is not naturally sufficiently elevated for this purpose, it will have to be raised by windmill or water-ram. Fortunate is the farmer who has a stream or pond sufficiently above the fields to be irrigated to permit a flow of water over and through them. Irrigation may be effected by damming any water-break passing through a field, and thus causing the water to flow back over the land. When water can be dammed until it swells high enough to be carried by pipes or otherwise to the land, irrigation is easy. Hydraulic rams and windmills are often used for forcing water to a sufficient level for irrigation.

Water is conveyed from reservoirs or streams to the fields by ditches or aqueducts, and throughout the field in pipes or ditches. Where the character of the surface of the field is such that it has irregular depressions, but a general slope downward from the level of the reservoir, the courses of the distributing channels may be laid so as to irrigate the whole. Inexperienced irrigators often overdo the thing. A soil containing eighty per cent. of sand may be irrigated every five days; one containing 20 per cent. once in 10 or 15 days. Sandy soils are most benefited by irrigation, yet tenacious clay soils are improved by it. Irrigation when applied to gardens is particularly beneficial and profitable.

Isinglass (i'zing-glas), a semi-transparent, whitish form of gelatine, chiefly prepared from the sounds or air bladders of various species of sturgeon found in the rivers of Western Russia. The isinglass of commerce, however, is generally some cheaper form of gelatine. This article is used in fancy cookery, in making glue and in fining liquors,—all treated in their proper places in this volume. In cold water it softens, swells up and becomes lustrous. Boiling water entirely dissolves it, with the exception of a minute proportion of impurities. On cooling, the solution assumes the form of a jelly, which consists of pure gelatine and water. As an article of diet it has no advantage over calves'-feet jelly. Three drams to a pint of water are the usual proportions for preparing a dish. In fancy cookery its principal use is for making icings or frostings for cakes, etc.

Issue, in medicine, an artificial ulcer designed to promote the secretion of pus. This ulcer is usually made in the fleshy part of the arm or leg, by a slight incision, into which a little lint is put till the wound suppurates; the lint being then removed, an "issue pea" is introduced, and by the irritation it creates and promotes the secretion and discharge of pus. An "issue pea" is a common pea or any small, round body used to maintain irritation in a wound and promote the secretion of pus. In the treatment of farm animals, an issue is kept open by a rowel or seton. The practice is going out of use.

Itch. This disease is known by the appearance of pimples and vesicles, which by scratching acquire little black heads. The itching is augmented at night by the warmth of the bed. The disease may generally be known by the peculiarity almost always existing between the fingers, and on the wrists and elbows, when it affects other parts. It never appears on the face. It seldom happens in any but those of dirty habits or trade; common cleanliness will always prevent it. It is contagious or catching, being communicated by contact. There is supposed to be a kind that last for seven years, and known as seven years' itch; but the ordinary kind will last as long if left to their career. The luxury of scratching is said to greatly compensate for the filthy disease. Dr. Ellitson says a Scotch king—viz., James I.—is alleged to have said that no subject deserved to have the itch—none but royalty—on account of the great pleasure derived from scratching. The king is said to have spoken from experience.

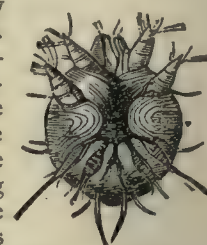


Fig. 1.—*Itch Mite.*

Treatment. Among many sulphur is the grand treatment; it does little good taken internally, but the ointment should be well rubbed in every night and morning. Care should be taken not to catch cold while using it. Among the better classes who occasionally get this disease by accident, the sulphur is usually perfumed. We can recommend another powerful remedy, viz., a strong solution of the iodide of potassium, which should be put over all the affected parts every night, and left to dry on. It has the advantage of having no smell.

Or, wash the body well in warm water, and rub it with the following preparation: Lime, 2 ounces; sulphur-vivum, 2 ounces. Mix in 1 quart of water. Pour off and use it when clear.

A decoction of white hellebore, with a little lavender water, has been recommended.

Barbers' Itch. This is a variety of itch which usually appears upon the face. It is thought to be caught in barber shops while being shaved. It is confined almost exclusively to the male sex, and generally to men and those who shave. A few red pustules first appear, attended with a sense of itching or burning. In a few days these dry up and peal off in thin scales. Other pustules appear and scale off in the same way. If permitted to continue it will become chronic, gradually spreading and extending deeper into the skin. To treat this, use an ointment made by mixing 1 ounce of lard and 2 drams of sulphate of zinc. Or equal parts of tincture of lobelia, blood-root and stramonium seeds and oil of cedar, and use two or three times a day. Should there be much inflammation, poultice the part with elm bark at night.

J

JACK, a portable apparatus, variously constructed, for raising great weights a short distance, as by means of a pedestal or support, in which works a screw lever, rack and pinion, or some combination of simple mechanical powers; also, an engine to turn a spit, as a kitchen jack, or smoke jack; in general, any appendage, rendering convenient service; also, a horse or wooden frame, on which wood or timber is sawed; a wooden wedge used by miners to separate rocks after blasting, etc. Also, the male of certain animals, as of the ass. "Jack at all trades," one who can turn his hand to any kind of business. "Jack boots," large boots reaching above the knee. "Jack plane," a plane about 18 inches long, used for coarse work. The bit has rounder corners than that of a smoothing plane, and is adjusted to take a deeper hold. "Jack knife," a heavy and strong pocket knife. "Jack screw," a portable apparatus, worked by a screw, for raising heavy weights a short distance. For Jackass, see Ass.

Jalap (jal'ap), a medicinal root from Mexico, named after a country there,—Jalapa, or Xalapa, pronounced hal'a-pa. It is an active cathartic, producing copious watery stools. A dose of jalap in powder is 15 to 30 grains; for a dog, 20 to 60 grains.

Jam, same as Marmalade, which see.

Jamaica Pepper, allspice. See page 19.

Jamb (jam), the side-piece or post of a door; the side-piece of a fire-place or any other aperture in a building.

Jaundice (jan'dis), a disease, whereby the bile is thrown into the skin, mucous membranes and even into the eyes, causing a yellowness of the skin and eyes, white fæces and high-colored urine. The vision is so affected that every object seems to have a yellowish color, and there is general fever. It might be described as ague or bilious fever turned inside out, as scrofula is an eversion of tubercular consumption. This disease is not dangerous, and as to the treatment no medicines are more beneficial than emetics occasionally repeated, followed by gentle purges of rhubarb or Epsom salts. Give bitters to regulate the bile and restore the digestive powers, and treat the same as for ague, page 11. When the system is much disordered, it will be necessary to go through regular courses of medicine. Patients have often been cured of jaundice by a long journey, after other means had failed. Jaundice in horse, see page 785; in cattle, see page 231.

Jelly, the thickened juice of fruits or meat, boiled with sugar. It is therefore a "sweetmeat," and used as a condiment or a dessert.

Fruit jellies are compounds of the juices of fruits combined with sugar, concentrated by boiling to such a consistence that the liquid, upon cooling, assumes the form of a tremulous jelly. Vegetable jelly is a distinct principle existing in fruits, which possesses the property of gelatinizing when boiled and cooled; but it is a principle entirely different from the gelatin of animal bodies, although the name of jelly, common to both, sometimes leads to an erroneous idea on that subject. Animal jelly, or gelatin, is glue; whereas vegetable jelly is rather analogous to gum, though different from it, and not nearly so nutritious as animal jelly or gelatin. In preparing vegetable jellies, it is necessary to guard against boiling them too long, since this destroys their property of gelatinizing, and they then assume the appearance of mucilage or gum; and this accident is most likely to occur when the quantity of sugar is too small to absorb the water of the juice. Jellies are most perfect as to beauty and transparency when clarified sugar is used; but for ordinary purposes refined sugar answers very well.

Apple Jelly. Almost any apple will make jelly, though a hard, sour, juicy apple makes the best, both for keeping and flavor. Peel and core your apples, boil them in a pint of water to every four pounds of apples till the latter are perfectly soft, stirring them occasionally to prevent burning. Strain, without squeezing, through a jelly-bag, measure the juice, and put a pound of loaf sugar to every pint of juice. Put juice and sugar into the preserving-kettle, and boil steadily for half an hour, skimming occasionally. Cool a little, and if it will not jelly, boil a little longer. Pour into glasses before it cools, and when perfectly cold, cover each glass with a paper wet with alcohol; tie closely, and keep in a cool, dry place. The apple remaining in the bag can be stewed with one pound of sugar to two of apples. If flavoring is preferred, lemon peel, green ginger, or cinnamon can be used.

Arrow-root Jelly. To a dessert-spoonful of the powder, add as much cold water as will make it into a paste, then pour on half a pint of boiling water, stir it briskly and boil it a few minutes, when it will become a clear, smooth jelly; a little sugar and sherry wine may be added for debilitated adults; but for infants, a drop or two of essence of caraway seeds or cinnamon is preferable, wine being very liable to become acid in the stomachs of infants and to disorder the bowels. Fresh milk may be substituted for the water.

CURRANT JELLY. Put the currants, with the stems on, in stone jars, and cover them; put no leaves in. Set the jars in warm but not hot water, over the fire. When the water boils and the fruit is warm and somewhat sunken down, strain them through a linen or flannel bag. To every pint of juice allow a pint of loaf sugar; do not cook the sugar. Put it in a clean milk pail; put the juice into a granite kettle, boil it about 5 minutes but not longer; pour it boiling hot upon the sugar and stir till all the sugar is dissolved. Then put it in bowls, glasses or jelly molds. Paste on white paper covers; white of egg is often used for this purpose. The jelly will be thick in a few days. A good squeezer is made by two boards attached at one end with a hinge and the other ends shaved down into handles. This is used for the straining.

White currant jelly is made in the same way as red currant jelly, only it should have double refined sugar and not be boiled above ten minutes. White currant jelly should be put through a lawn sieve.

CURRANT JELLY. The currants should be ripe and freshly picked and the jelly should be made before the 20th of July. Pick them from the stems and put them into a preserving kettle without any water; let them stew gently; remove from the fire when they begin to turn white, and press them through a strainer cloth to extract the juice; to each pint of juice take a pound of sugar; it is better if it can be put into the oven and dried, and put hot into the currant juice. Boil it 15 minutes after the sugar is added. Dip it slowly into your jelly glasses, having a wet cloth wrapped around each to prevent it from cracking when the hot jelly is put into it. Some think it an improvement to put a quart of raspberries to half a peck of currants.

GRAPE JELLY. Strip from their stalks some fine, ripe grapes, and stir them with a wooden spoon over a gentle fire until all have burst and the juice flows freely from them. Strain it off through a jelly cloth or bag. Measure, and to each pint of juice allow fourteen ounces of sugar. Put the juice on to boil for 20 minutes; then stir in the sugar and boil 15 minutes longer, keeping it constantly stirred and well skimmed.

BARBERRY JELLY. Pound the berries in a dish with a mortar pestle, or a masher, a few at a time, to extract the juice; put them into a kettle with just a trifle of water; scald them a little to make them press well. Measure the juice, and allow to each pint a pound of sugar. Boil the juice up once; but just before putting it over the fire, put the sugar into the oven to dry; add the sugar to the juice and boil seven minutes after it commences to boil. Spoon the jelly hot into the glasses.

CRAB-APPLE JELLY. Put the apples into a kettle with just water enough to cover them, and let them boil until they are very soft; mash them up, and strain them through a very coarse hair sieve. Take a pound of apple to a pound of sugar, boil it twenty minutes, and put it into jars.

QUINCE JELLY. Take the skins and cores of quinces, cover them with water, and let them boil about two hours; strain them through a fine sieve; measure, and to each pint allow a pound of sugar; boil it twenty minutes.

STRAWBERRY JELLY. Press the juice from the berries; strain it through a jelly bag, measure, and to each pint of juice allow a pound of sugar; boil the juice ten or fifteen minutes before adding the sugar; then boil fifteen minutes.

GOOSEBERRY OR CRANBERRY JELLY. Boil the berries in a very little water until they are soft; then squeeze them through a cloth or jelly bag; and allow to each pint of juice a pound of sugar, and boil it fifteen or twenty minutes.

JELLY WITHOUT FRUIT. Take water, 1 pt., and add to it pulverized alum, ¼ oz., and boil a minute or two; then add 4 lbs. of white crushed or coffee sugar, continue the boiling a little, strain while hot; and when cold put in half of a two-shilling bottle of extract of vanilla, strawberry or lemon, or any other flavor you desire for jelly. This will make a jelly so much resembling that made from the juice of the fruit that any one will be astonished, and when fruit can not be got, it will take its place admirably.

AN EXCELLENT JELLY FOR THE SICK-ROOM. Take rice, sago, pearl barley, hartshorn shavings, each 1 oz.; simmer with 3 pints of water to 1, and strain it. When cold it will be a jelly, of which give, dissolved in wine, milk, or broth, in change with the other nourishment.

Do not buy jellies at the groceries if you can avoid it. The basis of nearly all the jellies turned out in manufacturing establishments is what is termed "apple juice;" and this is doctored up with various drugs for flavoring, and correspondingly labeled "Pure Raspberry Jelly," "Pure Currant Jelly," etc. For example, their "Pure Raspberry Jelly" will be made as follows: 8 gallons apple juice, 16 pounds sugar, 8 pounds glucose, 1 ounce sulphuric acid, ¼ pound corn starch, and aniline and acetic ether for flavoring. How is that for food? Real, pure fruit jelly cannot be furnished in the market for less than 12 cents a pound; and, therefore, when we find it offered for much less we may be certain that the article is a base fraud.

Jenny, a spinning-machine; a female ass.

Jersey, as a breed of cattle, see page 202; for Jersey Red hogs, see article Swine.

Jerusalem Artichoke, a salad. See page 49.

Jewelry. As to the quantity, quality and style of jewelry to be worn by polite people, see page 394. To clean and polish jewelry, see Gold and Silver. Precious stones may be cleaned and brightened by first washing them with a brush in soap-suds and then shaking them violently in a small box of sawdust for several minutes The best sawdust is that which is furnished at the jewelry stores for the purpose. Great care should be taken in the purchase of jewelry. Be particular and see that the metal be pure, and if set with jewels ascertain that they are genuine or are really what they are called. Some precious stones are easily known, but others are extremely difficult to

distinguish, and therefore jewelers may very easily deceive their customers. The only safe way, where one wishes to purchase really good jewelry, is to buy from a well-established and reliable jeweler.

DIAMOND. The unrivaled brilliancy of this gem has always attracted universal admiration, and among ornaments it has ever occupied the highest rank. No other substance, natural or artificial, can rival its luster, rich with prismatic colors. The beauty of other gems is almost lost to the distant beholder; the diamond alone diffuses its starry radiance to the most distant parts of the assembly, and has acquired, by common consent in all ages, a prodigious value that continues undiminished. The diamond is the hardest of all known substances, and it is supposed by some not to be capable of being broken by the blow of a hammer; but though the substance is extremely hard, it is not difficult to fracture. Diamonds are cut and polished in particular shapes, which have received the names of brilliant, rose, and table-cut. The brilliant is in the highest estimation, as it is in the form which shows to the greatest advantage the peculiar luster of the gem. The setting of diamonds is of great importance, and depends partly upon their quality. The finest brilliants are always set open, that is, without a back. Diamonds are always equally in fashion, but the mode of setting them varies according to the caprice of taste or the desire of novelty.

GEMS BELONGING TO THE SPECIES CORUNDUM. Corundum is the name of an extremely hard mineral substance, found chiefly in India, and used there extensively for cutting and polishing the hardest stones.

Sapphire is the purest or perfect state of corundum, and is the hardest of all earthy minerals, being inferior in this respect only to the diamond. What is considered as the most perfect, or Oriental sapphire, is of a clear, bright blue color, with a high degree of translucency; but it is also pale blue, and sometimes violet blue, or cloudy. Sapphires are also occasionally colorless. The finest sapphires come from Pegu and Ceylon, where they are found only in the beds of rivers, often in rounded fragments, generally small, and seldom exceeding the size of a hazelnut.

Ruby. The ruby is a gem which, when of the kind called Oriental, is of great beauty and value. The true, or Oriental ruby, when perfect, is the most valuable of the gems next to the diamond; the color is a fine, deep, cochineal red, having a richness of hue unrivaled; occasionally it is rose-red, or has a tinge of violet.

Emerald. The emerald, in value, ranks next to the ruby. It is of a pure, beautiful, bright, and intensely green color, when the stone is of the most perfect kind, called Oriental; hence the name emerald green. The color, however, varies a little; sometimes it is paler, and the green less lively, or it is a pale blue, or yellowish. The form of its natural crystals is a six-sided prism. The finest emeralds come from Peru, where they have been found occasionally several inches in length. They are also found in Ceylon and Egypt.

Beryl, Aquamarine. The primary form of its crystals is a six-sided prism, terminated by a six-sided pyramid, truncated; and this is its usual form. The color of the beryl is various shades of pale yellow, or green, or blue. The common beryl is scarcely employed in jewelry, on account of its numerous flaws and cracks.

Topaz. The topaz is a particular species of mineral, occurring in crystals of the form of a rhombic prism, variously terminated. It somewhat resembles quartz, but is distinguished by the form of its crystals, by its superior hardness, and specific gravity. Both it and quartz scratch glass, but topaz scratches quartz. It is sometimes colorless and translucent, but usually has various pale shades of yellow, green, blue, lilac, or red.

Turquoise. The turquoise is rare and much in request. It is destitute of the luster which distinguishes most of the precious stones; it is opaque, and does not admit of a very high polish, but its color is a fine celestial blue. It is from the size of a pin's head to that of an almond. Malachite is sometimes sold for turquoise.

Moonstone. The moonstone is a variety of feldspar called *adularia*, and is beautifully translucent, of a milky color, and having a remarkable play of light, amounting to a slight pearly luster, and sometimes iridescence, which contrasts agreeably with the delicate bluish tint of the stone; whence its name. It is used for ear drops and rings, and when fine, sells for a high price.

Garnet. Garnet is a very common mineral, though beautiful specimens, called the precious garnet, or *almandine*, are classed with gems. They are usually of a deep red. The finest come from India. Garnets are hard enough to scratch quartz, and, of course, much harder than glass, by which glass counterfeits may be easily distinguished by means of a file.

Rock Crystal, Transparent Quartz. This stone is sometimes quite colorless, and beautifully transparent; it is also occasionally, though rarely, yellow like topaz; but it is softer than topaz, and of a different crystalline form in its natural state. This is the "Alaska diamond" now so common in this country.

Amethyst. There is the same confusion respecting stones of this name as with others we have mentioned. The amethyst of modern mineralogists is merely a violet-colored quartz or rock crystal; but what has been called Oriental amethyst among jewelers is a violet-colored sapphire, which is a stone of great beauty and value. The color of the common amethyst is purple, of various shades and degrees of intensity; those which are of the deepest purple are the most precious, but the depth of the tint varies much, being in some scarcely perceptible, when the stone is of scarcely any more value than rock crystal. Amethysts are found in many countries; but of late many have been brought from Brazil, and some of considerable size. They are much used in bracelets, seals, and similar ornaments.

Opal. This stone is a very pure kind of flint, and differs from chalcedony chiefly in its luster and color; but the difference cannot easily be expressed in words. There is the precious opal and the common opal: the former exhibits a remarkable play of prismatic or iridescent colors—blue, red, and yellow, green, etc. These colors are sometimes, in fine specimens, intensely bright and beautiful; sometimes the stones exhibit only one color. It is always cut hemispherically, and it is often full of flaws, which only adds to its beauty from increasing the vivacity of the colors. When fine, the precious opal is of great value; it is brittle, and softer than rock crystal.

Chalcedony, Agate, and Carnelian. These stones are placed together because they are all varieties of the same thing. Chalcedony is a sort of very pure flint; but, instead of being perfectly clear and transparent, it is tinged, more or less, with a milky hue. When chalcedony has in it various curved parallel bands or stripes of a white or other color, it is called agate. Fortification agates are those which have zigzag parallel bands, generally of white and gray, having a distant resemblance to the plans of a modern fortification. In the center of these agates there are sometimes rock crystals and amethysts. Sometimes, instead of these bands, there are minute metallic crystallizations resembling mosses, and which have been, though erroneously, supposed to be really vegetables; these are termed moss agates. Those are most valuable which resemble very closely some plant. The onyx is a variety where the bands of different colors are perfectly straight, the stone consisting of several flat layers, whereas in agates the layers are curved. Onyxes were much used by the ancients for making cameos.

Jet. Jet is well-known to be of a deep black, and is used for necklaces, chiefly worn in mourning. It is a kind of coal, or, rather, fossil wood, and costs little more than the expense of cutting; it is made into beads, snuff-boxes, and other trinkets. Cannel coal is sometimes substituted for it, but this is very inferior.

Amber. This is a well-known transparent mineral substance, of a yellowish colour, and is supposed to be a fossil resin.

PEARLS. Pearls are precious, and form beautiful ornaments, highly prized. They are calcareous bodies, of the same nature as mother-of-pearl, only purer, found in the inside of certain shells, particularly a large one called the pearl oyster. The pearl shell is found only in warm climates. They are found either loose in the body of the animal, or attached to the side of the shells. These shells are extremely abundant near the shores of some of the East India islands, and particularly Ceylon, where the chief pearl fisheries have been established. The shells are brought up by persons who have learned to dive for them to great depths. They descend to the bottom of the sea from five to ten fathoms in depth, assisted by a large stone, which they carry down with them; and, being furnished with a basket, they collect, with as much expedition as possible, such shells as happen to lie about the spot of their descent, continuing their search for about two minutes when, according to a signal which they make to the boat to to which their cord is attached, they again ascend with their treasure. Each diver will bring up as many as one hundred shells of various sizes, and some, from long habit, acquire the power of remaining under water for five or six minutes. It is not every shell that affords pearls; some contain only small ones of little value. The finest are of a clear white, and very translucent: those which have a tinge of yellow are less precious. Though pearls are found of the largest size, greatest beauty and most abundantly in the shell we have mentioned, yet they are not confined entirely to these: common oysters and muscles occasionally contain small pearls; and a fresh-water shell called a *unio*, or pearl muscle, is particularly remarkable for the pearls it contains.

CORAL. This beautiful material, of a fine red color, is the production of animals that inhabit the sea, and which consist of a fleshy substance, surrounding a solid, calcareous body, which is called the coral. The species of red coral used for ornaments, in form resembles a small, branched shrub, and is attached to rocks at the bottom of the sea.

Jibber, is a poorly broken horse; one that moves restively sidewise or backward.

Jog Trot, a slovenly trot in which an animal shakes his body up and down, without getting over the ground very fast.

Joints, DISLOCATION OF: see Dislocation, page 324.

Journal, the portion of a shaft or axle which revolves on a support.

Judas Tree, red-bud; a low, scraggy forest tree, with a spreading top, which sends forth a profusion of red or purple flowers in early spring before the leaves appear. It is somewhat ornamental, and as such is found on some lawns. Another species grows in the Old World, and the name is derived from the legend that Judas, the apostate disciple, hanged himself upon such a tree.

Judgment, HOW LONG COLLECTIBLE: see Limitations. For "judgment note," see Note.

Julep, a sweet drink, particularly one which has mucilage and vegetable acid mixed with it. A mint julep is a drink of spirituous liquor, sweetened, iced and flavored with sprigs of mint.

Jumble, a small sweet-cake, often in shape like a ring. Recipe: One cup of butter and 2 of sugar, beaten together; 1 cup of milk, ½ teaspoonful of soda stirred into the milk and 4 eggs. Beat well together, spice, add 6 cups of flour, roll thin, cut with a jumble cutter, brush with white of egg, sift on a very little fine white sugar, and bake 15 or 20 minutes.

LEMON JUMBLES. One egg, 1 cup of sugar, ½ cup of butter, 3 tablespoonfuls of milk, the juice and grated rind of two small lemons, a teaspoonful of condensed

baking powder, flour enough to roll out, cut with a cake cutter, and bake as above.

FRUIT JUMBLES. Three-fourths of a pound of butter, a pound of sugar, 5 eggs, a teacup of milk, a gill of wine, a teaspoonful of soda, 1 1/4 pounds of flour, and 1/4 pound of currants. Drop them on tins with a spoon, and bake in rather a quick oven.

Jump-seat, a carriage constructed with a movable seat, so as to be readily changed from the one-seated to the two-seated form; a movable carriage seat. Hence, any style of carriage with such a seat is called "jump-seat;" as, "jump-seat rockaway," etc.

Juniper, an evergreen shrub or tree, of the pine family. The common juniper has a low, spreading

Juniperus venusta.

form; awl-shaped, rigid leaves in whorls of threes; and bears small purplish-blue berries, of a warm, pungent taste, yielding by fermentation a kind of "gin." When the bark is wounded a resin exudes from it, from which varnish and incense have been made, and which, dried and pulverized, is used on paper to prevent ink from spreading. The oil of juniper is acrid, and is used in varnishes, medicines, etc. In horse and cattle diseases, the berries act as a stimulant to the stomach. One to two ounces are given at a dose. Dogs are given 20 to 40 grains.

The wood is of a reddish color, hard and durable, and is used in cabinet-work and veneering. Irish juniper is a most beautiful variety of this species, being erect, dense and compact, and well adapted to fancy forms on the lawn. Swedish juniper is more hardy, has light yellowish-green foliage, and grows upright, 10 to 15 feet high. The weeping juniper is a beautiful, but tender tree, from Japan and China. The red cedar is a species of juniper. One of its forms is the beautiful Juniperus venusta, here illustrated.

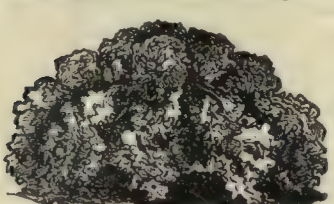
Jute, the fiber of the jute plant, and is the material from which "gunny-bags" are made. The plant is a native of India, where it is largely cultivated by the natives, who weave the fiber into sacks, nets, etc. The gunny-bag is used in all countries, and is always in demand. The fact that jute is so extensively used in this country has inaugurated experiments to ascertain whether it can be successfully raised here. Though these experiments have been made on a small scale, it is proved that jute can be successfully grown in California and the Gulf States, and possibly in somewhat more northern States. Farmers living in any of the above-named States should experiment, at least to the extent of one or two plantings. If its culture prove successful, they have opened a new avenue to wealth which only needs working to yield immense profits. It is cultivated and cured as follows: Sow the seed broadcast, early in the spring, in a moist, sandy loam. The plants grow rapidly, and will attain a height of 6 or 8 feet in 3 or 4 months. Cut the stalks as soon as the blossoms fall, and before the seed begins to ripen. Tie them in small bundles and throw them into a tank or pond of water, where they should remain from 5 to 8 days to rot, when the fiber will fall from the stalk. As soon as it is dry it is ready for the loom or paper mill. Immense quantities of this plant are annually turned into paper, and even the root is used for that purpose in India. An experiment in the South seems to show that a belt of jute around a cotton field protects it from the cotton worm. The peculiar odor of the flower and the bitter exudation from the leaves seem to be strongly repulsive to the worm.

K

KALE or **BORECOLE**, a plant of the cabbage family and cultivated on the same principles. Plant the larger sort in hills two by three feet apart, and thin to one plant in a hill. Being very hardy, it is easy to be wintered, and is good for early sprouts in the spring, to be used as greens. It is rather too rank for use in the fall before it has frozen. Some of the varieties are very ornamental, and scattered singly are attractive in the flower garden, being finely curled and variegated with green, yellowish white, bright red and purple leaves.

VARIETIES. *Carter's Garnishing*. Both ornamental and useful; the seed will produce many varieties of high-colored plants.

Sea Kale. The young shoots when blanched are exceedingly delicate, being much superior to broccoli.



Kale, or Dwarf German Greens.

Dwarf German Greens, or *Green Curled*. Very hardy; standard market sort.

Acme. Very tender and delicious when boiled; very dwarf.

Field Kale, for cattle; can be cut several times during the season.

Green Curled Scotch. A very fine variety.

Frisby's Crested, *Green-Curled Tall Scotch and Abergeldie* are new and promising varieties. Several other varieties are ornamental.

Kalsomining. See Calcimining, the correct spelling.

Kennel, an establishment for breeding dogs; a dog house; a pack of hounds. See page 355.

Kerosene, a liquid hydrocarbon or oil extracted from bituminous coal or petroleum, used for illumination and other purposes. The medical and economical uses of kerosene are so numerous that the reader may look for them under almost every heading in this volume.

TO KEEP KEROSENE OIL in good condition, always keep it tightly corked, otherwise it will burn dull and cake on the wick, especially if kept in a warm place. As this oil precipitates a sediment, it is well to have a faucet near the base of the can, through which to draw off supplies without disturbing the sediment. The oil used will then be clear and bright.

TO TEST KEROSENE. Kerosene, or coal oil, is often adulterated with heavy oil or with benzine. The adulteration with the former is shown by dimness of the flame after having burned for some time, accompanied by a charring of the wick. The latter may be readily detected by means of a thermometer, a little warm water and a tablespoonful of the oil. Fill the cup with warm water and a tablespoonful of the oil. Fill the cup with warm water of the temperature of 110° Fahr. Pour the oil on the water, apply flame to the floating oil by match or otherwise. If the oil is unsafe it will take fire, and its use in the lamp is dangerous; for it is liable to explode. In some States the law requires a higher flash test, but amendments are frequently made, varying the standard. No oil is explosive in and of itself. It is only when the vapor arising therefrom becomes mixed with the air in a certain proportion that it explodes. There should be no inflammable vapor from any oil used for burning in lamps at ordinary temperatures. A volatile oil is therefore unfit for the purposes of illumination. See Lamp and Petroleum.

To remove kerosene odor from the hands, wash in sweet milk or with wetted bran.

Kerf, the face of a cut made by an ax or a saw.

Kettle. To prevent iron kettles from rusting, rub them thoroughly with grease or oil while they are hot, envelop them in paper and set them in a dry place, the nearer the stove, stove-pipe or chimney the better. Boiling up iron rust into one's victuals is not healthful. When alkaline solutions (ashes or lye) have been heated in a kettle, all the protective coating is taken off, and this is the case most necessary in which to put on the above coating, which also, applied on the outside, will keep it black and shining. Wipe with a newspaper.

To prevent incrustations of lime or furring in a tea-kettle, keep in it an oyster shell or piece of marble.

When a kettle is heated dry, water should not be poured into it, as it has a tendency to crack the metal.

Key, in mechanics, a wedge of wood or metal driven into the end of a piece which is inserted in a mortice for holding it securely.

Kicking, a well-known vice in horses. See pages 712–3, 723

Kid Gloves. To clean, put them into gasoline for a day. Or wash by laying the glove on a clean cloth, and rub first until dry with another white clean cloth. Black kids may be renovated by going over

them with a feather dipped in a little salad oil with which a few drops of common black ink have been mixed. Rose oil is also good.

To remove stains from kid gloves, suspend them for a day in an atmosphere of ammonia. Provide a tall glass cylinder with a little strong ammonia water in it; be careful to remove from the sides of the jar any ammonia that may have spattered upon them, and suspend the gloves to the stopper, not permitting them to touch the liquid.

To prevent injury to kid gloves by perspiration, dust the hands with corn starch or pulverized soapstone before drawing on the gloves.

Kidney Bean, the type of all the varieties of cultivated bean, so called from its shape resembling that of a kidney; called also "haricot bean." The White Kidney bean is an excellent variety for shelling green and cooking with green corn, forming succotash.

Kidneys. These, in the human subject, are two dark red bodies, five to six inches long and three to four wide, having one side slightly longer than the other. They are situated near the back-bone in the upper part of the abdominal cavity, their upper half stretching across the two lower false ribs and the upper extremity in contact with the lower side and posterior border of the diaphragm. When they are painfully diseased, the pain seems to be about the middle of the back. The office of the kidneys is to secrete the urine, which passes from them in tubes called ureters to the bladder, whence it is conveyed by the urethra to the external outlet.

INFLAMMATION. This is characterized by pain in the region of the kidneys, shooting downward through the bladder. Sometimes it is accompanied by numbness of the thighs, high-colored urine, which is frequently discharged, constipation, vomiting, and general fever. It is caused by acrid food, irritating condiments and diuretic medicines, severe exercise, exposure of the back to drafts of air, etc.

Treatment. Give small doses of lobelia, just sufficient to relax the system and produce perspiration. Afterward apply to the region of the kidneys a hot fomentation of hops, wormwood and tansy, simmered in vinegar and water, with a little bran mixed with them. Then give sweet spirits of niter, 2 ounces; oil of sweet almonds, 2 ounces, and spirits of turpentine, 1 ounce, mixed,—a teaspoonful every three or four hours during the day, in a cup of warm spearmint tea. Let the patient drink also a decoction of marsh mallows (leaves or root) and mullein leaves, or either of them if both cannot be procured. Horsemint may be added. If the pain is severe or of long standing, apply a liniment made of oil of juniper ½ ounce, oil of spearmint ½ ounce, spirits of turpentine 1 ounce, tincture of cayenne 1 ounce, laudanum 1 ounce and alcohol ½ pint.

ULCERATION and other obscure diseases are too difficult of diagnosis by the unprofessional, and indeed by the profession generally, as a powerful microscope has to be used and many recondite symptoms and conditions taken into account. Almost any "doctor" will pretend to know what is the matter, and tinker with the case as long as he is permitted; while every time the patient is better the doctor gets the credit and every time he is worse the disease gets the blame.

BRIGHT'S DISEASE. This is a structural degeneration of the kidneys, attended with albuminuria (albumen in the blood) and a dropsical condition. The tendency of the chronic form is always toward a fatal result. About one-third die of uræmic poisoning (urine in the blood); a considerable number die of dropsical effusions (collections of water in some part); one-fifth die from secondary pneumonia, inflammation of the membranes enveloping the heart or pleurisy; the rest by exhaustion from loss of blood, indigestion, general dropsy, etc.

Symptoms. The acute form seems to be excited into existence by exposure to cold, a drunken spree, an attack of fever or the use of irritating diuretics, and is ushered in by chilliness, headache, nausea, vomiting, pain in the back and limbs, stoppage of perspiration and oppression in breathing. The urine is scanty, heavy, and dark in color, from the presence of blood, and ropy or cloudy from the presence of albumen. Probably two-thirds or more of the acute cases recover. The chronic form is characterized by the persistence of albumen appearing by periods in the urine, complicated with dropsical symptoms.

Treatment. Foment the region of the kidneys as long as the pain is severe; take general hot-air baths; keep the bowels open by a proper diet, or take purgatives, as cream of tartar and jalap or citrate of magnesia or potash, etc. Avoid exposure to cold, wet and fatigue; be totally abstinent from alcoholic and other intemperance; bathe frequently, always finishing off with a great deal of hand-rubbing of the skin; permit no acid matter in the diet. Tincture of the chloride of iron and (for strong stomachs) cod-liver oil may be given for the chronic form. Avoid astringent and mercurial medicines. But generally the complications of chronic Bright's disease are so obscure and threatening that the skill of a physician will be requisite.

Farm animals afflicted with kidney disease show the fact by weak hind-quarters, and are past redemption. See respective animals.

Killing ANIMALS: see Slaughtering.

King Bolt, of a wagon, is the largest bolt, which holds the coupling pole to the fore axletree, and at the same time the bolster on the axletree, allowing the latter to turn freely and independently.

Kino (ki'no), an astringent extract of a deep brownish red color, obtained from certain tropical trees. It is used in medicine, to stop diarrhœa when no high fever accompanies, and the powdered root stops bleeding at the nose or from wounds. It is also used for other purposes, but for all of them more common remedies are equally efficient.

Kitchen, a cooking room. The culinary art is a complicated and responsible one, involving knowledge and skill in various subsidiary or collateral branches; and these are distributed throughout this volume under the heads, Cookery, Residence, and all the different articles and processes used in or in connection with kitchen work.

Below we give a list of the articles more or less needed in the kitchen and dining-room, omitting laundry furniture, special dairy appliances and most carpenter tools, some of which are occasionally required in culinary work:

Apple-Corer	Fruit Dishes	Skillets
Apple Parer	Fruit Press	Soap Dish
Bath Brick	Frying Pans	Soup Ladle
Bellows, Hand	Funnels	Spice Cans
Bone Saw	Goblets	Spice and Pepper Boxes
Bottles	Gridiron, for Broiling	Spit
Braising Pans	Hash Knife or Meat Chopper	Spoons, Table, Dessert and Tea
Bread Board	Heat-Fender	Spoon Case
Bread Box	Jelly Molds	Steak-Beater
Bread Knife	Knife Box	Steamer
Bread Tray	Knife Sharpener	Stew Pans
Broom	Match Safe	Stools
Butter Ladle	Meal Sieve	Stove or Range
Butter Plates	Meat Dishes	Stove-Lid Lifter
Butter Stamp	Mush Paddle	Strainer
Cake Cutters	Napkins, for Washing, Wiping and Furnishing Table	Sugar Dredger
Can Opener	Napkin Rings	Tables
Call Bells	Nutmeg-Grater	Teacups
Carving Knife and Fork	Pails	Teapot
Case Knives and Forks	Paring Knife	Toast Rack
Casters and Cruets	Patty Pans	Tongs
Chairs	Pie Pans	Tubs
Cherry-Pitter	Plates, Breakfast and Dinner	Tureen
Coffee Pot	Plate Rack	Vegetable Dishes
Colanders	Poker, for Fire	Vegetable or Root Grater
Cork Screw	Pots	Vials
Decanter	Rolling Pin	Waiter (Server or Salver)
Dippers	Salt-cellars	Wash Basins
Dust Pan	Sauce Dishes	Water Filter
Dutch Oven	Saucers	Whetstone
Egg Beater	Shovel, for Fire	Whisk
Faucets	Silver Polish	
Fender		
File		
Flour Dredger		
Flour Sieve		

Knee, a principal joint in the legs of man and the fore-legs of quadrupeds. The knee of the horse is a very complicated and exceedingly important joint. It constitutes the articulation between the horse's arm and his shank, and corresponds anatomically, or in relative position, to man's wrist. It comprises the lower end of the bone of the arm, the upper end of the three bones of the shank, and six proper or interposed bones, arranged in two rows of three each, with a seventh one behind. This important joint and integuments are very subject to injury from falls and bruises.

Knee Joint, or **Toggle Joint,** a joint consisting of two pieces butting on each other like the bent knee, so as to thrust with increasing power when pressed into a straight line.

Knickknack, a sweetmeat; a dainty.

Knife-Sharpener. A small contrivance has been invented, consisting of two hardened edges of steel, adjusted so as to shave off a knife edge. It is found at some hardware stores, and sometimes sold on the streets of towns by hawkers. It is seldom substantial, and does not supersede the old-fashioned whetstone, grindstone or file.

Knock Down or **Off,** at auction, is to declare the sale of the article closed to the last bidder.

Knots. The farmer who knows how to tie the right kind of a knot with a rope, cord or strap, with

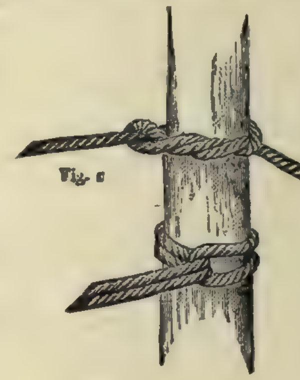


FIG. 1 and 2.

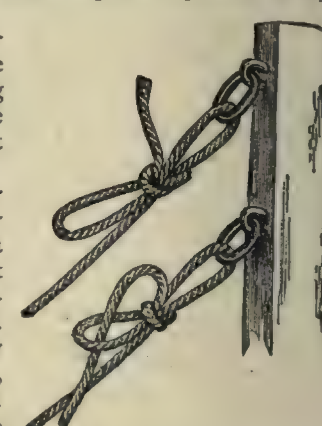
FIG. 3.

neatness and dispatch, possesses a useful accomplishment, and will often save time and trouble in the numberless cases where this kind of skill is needed.

FIG. 4.

For the purpose of assisting the unskillful and inexperienced, we give a few brief directions, accompanied with illustrations, to show how some of the more common and useful knots are tied, to which many others might be added, especially of those known to sailors; but these here described embrace nearly all that are necessary for farmers to know.

For readily attaching a rope to a timber, mast or any part of a building, for sustaining a continued force, the timber hitch shown by Fig. 1 answers a good purpose. The greater the force exerted, the firmer it will hold, in consequence of the hard pressure against the timber. A noose or running knot with a double rope is represented by Fig. 2.



FIGS. 5 and 6.

Figs. 3 and 4 represent the simplest mode of forming a running knot for a loop, the first loose, the last drawn tight.

LOOPS. Fig. 9 represents a simple running loop, tied with a loop in the knot, so that it may be instantly untied by jerking the end. This is a common way of tying horses' halters, being quickly tied and quickly loosened. To prevent the animal from working it loose, thrust the end through the loop

of the knot, as in Fig. 6, which will render it perfectly secure. Every boy should know how to tie this very simple knot for hitching horses, but many boys, as well as men, do not.


FIG. 7.

As it is exceedingly convenient for every one who works on a farm to know how to tie quickly the various knots described in this short article, it will be an interesting exercise both for boys and men, on rainy days and long evenings, to procure a small rope or cord and acquire a ready practice in forming the various kinds here figured and described.


FIG. 8.

The quickest way of tying two ends together is shown by Figs. 7 and 8. Place the two ends parallel together, then tie a common single knot near the end, as shown in Fig. 7; then draw the two cords or ropes apart so as to tighten it, as shown in Fig. 8, and a very secure connection will be found, which will not untie or slip. It is rather rough and awkward in appearance, but is often useful on account of the quickness with which it may be formed.


FIGS. 9 and 10.

Fig. 9, known as the "reef knot" by sailors, is the most useful knot where two ends are to be fastened together, and represents the cords loosely connected; Fig. 10 shows the same tightly drawn together. As a general rule, the best knot is the one that is neatest in appearance, and this combines both qualities. It will be observed that the ends and the main cords lie closely parallel together, or on the same side of the loops. This knot is often spoiled and rendered nearly useless by placing the ends and cord on opposite sides of the loops.

Knuckle (nuk'l), the joint of a finger, particularly when made prominent by closing the finger; the knee-joint, especially of a calf, as a "knuckle of veal;" the joint pieces of a hinge through which the pin or rivet passes.

Kohl Rabi or **Turnip Cabbage.** The stalk is swelled out the shape of a turnip. Prepare the ground as for cabbage, then plant about the first of June in rows two feet apart, thinning plants to 12 inches in the row. It will stand severe drouth. Preserved over winter like turnips. When young their flesh is tender and delicious, resembling a fine ruta-baga with less of the turnip flavor. When fully matured they are excellent for stock.

VARIETIES. *Large or Late Giant Purple.* Best for stock.

Early White Vienna. A standard early kind.

Early Smooth Purple. Fine for table use.

White Giant. Very large and choice.

Koumiss (koo'mis) or Kumyss (ku'mis), a liquor made among the Calmucks of Tartary by fermenting mare's or camel's milk, from which they obtain by distillation an intoxicating spirit. In some parts of Western Asia, however, a beverage by this name is simply fermented mare's milk. This beverage is manufactured in this country for the use of those who have impaired digestion, and is to be had at some drug stores.

Kyanize (ki'an-ize), to preserve timber from decay by the following process: Dissolve 1 pound of corrosive sublimate in 20 gallons of water, in a tight half hogshead or rectangular box of the proper height, and stand up the posts in the liquid for two weeks. Be sure all the necessary parts of the posts to be kyanized are under the liquid during the whole time, then take out and dry, and fill up the bath with more posts. If the liquid evaporate, add water and more of the solution, when necessary. A bath of strong lye from potash or wood ashes makes a fair substitute, and it is presumed the cheaper solution made from copperas (sulphate of iron) and water would form a styptic equally effective. The corrosive sublimate solution will not, however, be very expensive, as so large a number can be treated with so small a quantity.

L

Label, a small piece of any material, attached to any object and designating its name or number, etc. The labels in use on a farm, and especially in the orchard and garden, are of many styles, according to taste or convenience. Tin labels, when once made, and with one end long and narrow to be readily wrapped around a twig, can be more rapidly attached to trees and other plants than any other kind. They are a great convenience when considerable labeling is to be done in haste, as with nurserymen in spring time. They may be prepared during the winter, by painting them black and writing on them with a blunt stick before the paint is dry, and then so classifying them that they can be quickly selected when the emergency arises. Or, cut strips of zinc half or three-fourths of an inch wide at one end, and half that width at the other, with a length of about five inches; and they may be readily attached to a small branch by winding the narrow end twice around the branch, and nothing more. As the branch grows, the zinc expands by uncoiling, and no harm will be done by cutting into the bark, as is so common with wired labels. Pencil marks on these are said to last for years.

In housekeeping it is very important to have every bottle, package, box, etc., labeled, if it contains anything for use and is closed, and thus save time when one is in haste, and prevent mistakes. To be obliged to uncork a bottle, open a box or undo a package—and generally a lot of them—every time you go to find what you want, is a both a needless and vexatious waste of time, especially when one is in a hurry. Besides, mistakes in the use of medicines, chemicals and culinary preparations are often very serious—which would generally be prevented by proper labeling.

Labium, the lower lip of an insect. It is a very complicated organ, and generally serves to close the mouth from beneath.

Labrum, the upper lip of an insect. In biting insects it is a flattened horny or leathery plate, but in many other insects it is quite membranous and completely concealed.

Lace, TO WASH: see Laundry.

Lactic Acid, the acid of sour milk, extracted by chemists for medical purposes. It is a limpid, sirupy liquid, colorless or of a pale wine color, of a slight but not unpleasant odor and a very sour taste. One to three drams a day are recommended for dyspepsia.

Lactometer, an instrument for ascertaining the comparative richness of new milk.

Ladder, a well-known hand implement for climbing. All persons conversant with the routine of farm operations know the importance of good strong ladders. In proportion to their cost they are of more value than any other farm contrivance. They need not be expensive. Even the most bungling user of tools may construct one. Yet it is a fact that in almost every neighborhood are farmers and owners of buildings who, in case of fire, have not at hand a ladder of sufficient length to reach the eaves of the barn, or even of the dwelling; and how often it occurs that when a fire breaks out there is plenty of water, and persons at hand to quench the flames if they had a ladder to reach the roof, or other point of danger! For general farm purposes it is best to have two ladders, one about 12 feet in length the other from 22 to 30 feet long, or of a length sufficient to reach the roof of the highest building on the premises. The side-pieces should be free from knots or decayed portions, and it is best, if possible, to construct them from some light wood, such as pine, chestnut or basswood. For a rough, cheap job, poles may be used, simply splitting them. Or select straight poles of suitable length, and saw them lengthwise, and they will be found better and much cheaper than sawed pieces obtained at the mill. The connecting rollers or rungs should be of the best hard, tough wood, and never less than an inch and a quarter in diameter at the ends. For long ladders it is best to wedge each one in position. A good ladder should decrease three inches in width to every ten feet in length. Paint, or at least apply a good coat of oil. Keep at some convenient and readily accessible place under shelter when not in use.

Ladle, an instrument used in lading or dipping; a cup with a long handle, used for throwing or dipping out liquids from a vessel. For household purposes good ladles of all kinds, both wooden and metallic, can be had at hardware stores, groceries, etc.

Lady-Bird, Lady-Bug or **Lady-Fly:** see page 865.

Lamb, the young of sheep: see Sheep.

Lambrekin (lam'ber-kin), a kind of pendent scarf or covering attached to the helmet, to protect it from wet or heat; also a short, ornamental curtain to

be fixed at the top of windows. The latter is made of costly material, too fine to be washed; and although it is still to be found in the mansions of the wealthy, it casts a somber shade of gloom over the parlor scarcely in keeping with the demands of modern physiology. Neither good taste nor "style" absolutely requires the use of such an article.

Lamb's-quarter, a common garden weed, called also pigweed and goosefoot; the last mentioned name is the most appropriate and definite. The weed, though common, is not a very disagreeable pest. It belongs to the same order as beets and spinach, and has been used as "greens," mixed with mustard leaves or some other species.

Lamb's-wool, or Wassail, a beverage made by mixing the pulp of roasted apples with ale, with sweetening and spicing.

Lamp, a well-known apparatus for producing artificial light. For history of, see Light. There are very few common illuminating substances that produce a light as brilliant and steady as kerosene oil, but its full brilliancy is rarely attained, through want of attention to certain requisite points in its management. The wick, oil and lamp, and all its appurtenances must be perfectly clean. The chimney must not only be "clean," but clear and bright. The wick should be trimmed exactly square across the wick tube and not over the curved top of the cupola or dome. Cut off the perfectly charred portion. After thus cutting evenly across the top of the tube, raise the wick a little and cut off the corners slightly. The sharper the scissors, the better the cut and the better will be the flame. A wick made of felt is superior in all respects to one of cotton. The kerosene ought not to be suffered to get very low in the lamp, nor should it be filled to within an inch of the base of the tube, as in such cases it oozes out through the wick and over all the lamp. But greasiness of the lamp can be prevented by placing a felt ring a half-inch wide close around the neck or socket. (See article Kerosene, page 884). The wick should not be turned down very low, and the lamp left standing very long in the absence of all persons from the room, or in one's sleeping-room during the night. Wicks are often too narrow or too wide. When too narrow they give but little light, the flame burns with jets and puffs, and sometimes, by a sudden draft caused by opening or shutting a door, the flame may be drawn down into the globe and an explosion result.

To clean kerosene lamps, pour out all the oil, wash thoroughly with warm water, soap and sal-soda, rinse repeatedly until all signs of the suds disappear, and then let drain until dry.

To clean kerosene lamp chimneys, rub them out with soft newspaper or cotton, by means of a stick. Have the chimney cool, and moisten it inside several times by breathing into it. Occasionally it may be better to wash them as just recommended for lamps. To prevent lamp chimneys from cracking, put them into a kettle of cold water, gradually bring to the boiling point and then as gradually let them cool. Some add a little salt to the water.

A new top may be cemented upon a kerosene lamp with the following composition: 3 parts resin, 1 caustic soda, 3 water, boiled together, and then mixed with its own weight of plaster of Paris. This will set firmly in half to three-quarters of an hour. Zinc white, white lead or precipitated chalk may be substituted for plaster, but it hardens more slowly. Of course, the neck of the lamp has to be perfectly clean from all the oil and other foreign matter before the process of cementing on another top is commenced. Generally it is cheaper and better to take the lamp to some place in town where they repair such things.

In lighting a lamp, it is best to commence with a small blaze and heat up the chimney gradually to prevent breaking it. Lamps without chimneys are in the market, but they are objectionable in some respect. The most serviceable style is a chimney which is held on the lamp-top by a small thumbscrew, and the top so arranged that in lighting you can turn the chimney and dome over in one piece, which is held to the neck piece by a spring.

For all table work the lamp should have a shade, white inside. Next to white a bluish tint is best; but unless the light is pretty strong, a bluish shade or chimney makes it too dim for comfortable use.

Argand burners are those adapted to cylindrical, hollow wicks, allowing ventilation through the hollow. A slender, cylindrical chimney is used, with a constriction or neck near the base. It is slightly more economical of the oil than the ordinary apparatus, but the chimneys are apt to break.

"Students'" lamps are stylish and somewhat costly, but have the slight advantage of an adjustable arm by which the light can be elevated or lowered to suit the convenience of the student.

Lampas, tumefaction of the gum and of the bars of the palate of the horse's mouth; see page 787.

Lampblack, is a fine soot formed by the condensation of the smoke of burning resinous substances It can be made on a small scale in the following manner: Suspend over a lamp a conical funnel of tin plate, having above it a pipe, to convey from the apartment the smoke which escapes from the lamp. Large mushroom-like concretions of a very black carbonaceous matter, and exceedingly light, will be formed at the summit of the cone, and must be collected from time to time. This black may be rendered less oily and drier by calcination in close vessels. The funnel should be united to the pipe, which conveys off the smoke, by means of wire, as solder would be melted by the flame of the lamp. For fine painting, lampblack must be ground in a paint-mill.

Land, a tract of territory, referred to as a measured piece or with reference to its contour. The nature of

the surface with reference to tillage is comprehended in the term "soil."

TO MEASURE LAND. Surveyors measure land by four-rod chains, which contain 100 links. Each link is therefore 7.92 inches. On request, they report their surveys in miles, sections, acres, rods, etc. To measure land for agricultural purposes, when exactness is not required, "stepping" is the most convenient. By a little practice one can make five steps to the rod within a few inches, and thus be able to calculate the area or dimensions of his grounds in a very simple manner. When the field is a square, a parallelogram, a rhombus or a rhomboid, the exact area can be calculated by multiplying the length in rods by the breadth in rods, and dividing the product by 160. When the field is triangular, multiply the base, or longest side, in rods, by the greatest width, in rods, and divide half the product by 160. When the field is a trapezium or a trapezoid, divide it diagonally by a line running from one extreme corner to the other, which will cut the field into two right-angled triangles; then proceed with each as in the foregoing rule, and add the areas of the two triangles together. The product will be the number of acres. When the field has more than four sides, all of which are straight, draw diagonals to divide the field into triangles; find the area of each separately, and the sum of the whole will be the number of acres. Where the field is long and the sides crooked and irregular, take the breadth in rods in a number of places, at equal distances apart; add them, and divide the sum by the number of breadths for the mean average or breadth; then multiply that by the length in rods and divide the product by 160: the quotient will be the number of acres. Where the field is long, and the sides and ends crooked and irregular, find the mean breadth in rods by the foregoing rule, and proceed in like manner to find the mean length in rods; then multiply the mean length by the mean breadth, and divide the product by 160, and the quotient will be the number of acres. Where the field is a circle, multiply the diameter by itself and the product by 7854, and point off four figures to the right. If the measurement is taken in rods, the answer will be in square rods, which if divided by 160 will give the number of acres.

Horizontal measurements are always understood in surveying land. Therefore the chain or rod must be held on a level with the horizon in taking measurement. In going over steep hills a short chain must be used and great care taken in setting the pins. A plummet, and even a level, are necessary to exactness.

THE PUBLIC LANDS are divided into two classes, one at $1.25 per acre, designated as minimum, lying outside of railroad limits; the other at $2.50 an acre, as double minimum, lying within railroad limits. Titles are acquired by purchase at public land sale, by ordinary "private entry," and in virtue of the preemption, homestead, timber-culture, and other laws. Purchases at public sale are made when lands are "offered" at public auction to the highest bidder by proclamation of the President or by order of the General Land Office. Lands so offered and not sold, and not since reserved or withdrawn from the market can be secured by "private entry" or location.

Heads of families, widows or single persons (male or female), over the age of 21 years, citizens of the United States or who have declared their intention to become such under the naturalization laws, may enter upon any "offered" and "unoffered" lands or any unsurveyed lands to which the Indians' title is extinguished, and purchase not exceeding 160 acres under the pre-emption laws. After making settlement, if on "offered" land, the applicant must file his declaratory statement with the district land office within 30 days, for which a fee of $2.00 is required, and within one year from date of settlement, make final proof of his actual residence on and cultivation of the tract, and pay therefor at $1.25 per acre if outside of railroad limits, or $2.50 per acre if within these limits; and he may pay in cash, or by military bounty land warrants, agricultural college, private claim or Supreme Court scrip.

When the tract has been surveyed and is not "offered" land, the claimant must file his or her declaratory statement within three months from date of settlement, and make proof and payment within thirty-three months from date of settlement. Settlement is the first thing to be done under the preemption laws.

When settlements are made on unsurveyed lands, settlers are required to file their declaratory statements within three months after the date of the receipt at the district land office, or of the approved plat of the township, embracing their claims, and make proof and payment within thirty months from the expiration of said three months; payments the same as in case of "offered" land.

Pre-emptors may submit proofs of residence and improvements at any time after six months of actual residence. He must show by his own testimony and by two credible witnesses such actual residence and cultivation—a habitable dwelling and other improvements, to the satisfaction of the land officers that the spirit of the law has been complied with.

At any time before the expiration of the time allowed for proof and payment, the settler may, by making proper application at the land office and payment of the required fee, convert his claim into a homestead, and the time he has resided upon the land is credited on homestead residence if he desires. No person who abandons his residence on his own land to reside on public land in the same State or Territory, or who owns 320 acres of land, is entitled to the benefits of the pre-emption laws. It is held, however, that this provision does not apply to a house and lot in town. Claims cannot be transferred until title is perfected. The second filing of the declaratory statement by any pre-emptor, when first filing was legal in all respects, is prohibited. Before proof and payment on pre-emption claims, written notice must be given by the claimants to the Register, who must post a notice in his office and cause the same

to be published in a newspaper nearest the land for at least 30 days, as in cases of homesteads.

Any person who is the head of a family or who has arrived at the age of 21 years, and is a citizen of the United States or has filed his declaration of intention to become such, is entitled to enter one-quarter section or less quantity of unappropriated public land under the homestead laws. The applicant must make an affidavit that he is over the age of 21 or is the head of a family, and that he is a citizen of the United States or has declared his intention to become such, and that the entry is made for his exclusive use and benefit and for actual settlement and cultivation, and must pay the legal fee and that part of the commission required to be paid when entry is made, as follows: When within railroad limits, for 160 acres, $10, commission $8; for 80 acres, fee $5, commission $4. Outside of railroad limits, fee $10, commission $4, and in proportion for 80 or 40 acres. When these requirements are complied with, the Receiver issues his receipt in duplicate, and the matter is entered upon the records of the office. After faithful observance of the law in regard to actual settlement and cultivation for the continuous term of five years, at the expiration of that term or within two years thereafter, final proof must be made, and if satisfactory to the land officers, that part of the commissions remaining unpaid (the same in amount as paid on entry) must be paid. The Register then issues his certificate and makes proper returns to the General Land Office, as a basis of a patent.

Any settler desiring to make final proof, must first file with the Register a written notice of his intention, describing the land and giving the names of four witnesses by whom the facts as to settlement, continuous residence, cultivation, etc., are to be established. This notice must be accompanied by a deposit of money sufficient to pay the cost of publishing the notice which the Register is required to publish for thirty days (five times), in a newspaper designated by him, and arrange with the publisher of the paper therefor. Notice is also posted in the land office for the same period.

Final proof cannot be made until the expiration of five years from the date of the entry, and must be made within two years thereafter. In making final proof the settler may appear in person at the district land office with his witnesses, and there make the affidavit and proof required; or he may, if by reason of bodily infirmity or distance it is inconvenient for him to appear at the land office, with his witnesses, appear before the judge of a court of record of the county and State, or district or Territory in which the land is situated, and there make final proof. When a homestead settler dies before he can prove up, the widow, or in case of her death, the heirs, may continue settlement and obtain title and requisite proof at the proper time. In case of death of both parents leaving infant children, the homestead may be sold for cash for benefit of the children, and purchaser will receive title.

The sale of a homestead claim to another party before completion of title, is not recognized. In making final proof the settler must swear that no part of the land has been alienated, except for church, cemetery, or school purposes, or right of railroads.

Homestead claims may be relinquished, but in such case the land reverts to the Government. If a settler does not wish to remain five years on his tract, he may pay for it, as under pre-emption law, in cash or warrants at any time after six months of actual residence. Homesteaders are allowed six months after entry to commence improvements and establish residence.

The law allows but one homestead privilege to any one person.

Every person who served not less than 90 days in the army or navy of the United States during the recent rebellion, who was honorably discharged and has remained loyal to the Government, may enter a homestead, and the time of his services shall be deducted from the period of five years, provided that the party shall reside upon and cultivate his homestead at least one year after he commences improvements. The widow of a soldier, or if she be dead or is married again, the minor heirs (if any), may, through their guardian, make a homestead entry; and if the soldier died in the service, the whole term of his enlistment will be credited upon the term of required residence. Lands acquired under the homestead laws are not liable for any debt contracted prior to the issuing of the patent therefor.

Under the timber-culture law not more than 160 acres on any one section, entirely devoid of timber, can be entered, and no person can make more than one entry thereunder.

The qualifications of applicants are the same as under the pre-emption and homestead laws. The land-office charges are, for 160 acres or more than 80, $14 when an entry is made, and $4 at final proof. For 80 acres or less, $9 at entry, and $4 at final proof. The applicant must make an affidavit that the land specified in his application is exclusively prairie, or other land devoid of timber, that his filing and entry are made for the cultivation of timber for his own exclusive use and benefit; that the application is made in good faith and not for the purpose of speculation, or directly or indirectly for the use of any other person or persons; that he intends to hold and cultivate the land and comply with the laws, and that he has not previously made an entry under the timber-culture law.

No residence is required on a tree claim, but the claimant must break or plow five acres of a quarter section, and pro rata on a smaller tract, during the first year after entry. During the second year he must break five acres more, and cultivate to crop or otherwise the five acres first broken. During the third year he must plant in tree seeds, trees or cuttings, the first five acres, and cultivate to crop or otherwise the second five acres, and by the end of the fourth year the entire tract of ten acres must have been planted

to timber trees, seeds or cuttings. Provision is made for extension of time in case drought or grasshoppers destroy trees. These trees he must cultivate and protect, and if, at the expiration of eight years from date of entry, or at any time within five years thereafter, the entrant, or if he be dead, his heirs, shall prove by two credible witnesses the planting, cultivating and protecting the timber for not less than eight years, and that there were at the end of the eight years, at least 675 living thrifty trees on each of the ten acres required to be planted, he or they will be entitled to a patent. It should be added, that in making final proof it must be shown that "not less than 2,700 trees were planted to each acre."

It is not necessary that the ten acres should be in a compact body.

Failure to comply with any of the requirements of the law at any time after one year from date of entry, renders such entry liable to contest, and upon due proof of such failure the entry will be canceled. No land acquired under this law will in any event become liable to the satisfaction of any debt or debts contracted prior to the issuing of the final certificate therefor.

A qualified applicant cannot take a homestead and pre-emption claim at the same time, but he may take either and a tree claim at the same time. A man may take a pre-emption and a tree claim, and after proving up and obtaining title to his pre-emption, may then enter a homestead (if he can find one), and thus secure 480 acres of land.

Land, in farming, the unplowed portion of an area laid off to be plowed. A plow is said to "run to land" when it takes too large a furrow slice.

Landau, a kind of carriage. See page 188.

Landlord, a person who owns land and lets it out to tenants.

Land-side, of a plow, the side next the unplowed land and opposite the feather.

Landscape Gardening. In the infancy of human arts, all gardening would be comprehended in the culture of a few fruits and esculent plants within a very limited space; but at present the word garden has at least three distinct significations. It is used to designate a spot destined for the culture of fruits and culinary vegetables; to mark a space devoted to flowers and botanical pursuits; and to denote a more extended scene, characterized by forest trees and walks for shade and recreation, and combining such other objects belonging to external scenery as taste, art, or locality may confer. For kitchen-gardening and floral gardening, we refer to the articles on Garden and Floriculture. The art of forming the third class of gardens, and to which we propose in this article to confine our attention, has been indifferently known under the terms pleasure, ornamental and rural gardening; but is now more generally designated landscape gardening—a very happy term, particularly as applied to the modern style of laying out grounds.

We wish to impress upon the farmers the importance of beautifying their farms, at least to some extent. A little taste and very little labor, and this labor well rewarded, may easily make a purely agricultural region one of delightful beauty.

A farm that is skillfully managed, requires but little additional attention to fences, borders, farm roads and farm buildings, to make it a distinct and beautiful member in a beautiful landscape. Art and utility here thoroughly concur. The cultivation which reaches cleanness, neatness and good order—and nature will do the rest surprisingly well in the country—is the most economical tillage. The neglected out-buildings and the abused and scattered tools are as costly as they are unsightly. The ragged edge of cultivation which stops where the plow and harrow end, is no more in keeping with clean fields, and the full service of every foot of land, than it is with our human sense of work well and completely done. However it may be in the city, it is not beauty that costs, but ugliness; not cleaning up that makes life a drudgery, but the exasperation of things in the way, things out of the way, and things not worth having when found.

Art, when it costs most, often brings a sufficient reward; but in its first principles in the country it hardly costs anything, and is still liberal in its gifts. Let the farmer simply aim, as the basis of operation, at clean grass, fine trees, snug buildings, and tools in their places, and while he has saved many dollars from waste, and can hardly be said to have spent a dollar for ornamentation, he has the staple of beauty in large possession. He may afterward confine himself to these first terms, or he may overpass them at his leisure and according to his ability.

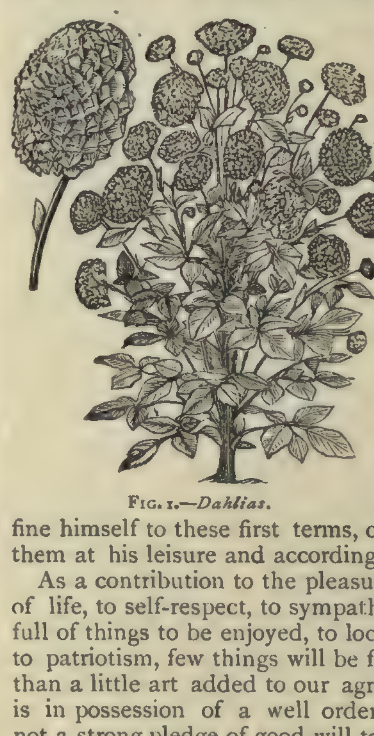


FIG. 1.—*Dahlias.*

As a contribution to the pleasures and refinements of life, to self-respect, to sympathy with the world as full of things to be enjoyed, to local attachments and to patriotism, few things will be found more effective than a little art added to our agriculture. No man is in possession of a well ordered place who has not a strong pledge of good-will to the world, of good-will to his neighbor who shares and enhances his pleasure, and of good-will to the nation which casts about it safety and peace.

Then it enhances the value of his property, and not alone that, but the attractions which it throws around the homes of young people are far more important, for

these may prove the turning influences in their future lives.

As landscape gardening is a fine art, it is impossible to lay down definite rules for every detail to be observed everywhere. In planning, stocking and furnishing a landscape, nearly everything depends upon

FIG. 2.—*Gardenia.*

a cultivated taste; and this taste is developed and cultivated by the study of the general principles of all the fine arts, especially the works of art. A real good landscape and an elaborate oil painting called a

FIG. 3.—*Arbor Vitæ, American.*

"landscape" equally represent the elements of culture; therefore to make a good landscape is virtually the same as to execute a good oil painting representing one; both operations are simply picture-making.

The two most general principles of this art are congruity and variety. The ground and the objects upon it should have a kind of mutual reference and at the same time a sly and illusive change from one scene to another. The natural position of the ground, the ravines, lakelets, streams of water, hills, low elevations, rocks, native groves, and even the points of the compass toward which these various objects lie as viewed from the residence and public highway, all have to be considered in originally laying out the plan to be pursued. Gentle undulations of the surface of the ground, for example, suggest that the trees, shrubbery and all works of art upon it should also

FIG. 4.—*White Spruce.*

have rounded outlines, like the white oak, beech and sugar maple, while rocky and angular places suggest firs, sumac and angular structures. Beautiful views in the distance should be kept visible while the unsightly objects should be concealed; it is therefore requisite that the superintendent of the work should station himself at the doors and windows of the house and survey in every possible direction, directing the men on the ground in the setting of stakes. In making his surveys he has many things to consider. Besides those already referred to, he will have to take into account even the color of the foliage which the trees and shrubbery will have in autumn, and take

every possible advantage of every contingency. The architecture of the house should be planned along

Fig. 5.—*Dwarf American Arbor-Vitæ.*

with the original design, as it is often very diffcult to make everything mutually respondent after a great expense has been incurred in the wrong direction. A Gothic house, for example, and sharp, angular, rocky cliffs and fir trees have a similar outline, while a house of the Oriental or more rounded style would correspond

Fig. 6.—*Eulalia Japonica Zebrina.*

with rounding undulations of the ground, luxuriant shrubbery and round-headed trees. And what is said here of the house is of course equally applicable to any building or structure on the premises, as a lodge, arbor, observatory, bridge, etc.

The plan, of course, should not involve the removal of earth any more than is necessary; but there is scarcely a spot to be found but will need change from the original configuration of the surface. Some points will need rounding down or up, and other places will need sharpening, or made more rough and picturesque, etc. Where the ground naturally suggests a round-topped hill, there carry out the suggestion and complete a rounded hill; where it indicates a sharp and angular hill, there complete the idea; where it looks like a basin for water or a water course, there make a lake or rivulet, etc. The trees, shrubbery, flowers and the works of art at each place should be made to correspond with the character of that place, in setting, grouping, in general outline, and in detail.

The most important walk on the whole premises is that called the approach, leading from the public highway to the house. This, coming in toward the house in a winding diagonal, affords the visitor a better view of the architectural character of the house, enabling him to see two sides at once and from a varied "walking point". There is danger of making the approach, and indeed all other walks, too circuitous. In general, both should curve almost as little as possible; that is, the curve should be definite and visible, but not much more than that. In laying out

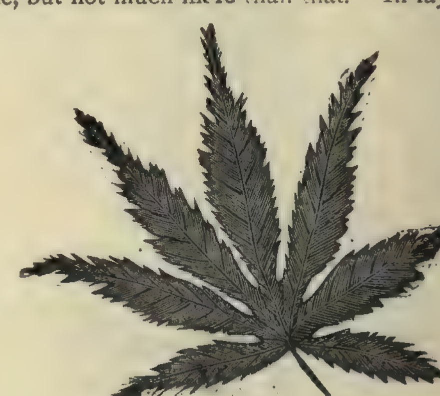


Fig. 7.—*Japanese Maple, Rose-tinted.*

the approach it is best to walk backward from the house, looking at it critically and staking off the ground as you go. It is even important that the exact spot where a visitor gets sight of the residence should be located, and the groupings of the trees so arranged as to conceal the house from the person coming in up to that point. The approach should

appear to be the nearest route to the house, if it does not appear so naturally, it should be made to appear so by artificial obstacles which also should appear to be in their natural place. Where it quits the public road it ought not to break from it at right angles nor in such a manner as to rob the entrance of

Fig. 8.—*Cut-leaved Japanese Maple.*

its importance, but rather at some point of the public road from which a lodge or gate may be more conspicuous; and where the high road may appear to branch from the approach rather than the approach from the road. After entering the park it should avoid skirting along its boundary, as that would betray a want of extent or unity of property. The house, unless very large and magnificent, should not be first seen at so great a distance as to appear much less than it really is, and the first view should be from the most pleasing point of sight. As soon as the house is visible from the approach there should be no temptation to quit it,—which will ever be the case if the road be at all circuitous, unless sufficient obstacles, such as trees or inaccessible points of ground, appear to justify its course.

Fig. 9.—*Red-leaved Japanese Maple.*

There will, however, in almost every demesne be insurmountable obstructions to the execution of one or more of the foregoing principles, but ingenuity can in some way utilize such obstacles. It is easier and sometimes better to deviate from the general rule than to undertake to carry out a tasteful improvement without any guiding principles. Where, for example, a public road runs on one side of the premises and a navigable water on the other, necessitating as it were two fronts to the house, it is not best to make the approach or carriage drive lead all the way around to the opposite sides of the house, making the visitor see all the grand sights before he gets inside the domicile. It is better that he come in from the road-side and be "surprised" by a grand view of the river and bluffs as he passes through the house and looks out of a door or window on the river side.

Walks and drives are laid out on the same general principles as the approach, reference being had to all pleasant and unpleasant objects along the route. Some walks may open to the south, sheltered with evergreens and made dry and hard for a warm promenade in winter; others formed of closely mown turf, and thickly shaded by a leafy canopy of verdure, for a cool retreat in the midst of summer; others again may lead to some sequestered spot and terminate in a

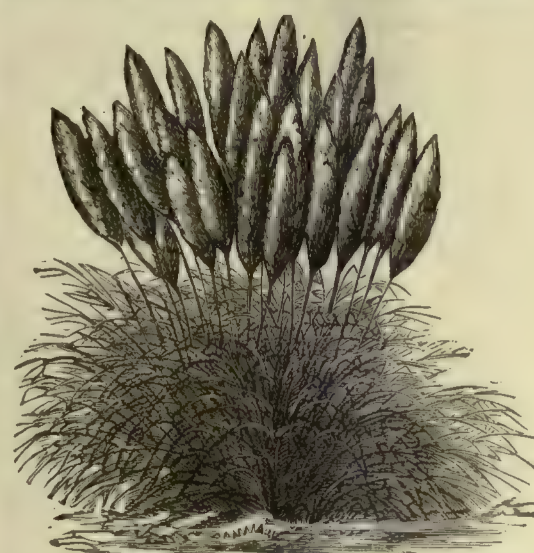


Fig. 10.—*Gynerium argenteum.*

secluded rustic seat, or conduct to some shaded or rugged eminence where an extensive prospect can be enjoyed. The walks should in some manner correspond to the scene it traverses, being rough where the latter is wild and picturesque, sometimes scarcely differing from a common foot-path, and more accomplished as the surrounding objects show evidences of culture and high keeping. The walk may turn more abruptly than the approach where there is an intervening obstacle.

For barriers, stone and wooden fences covered with vines are good; but evergreen and living hedges are better. Arbor vitæ, Newcastle and Washington thorns, buckthorn, Osage orange and privet are all capable of making superb hedges. All barriers are obstacles; hedges are barriers, and therefore should

not be set except where there seems to be some reason for their existence. For vines covering fences, the Virginia creeper is by far the cheapest in the West, and its foliage in the fall is very beautiful. Climbing roses of different species are good for covering fences.

In grouping trees, shrubbery, etc., liberal allowance should be made for long views, as they are the most important element in landscape, the skirting of trees and shrubbery being next. Extensive lawns can be kept well mowed with horse machines, and on distant grounds pasturage by sheep is just as good, for æsthetic purposes as well as utilitarian. Distant lawns, especially if lower than the ground at the residence, should be separated from the nearer grounds by a ditch, which is invisible, for, as before intimated, fences are to be avoided as much as possible.

Lakes should not appear to be mere watering places for stock, with straight, flat, muddy, monotonous banks; but the shore should have an irregular outline, with rocks, grass or willow down to the water's edge. In Illinois, Missouri, and most of the country in the Western States it is difficult to find a lake or a place to make one where the water will be regular; but Michigan, Wisconsin and Minnesota are very fortunate in respect to "water privileges" for park and landscape purposes. In improving a small lake, including all artificial lakes, nearly all imaginable irregularities of outline, height, shape, etc., of the banks can be made by digging and masonry Indeed, these irregularities can scarcely be too numerous and great, provided they appear neat and fresh.

FIG. 11.—*Phlox.*

Islands require a due share of attention, as they serve as much as anything to set out the beauties of the general view. The number, location, size, outline, etc., are points requiring consideration. An island should not occupy the middle of the lake, as that indicates shallowness of water where it should be the deepest. The best places, generally, for islands are near the inlet and exit of the water. The dam, where one has to be made for the purpose of creating a lake, should be concealed by islands. In general, also, islands should be placed opposite the salient points of the shore. They should be covered with shrubbery, small trees and vines; and small islands may have, besides, rustic habitations for swans and other aquatic birds. For the clothing of islands, the following shrubs, vines in their various species, etc., among hundreds of others, are commendable: Hazel, hawthorn, alder, spicewood, winterberry, azalea, spirea, button-bush, swamp magnolia, laurel, rhododendron,

FIG. 12.—*Snowdrop Tree.*

Virginia creeper, moneywort, grape, crab-apple, willow, aspen, etc.

Brooks and rivulets should be encouraged into variety, as pools, islands, cascades, etc., with the margins rendered refreshing with appropriate verdure.

Rustic seats and other frame work should not be prominent objects of view in the front yard or at a great distance anywhere else. They should be pretty well concealed by trees, shrubbery and vines. Gate lodges, terraces, vases, fountains, flowers in pots, tender shrubbery, trees and other plants, statuary, etc., etc., all have to be treated by the same elements of art criticism as govern the landscape, lawn, house, etc.

By the accompanying engravings we give several very handsome designs for laying out grounds. These may be changed or varied according to the size of the grounds, the relative position of the various farm buildings, etc. By Fig. 13 a very neat and artistic design is represented. The carriage road is distinguished in the plan by its greater width. A separate entrance is provided for the foot-walk. Carriages may be turned in front of the house, as shown in the cut, or in the area of the barn.

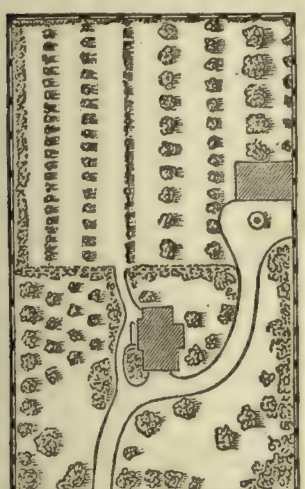


FIG. 13.—*Design of drive-way, walks and surroundings of a rural residence.*

A lot, about four or five rods wide, is represented by Fig. 14. The principal object is to obtain a small flower garden and shrubbery on an area of about one-tenth of an acre, and allow space for a kitchen garden and a few of the smaller sized fruit trees on nearly twice as much ground in the rear. If desired there may be a small horse or cow barn in the rear corner on the left—the "cart-way" otherwise being intended only for conveying coal and other heavy articles to the kitchen cellar. A small screen of evergreen trees runs on the right of the cartway to separate it from the rest of the grounds, and the boundary on the left of this way may be planted with grapes or with raspberries, the former being trained on the boundary fence, and the latter kept snugly within bounds by a slat running parallel with the fence, and about six or eight inches from it—the included space holding the canes spread out like a fan.

No large trees are planted on these grounds, as they would after a while occupy too much space and shade the smaller shrubbery and flower beds. Small trees may occupy the most remote corners, large shrubs the more open space, and small shrubs only be placed near the flower beds, where it is important to preserve an open space for full sunlight. A few plants will flourish in the more shaded spots. The flower beds are mostly circular, with two elliptical ones.

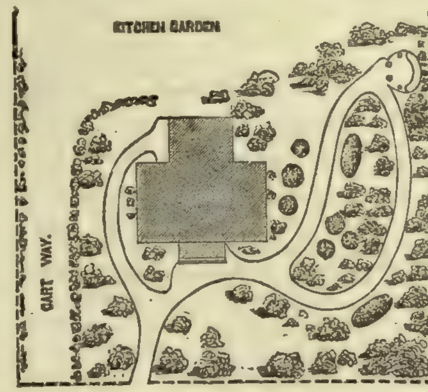


FIG 14.—*Design for Lot Four or Five Rods Wide.*

Fig. 15 is a plan intended for grounds varying from one to two acres, and it may be adopted for a large suburban or village residence, or for a farm, the owner of which can afford some expenditure to keep his home in finished order. If for the latter, the farm road will be placed to the right or left of the plan as here represented, and just without its boundaries, and the kitchen garden in the rear will be much larger, and be so arranged as to be cultivated by a horse.

The leading object of the plan is to place the dwelling in a central position, and to surround it with ornamental trees and shrubs, bordering the lawn in front and at the sides, with a flower garden and dwarf fruit trees at the rear. The carriage road at the right is distinguished in the plan from the foot-walks by its greater width. The entrance to the dwelling being at the side, greater breadth and a clearer view of the lawn are given in front. A carriage turn is afforded on the right. Space between the carriage-house and the boundary admits a cart with manure to the kitchen garden. The flower garden at the rear of the dwelling consists mostly of circular beds cut in the smooth turf, this shape admitting of a more easy preservation of the outline, while at the same time the distribution of these beds may give any degree of freedom and variety. Immediately in the rear of the flower garden, the dwarf

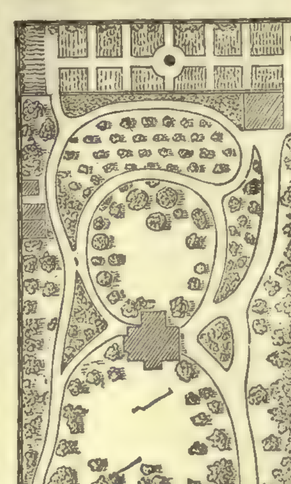


FIG 15.—*Ornamental Grounds.*

fruit trees are planted in quincunx form, and they may consist of dwarf apples on the Paradise stock, or of such dwarf pears as grow with greatest vigor on the quince, as the Duchesse d'Angouleme, Louise Bonne of Jersey, Doyenne Boussock and Beurre Superfin. The dwarf apples may be summer and autumn varieties of any selected sorts, and they will give a succession for family or table use at these times of the year. Between the dwarf trees and the kitchen garden is a trellis of grapes. The rear of the kitchen garden is planted with raspberries. The sides and rear boundaries are well flanked with irregular plantings of ornamental trees and shrubs.

Fig. 16 represents a comfortable farm residence, where the owner wishes to have everything neat and in good taste, but cannot spend much in ornamental gardening. The grounds are laid out in as simple a manner as practicable, so as to accord with good

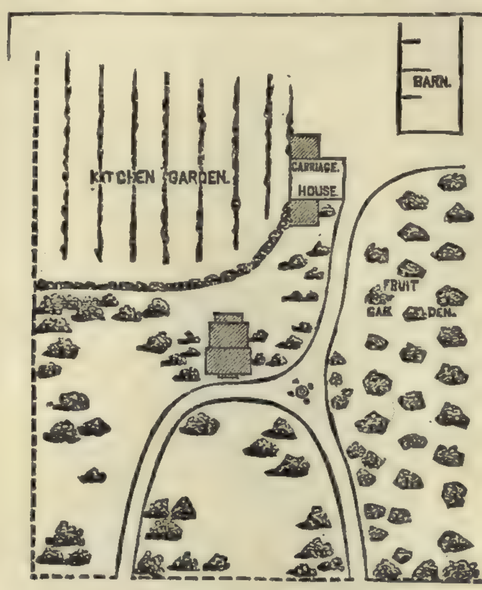


FIG. 16.—*Farm Grounds.*

taste. As represented in the plan, they comprise from two to three acres, including the lawn, half of the fruit garden, and most of the kitchen garden. The dwelling is approached by a good and well made gravel road, and the surrounding grounds are planted with handsome shade trees; those towards the rear may be the hardier, more vigorous and symmetrical fruit trees, such as will flourish in grass; as, for example, the Buffum, Bartlett and Howell pears, and the Elton, Morello and Black Tartarian cherries. The lawn should be mown at least three or four times early in summer, or it may be kept short by turning in, a part of the time, a flock of sheep, when they can be easily seen, and injury to the trees prevented. The fruit garden may be kept cultivated by a shallow plowing early in spring, and a few harrowings afterwards, and perhaps one or two rollings near the season of fruit, to keep it smooth to the pickers. The ice-house, hen-house, and other of the smaller buildings, may be placed near the carriage-house. An evergreen hedge or screen separates the kitchen garden from the front grounds. A water reservoir and hitching posts are placed at the right of the house, at the intersection of roads.

By more expenditure of labor and attention, flower beds may be kept in a circular form near the dwelling, and the lawn may be kept in the best order by mowing every few days. The main object, however, is to present in this plan simple, neat and cheaply kept grounds for a farm residence, with little expense.

We may notice here three general types of flower gardens. The irregular is surrounded by an irregular belt of trees and the beds are varied in outline as well as irregularly disposed, sometimes grouping together, sometimes standing singly, but exhibiting no uniformity of arrangement. It belongs to the picturesque type of landscape, where the residence is of the rural Gothic style; or it might form a pretty termination to a distant walk in the pleasure ground, where it would be more necessary that the flower garden should be in keeping with the surrounding plantations and scenery than with the house. Where the flower garden is a spot set apart, of any regular outline, not of large size, and especially where it is attached directly to the house, the effect is more satisfactory when the beds and walks are laid out in symmetrical forms. The French style has only low plants for the borders of the bed, with walks neither of gravel nor smoothly shaven turf. The beds are filled with choice flowering plants, and the outline of the grounds generally are very intricate and elaborate. The English style contemplates symmetrical forms and figures or irregular, curved outlines. Each separate bed is planted with a single variety, or at most two varieties of flowers. Only the most striking and showy are generally chosen, and the effect, when the selection is judicious, is highly brilliant. Nor are any plants admitted which have ugly habits of growth or meager or starved foliage, the aim being brilliant effect rather than the display of a great variety of curious or rare plants. To have this brought about more perfectly, and to have an elegant show during the whole season of growth, hyacinths and other fine, bulbous roots occupy a certain portion of the beds, the intervals being filled with handsome herbaceous plants permanently platted, or with flowering annuals from the green-house renewed every season. As a general principle for regulating the plants in this style, the winter and spring flowers ought as much as possible to be of sorts as admit of being in the ground all the year; and the summer crop to be planted at intervals between the winter plants, or the summer crop, having been brought forward in pots under glass or by natural protection, may be planted about the middle of June after the winter plants in pots are removed. A number of hardy bulbs ought to be potted and plunged in the beds during the fall, and when out of bloom, in May or June, removed to a reserve garden and plunged there.

LAYING OUT FLOWER BEDS. For a large central

flower bed, or one to be occupied with small shrubbery, a less formal and more ornamental outline may be given, as seen in Fig. 17. This bed is easily laid out by describing 2 concentric circles, as in Fig. 18, and then making several smaller ones on the outer one. When a flower garden of some extent is desired on a lawn in the more finished part of the grounds, that the whole may be seen at a glance a very handsome effect is produced by such a symmetrical arrangement as in Fig. 19, the dark figures being the beds, and the white space the lawn. A simpler form is shown in Fig. 20. An important advantage in such designs is the facility with which additional beds may be made, or the number reduced. Irregular beds for flowers may be made by drawing circles and joining them. Arabesque beds, represented in Fig. 21, flanking the curved walk, require an accurate eye for designing them in the best manner; but a graceful and curved outline may be preserved by the use of a rope, the mode of working with which we here describe:

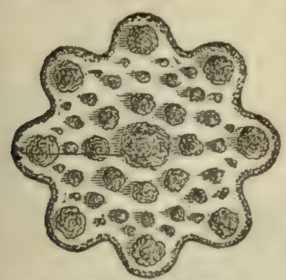


FIG. 17.—*Central Flower Bed.*

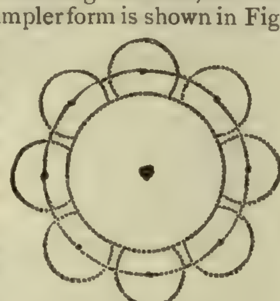


FIG. 18.—*Laying out the Same.*

If small figures are to be laid out, the rope may be of moderate size, so as to make short curves; for large figures a larger and stiffer rope may be used. The operator places it upon the ground and forms with it the outline of the proposed figure (Fig. 22). Then, before beginning work, insert a few small pegs or stakes barely touching it. These will keep it at its place while the sharp spade is inserted all along its side in cutting out the bed. On very small pieces of ground, a rope will assist in laying it out, without the use of the rod already described; and on larger grounds, where the roads and walks have been already staked, a stiff rope placed along in contact with them will enable the workman to make a perfect curve with the spade.

FIG. 19.—*Symmetrical Beds.*

It is important to make the two sides of a curved drive parallel. An easy and rapid mode is first to lay out and stake one side, and then place a rope parallel with this, as nearly as can be readily done with the eye. Then take a pole of a length equal to the intended breadth of the road, and placing one end against each stake successively, sweep the other end backwards and forwards against the rope, which will place it precisely where it is wanted.

FIG. 20.—*Symmetrical Beds.*

FIG. 21.—*Arabesque Beds.*

To have a show garden all season with the least trouble, one can succeed with a group of pansies and spring bulbs, a bed of ever-blooming China roses, including the Isle de Bourbon varieties, a few Eschscholtzias, petunias, Gilias, double dahlias, trailing verbenas and a few other annuals.

The mingled system is most in vogue in America. It consists of such a scattering distribution of flowers in the bed as will afford fresh flowers throughout the season in one part of the bed about as much as another, without any particular prominence of any portion. To accomplish this, however, considerable study is required, as the habits of the plants have all to be taken into consideration at once. The smaller plants are set near the walk, the taller to the rear, but not with slavish exactness.

All true taste in homestead scenery must spring from an appreciation of the scenery of nature; and we can scarcely realize how easily we fix ourselves in the old utilitarian routine of barely living on what we eat and wear, and forget the constant and unalloyed happiness which we derive from natural scenery. We need fine scenery more about our homes than anywhere else, yet there we have less of it than anywhere else. As in this art there is greater variety of situation and adornment than perhaps in any other department of life, it is difficult to lay down a full set of definite rules to be observed everywhere; hence the necessity of studying nature and forming a good taste, then of exhibiting that taste by the innumerable ingenuities which give delight to the inventive mind, and indeed to all who can at all rise above a perfectly dead repetition. Every farmer who has a dreary home has often driven into town and witnessed beautiful homesteads in the suburbs as he passed along,

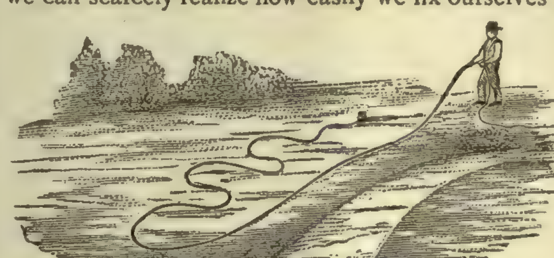


FIG. 22.—*Laying out with Rope.*

RIVERS' BEECH.

and yet he imagines that it is scarcely worth while for him to begin home adornment until he is as wealthy as he imagines the suburban residents to be. The cost of homestead adornment is much less than it appears to be, while the outlays in this direction are more likely to yield a reward, even though the proprietor expects to sell his place, than most other investments in life.

A farmer should never make the mistake of setting a pretentious mansion down on the prairie, with nothing about it but rough fences and rank herbage. The owner of a fine house without anything about it to tone down its glaring exterior, has made one of the most comfortless mistakes possible. A cottage, however humble, surrounded by trees and with its vine-clad porch, with a winding path, gladdened with a few flowers, leading to it, is far more beautiful as it is far more homelike. Other things being equal, the farm with its pretty cottage and comfortable barns, protected by wind-breaks, and

Fig. 24.—*Raceme of Horse-Chestnut.*

enlivened here and there with clumps of trees, will bring far more money than the other with its barn-like mansion and its bleak surroundings. Even people who are anxious to have everything very nice, conceive of no way only the old, stiff, rectangular, square-rule plans for everything—everything is brought to straight

Fig. 25.—*Flowering Thorn.*

lines and square corners—fences all straight, gate exactly in front, a straight walk to the front door, shade trees arranged in exact military order. Such grounds present no pleasing variety—nothing but the tiresome sameness of straight lines and rectangular forms.

For the site of your house, choose a rise of ground, a kind of hill if possible, in the most picturesque portion of your possessions. Locate the barn to the rear of the premises, somewhere in a northerly or easterly direction, and at the same time out of sight from the public highway. Have the vegetable garden also back of the house. Do not lay out a heavy wagon road through the front yard. Have the carriage way wind gently up toward the house, and off again to the barn. Put the grounds in blue grass and ornamental trees, but let the latter be in clumps irregularly scattered around. Do not have tall trees near the house; indeed, it is most graceful to have a perfectly gradual rise of tree-tops from near the house upward and outward, so that the house will appear to be in a small valley. This is specially practicable where the ground is level or nearly so, and the ground can be the west, north and east sides of the premises while the coveted hill spoken of can be on the south, and the public road running along on the latter. Evergreens should not be scattered about everywhere among the deciduous trees, but grouped in that portion of the grounds where a foreign or tropical feature of scenery can be best maintained. A few of the finest-looking ever-

greens can be set to advantage in the front yard sometimes; and one of these, or a mound, or some other ornamental object should be so situated as to be the apparent cause of each wind in the walks and drive. When we go winding we want some reason for doing so,—some object to go around, as it were. To have a long bend in the path with nothing but a clean space of ground within is not only ridiculous but also painful. Your largest trees, however, should stand back of your house. Then when your trees have grown up, your house, when viewed from the road, will appear to stand back in a kind of bay, partially encircled with a rich back ground of sylvan scenery. It is a common error to plant too many trees in front and not enough back of the house and off at the sides.

Fences are obstructions in landscapes, and the fewer of them the better. The front fence should be no higher than is necessary, and should be of about the same color as the bark of the trees in the front yard, so that it will not attract attention from the other scenery. It should never be white; but the dwelling, if small, may be white, yet if large, it should be of some "neutral" tint. Benches and rustic work should be out toward the right and left of the house and front yard, and not in the front yard.


Fig. 26.—*Weeping Birch.*

In commencing homestead arrangements on naked ground, first plow and harrow it all thoroughly; form your plan and stake out the ground; have the trees set out by experienced workmen; cultivate the ground about them for a few years; the more open portions of the landscape may be devoted to low crops, kept cleanly hoed; in using the plow and the harrow employ a good, single horse and a careful driver; after the trees have had


Fig. 27.—*Magnolia.*

several years start, and have become stout and vigorous, the ground may be seeded to grass. See article, Lawn. The small evergreens near the house may be trimed to neat proportions, but the larger ones farther away should be allowed to grow freely. Trees should not be allowed to touch each other.

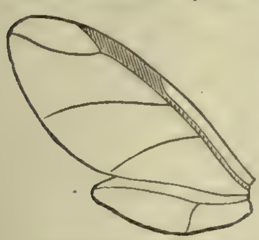
In short, endeavor to imitate nature's rounded turns and flowing outlines, so as to make groups of trees and other plants present a scene of wild diversity. The aspect of the ground will suggest the turns to be made.

The illustrations in this article, of trees and shrubbery, represent those which may be used in ornamenting the landscape. They are of recent introduction and most of them are becoming favorites for landscape decorations.

Lantern, something enclosing a light and protecting it from the wind, rain, etc. It may be a large, stationary structure, as on buildings, or small and portable, to be carried by hand or on the arm. The latter are called hand-lanterns, arm-lanterns, or breast lanterns, according to their arrangement for being carried. A "dark lantern," or "bull's-eye," is one emitting light only on one side, and having a door even to this side, which may be closed, completely concealing the light; much used by burglars. The magic lantern, used by exhibitors, consists of magnifying glasses adjusted in connection with figures of objects to be illustrated, so that an enlarged view is thrown upon a distant screen. There are many modifications of this apparatus, as stereopticon, panopticon, etc. In machinery and architecture the term lantern has also other meanings, as the upper portion of a dome, etc. For keeping a kerosene or any other kind of oil lantern in good trim, see the article Lamp and Kerosene.

Larch, a tree of the pine family, but which sheds

all its leaves every fall. The tree is somewhat ornamental in the landscape, but not sufficiently so to create much admiration. The wood is valuable for posts, telegraph poles, railway ties, etc. The European larch, however, now rapidly extending in cultivation, is a far more profitable tree to raise. A species of louse infests the larch, which may be identified by the veins of his wings, as exhibited by the annexed engraving.


Larch Louse. (Chermes laricis).

Lard, the leaf, intestinal and other fat of the hog when rendered into grease. It is the most important product of the hog next to the meat, being about one-sixth of the weight of the dressed carcass. The United States exports it in large quantities to foreign countries, principally Britain.

To render, or try out lard, cut in small pieces, wash it with successive portions of clean cold water, until it becomes soft and will not discolor the water. Then place it in a vessel (a well tinned vessel is the best), in the bottom of which is a little water, and heat over a slow fire until the fatty portions are crisp and the melted fat becomes perfectly clear and free from water. Strain it through cloth, into clean earthen jars, stir it a little while cooling, cover the jars as tightly as possible with waxed or varnished paper, and keep them in a cool dry place.

To cleanse rancid or impure lard, place it in a vessel which is set in another much larger vessel, and the space between filled with water, to prevent the burning of the lard. Now melt the lard, and stir into it, gradually, one ounce of powdered alum and two ounces of pure table salt to every 50 pounds of fat. Raise the heat to 212° Fahr., and skim it till the scum, which contains all the impurities, ceases to rise. Strain through cloth into clean stone jars and let it cool. Next put it in a kettle of water and boil it slowly, stirring, to enable the water to separate all the saline impurities from the fat. Let it get cold and hard. Then take it off the water and heat it sufficiently to evaporate any water that may remain, and again strain into clean jars. It will now be clean, white and pure.

Larder, a room where meat and other articles of food are kept before they are cooked; a pantry. The most important practical observation we can make in this connection is that no rancid meat, kerosene or other odorous articles should be allowed in a pantry, as such things contaminate other articles. For the structure of the larder, see Residence.

Lark, an innocent and cheerful bird, common throughout the temperate zones. There are several species.

HORNED LARK or Shore Lark, is about half the size of a Robin, the females being as large as the males and having a covering of brownish gray tipped with black upon the back, and white feathers upon the breast. There are yellow markings upon the neck and breast. The wings are dark brown mixed with white on the inside. The bird has three toes in front and one behind, the male having a beautiful black crescent on its neck, a black marking below its eyes and above its bill, and another handsome crescent or corona half encircling its forehead, some feathers which project above the head like a horn. These are all indicated in the illustration above given. There are hundreds of thousands of these birds in the Laramie Plains, the whole region during some seasons seeming to be alive with them.


Horned Lark.

Larkspur, a beautiful flowering plant, of which

there are several species. Three or four species grow wild in the Northern States.

Larva, an insect during the stage which intervenes between the egg and the pupa. The names grubs, maggots and caterpillars are popularly applied to many larvæ, and though all these names are very loosely used, and far too indefinite for any purposes of either scientific nomenclature or practical exactness, grubs may be generally regarded as a name for all larvæ which feed upon field crops, maggots as a name for the larvæ of flies, or dipterous insects, and caterpillars as a name for the larvæ of moths and butterflies.

Larynx, (lar′inx), the organ of the voice. It is constructed on the principle of a whistle, is situated in the upper portion of the wind-pipe, and is subject to a few diseases, in which case the voice is affected. Most of these diseases should be treated with "compresses,"—that is, wet cloths bound loosely to the throat. The temperature of the compress should depend on the nature of the disease and the sensations of the patient. A severe cold sometimes settles upon this organ, thickens the parts by swelling and inflammation and thus reduces the "vocal exercises" of the patient to a whisper. No special medication is required for such an affection further than the compresses mentioned and general care of the health.

Lash, the thong or braided cord of a whip; a cord; a string; a stroke with a whip or anything pliant and tough.

Lattice, any work of wood or iron, made by crossing laths, rods or bars, and forming a network; as, the lattice of a window; called also lattice work. The old and standard style of plain lattice work is that which consists of planed laths or larger strips of wood nailed together in two sets, one across the other, with spaces of the width of the slats, and painted green. This is almost universally used about porches, both above and below the floor. More expensive and ornamental lattice work varies so much in style that there can be no classification. In architecture, however, taste requires an adaptation of the style of lattice to that of the structure. Lattice shutters for windows, on the inside, are far superior to curtains.

Laudanum, a preparation of opium, especially in spirit or wine; tincture of opium. Used in many medicines as a sedative and soporific. Hence its popularity in paregorics and soothing sirups for children, as it has a tendency to relieve distress and lull them to sleep. Many, if not most, physicians declaim against its use among infant children,—at least against an extended use of it, as it tends to debilitate and derange the system permanently. Laudanum is sometimes given by injection *per rectum*, for the same anodyne purposes as when given by the mouth. For adults, 20 to 60 grains (or small drops) constitute a dose, to be repeated when it is ascertained that it is not effectual. For infants, 3 to 5 drops.

Laundry. Under this branch of domestic economy we shall take an extensive view. We shall not only treat of the ordinary process of washing the different fabrics and the theory of washing, but shall include all the appliances of the laundry.

THEORY OF WASHING. The primitive mode of performing this operation, before detersive or cleansing substances were known, was, no doubt, washing clothes in simple water, and this method is still practiced in many countries. The Hindoos carry their clothes to the Ganges, where they undergo the necessary purification in water alone. But this requires much labor; and to remove with greater facility the discoloration of linen occasioned by being worn, which is partly of an oily nature, and therefore very difficult to destroy by water only, certain substances, called detersive, have been introduced, which assist in the process. Of these the principal one is soap, the manufacture of which we fully treat under that head; but a few observations as to its uses and different kinds we will make in this article here.

It is well known that oil or grease is not soluble in, and will not unite with, water; a greasy spot cannot be washed out completely by water only, unless such a degree of rubbing be employed as will injure the cloth in some degree. But if oil be united to an alkaline substance, the mixture of the two is soluble in water; hence, if the greasy spot be touched with an alkali, as potash or soda, the latter will unite with the grease or oil, which being then soluble in water, rubbing in that fluid, or washing, will cause it to disappear. If, then, soiled or greasy linen be washed in water containing potash or soda, the labor of cleansing is much less than with water alone, and the fabric, not being necessarily subjected to so much rubbing, suffers less wear.

All the ashes of burned vegetables contain more or less of the alkali called potash; hence wood ashes was one of the most ancient detersive substances, and is still occasionally employed for that purpose. But alkalies, when used alone, have this inconvenience, that although they are extremely effective, yet, if employed in too great a quantity, they are capable of corroding the clothes to be cleansed, and likewise of acting in the same manner on the hands. The difficulty of regulating properly their strength has led to the invention of soap, which consists of alkali already united to a certain proportion of oil or fat of some kind, by which its power of corrosion is so much diminished as not to destroy the texture of the fabric; and yet the alkali in the soap is capable of taking up a little more oil or grease; such as may be found in soiled linen; and that is likewise converted into soap. Now, all soap being soluble in water, the whole of the impurities may be thus removed by rubbing the linen between the hands in that fluid. In fact, then, in employing soap for washing, we make more soap, though the newly formed material is in very minute quantity, and does not become solid. Soap is not necessarily solid; if oil and any solution of

alkali in water be mixed in a small vial and shaken together, liquid soap will be the result. Soap is made solid by certain processes of the manufacture, on account of the greater convenience in using it, than if it were in the liquid state. It will be easy to perceive, from this explanation, that the strongest soaps have the most alkali in their composition, since it is by the abundance of this ingredient that the cleansing effect is produced; and it will likewise be evident why soaps of different degrees of strength are suitable for different purposes. It may be observed that there are other detersive substances besides soap, as wood ashes and other things containing alkali. Various clays have a similar effect, but produced in a different manner than it is from soap; by their absorbent quality they attract the oily particles from the cloth, and cause them to be more easily removed mechanically by rubbing in water; but no chemical union is thus formed, as in the case of soap.

The alkalies potash and soda, when in a state of perfect purity, and not combined with any other substance, are of a highly caustic nature, that is, they powerfully corrode animal and vegetable substances; hence, although they would readily unite with oil or grease, so as to make it soluble in water, yet they would entirely destroy the texture of cloth, linen, or any similar substance, and therefore could not be used as detergents in that state. See Potash and Soda.

But when these alkalies are united with carbonic acid, and are thus converted into carbonates, they are rendered much less caustic, and, although they will still render grease soluble in water, yet they become so mild that they will no longer act powerfully upon the texture of cloth, and may then, in moderate quantity, be used with safety as detergents. Hence it is that in this state alone they are employed in washing, bleaching, scouring, etc.

Carbonate of soda is far preferable to carbonate of potash for these purposes, because it is much less acrid, and is not so apt to injure the texture of linen goods as potash. It is, accordingly, much more extensively employed, particularly since means have been discovered of preparing it so cheap as to supersede pearlash almost entirely.

Washing Fluids. A simple washing fluid is made by putting 1 pound of saleratus, or soda, in a gallon jug; fill up with water; let stand 1 week, and it's ready for use; to use it put two pails of clear water into your tub, put 1 teacupful of the fluid in, and all of the clothes it will wet nicely; let soak 25 or 30 minutes; wring out suds and boil as usual; add a little more fluid to the water left in the tub, and put your calico clothes through the same. It will not fade them at all, but loosens the dirt nicely.

Borax, 4 ounces; saltpeter, 4 ounces; sal-soda, 24 ounces; sal ammoniac, ½ ounce; aqua ammonia, 2 ounces; alcohol, 4 ounces; spirits camphor ½ ounce. Dissolve all in one gallon soft water, put in a jug (adding the liquids), and cork tightly. Soak the clothes over night, or for a short time in the morning, in a tub of warm suds, containing ½ teacup of the fluid; after rubbing, boil, putting ½ teacup of the fluid to a large boiler full of clothes. Will not fade prints unless spilled on in the full strength.

For four dozen of clothes, take 1 pound of hard soap; 7 teaspoonfuls of spirits of turpentine; 6 teaspoonfuls of spirits of hartshorn; 5 teaspoonfuls of vinegar. Dissolve the soap in hot water; mix the ingredients; then divide the mixture into two parts. Put half in the water with the clothes over night; next morning wring them out. Put them to boil in 6 gallons of water, and add the rest of the mixture; boil 30 minutes and rinse out thoroughly in cold water.

Take 1 pound of sal-soda and ½ pound of unslacked lime, put them in a gallon of water and boil 20 minutes; let it stand till cool, then drain off and put it in a stone jug or jar. Soak your dirty clothes over night or until they are wet through, then wring them out and put on plenty of soap, and to a boiler of clothes well covered with water, add 1 teacupful of washing fluid. Boil half an hour briskly; then wash them thoroughly through one suds and rinse well in water, and your clothes will look better than the old way of washing twice before boiling.

Soap. The most usual and convenient mode of employing the alkali for the purposes of washing is when made into soap, the action of which has been already explained. The various kinds of soap are made of one or other of the fixed alkalies, potash or soda, combined with fat or oil. We explained above that it is the alkali that gives to soap its detergent quality, and which renders it soluble in water. The grease serves to moderate the sharpness of the alkali, and to prevent its injuring the hands of those who use it. See Soap.

Water. The quality of water used for washing is of the greatest importance in the process. In the article Water we explain the nature and properties of the different kinds, as obtained from various sources, as well as the difference between hard and soft water. To this we must refer our readers. The softest waters are the fittest for washing, simply because they are the purest, containing no salts capable of decomposing the soap and destroying its action.

When water is hard, it is owing to its containing earthy salts, generally either carbonate of lime or sulphate of lime, the acids of which seize the alkali of the soap, which is united to the oil only by a weak affinity. If the cause of hardness be carbonate of lime dissolved in the water, simple boiling for a considerable time corrects it by driving off the carbonic acid in the form of gas, when the lime falls to the bottom, leaving the water soft, which may then be poured off and used for washing; or the addition of quicklime may effect it, as has been stated. But when the hardness proceeds from sulphate of lime, or lime united to the sulphuric acid, which is the most frequent case, boiling has no effect, because the sulphuric acid cannot be driven off in this manner. It is then necessary to decompose the sulphate of lime by put-

ting into the water common soda, or potash, or pearl-ash, as may be most convenient. Even wood ashes will answer the purpose if no better material is to be had, because, as we have shown, they contain potash. As spring water and well water are very frequently hard, the addition of soda, concentrated lye, potash, borax, or some of the manufactured washing powders or fluids, of which there are several good ones in the market, to such water, is a very common and a very useful practice. The following are simple and excellent recipes for softening hard water:

Hard waters are rendered very soft and pure, rivaling distilled water, by merely boiling a two-ounce vial, say, in a kettleful of water. The carbonate of lime and any impurities will be found adhering to the vial. The water boils very much quicker at the same time.

Fill the wash boiler with hard water, then put half a teacupful of wood ashes into a little cloth bag; let this lie in the water until that is warm enough to use. This is worth knowing.

Dissolve 1 pound of the saponifier or concentrated lye in 1 gallon of water, and keep it for use in a well corked jug; to a tub full of pump or hard spring water, add from one-eighth of a gill to a pint of the clear solution, according to the size of the tub and nature of the water; a tablespoonful will generally be enough to make 3 to 5 gallons of water fit for washing.

Washing. Some directions for the management of linen previously to its being washed may be useful; and we may, at the same time, observe that, though the term linen strictly means only cloth made from flax, yet, on this subject, it is usual to apply it in a general way to express most of the articles, whether linen or cotton, which are submitted to the various processes of the laundry.

Soiled or foul linen ought not to remain long unwashed, as the dirt is then more difficult to be removed. Some families wash only once a month; but once a fortnight, or every week would be better. What has been used in the kitchen and other offices should be kept separate, being generally greasy, or otherwise very foul. Silk stockings, lace, dresses, and various nice articles that require particular skill in cleaning, of course receive different attention.

Spots of grease or gravy on table-linen or napkins should be washed out with soap and water as soon as the cloths are withdrawn, otherwise they are sometimes difficult to remove after the linen has lain long by; and stains from ink, wine, or fruits should likewise be taken out.

An excellent and simple mode of doing the washing is as follows: On the afternoon previous to washing day, the linen should be put to soak in a weak lye of lukewarm water, having a little soda put into it; but first it must be well soaped on such parts as are the most soiled; and this operation should be performed with care, as it contributes much to the facility of the washing by loosening the dirt, and thus saving labor as well as the wear of the linen. For soaping the worst parts, soft soap will be found most economical. No more warm water should be used than is just sufficient to cover the linen when pressed down in it, that the strength of the soap may not be reduced.

To save soap, and make the process easier, it is usual now to put some soda or washing powder into the lukewarm water to render it soft; the quantity must be determined by experience; if too much is used it will exhibit its effects upon the hands of the operators. These are more particularly useful when the water is at all hard and will not make a lather. Careless washers leave their soap in the water where it dissolves, and is wasted unnecessarily.

After the linen is well washed with plenty of lukewarm water the first time, it is to be put into a quantity of water as hot as the hand can easily bear, and washed in this again.

The next operation after washing is boiling the clothes, in order to produce a good color, and to remove entirely the soap or other detergent matters that have been used, which if left in would occasion a disagreeable smell. Some enclose the linen in a bag before it is put into the boiler, in order to guard it effectually from the scum of the water, which is apt to attach itself. After being boiled for twenty minutes or half an hour, the linen is taken out, well rinsed in abundance of clean hot water, and afterward in clean cold water which has a sufficient quantity of blue to give the proper tinge. It is then taken out and wrung dry. Next it is ready to be conveyed to the place where it is to be hung up and dried. It is necessary to state that, if the operations were commenced by boiling the linen, the dirt would be fixed instead of being removed. Washing, therefore, precedes the boiling.

The quickest and best way to do the washing for a family of six or eight persons: First, have plenty of boiling water; to every boilerful add from two to three tablespoonfuls of pulverized borax; use some of the borax water from the boiler for every tubful of clothes, adding only enough cold water to make it comfortable for the hands; use soap on the most soiled, and rub on the board or through a washing machine; do not boil the clothes; have a tub partly full of boiling hot borax water in which to put the clothes that have been rubbed; let them remain in the hot borax water until you are ready to rinse them; from a quarter to a half hour will do; rinse in one clear water, without borax. Use very little, if any, bluing. Borax will not injure the texture of the finest linen, and for infants' clothes or flannels it is the only thing that can be used with perfect safety. If stockings or socks are badly stained, they might be boiled in borax water for a few minutes only; too much boiling makes clothes yellow. Borax acts slowly, but surely. The improvement in clothes washed after this direction will be noticed after the second or third trial, often after the first. Add a teaspoonful of borax to every quart of starch: it will keep the starch from sticking, and add to the polish.

Drying. It is not sufficient that the fabrics be

well washed, if it be not likewise dried in the best manner, since the whiteness and good appearance depend much upon this. All white goods should be hung in the sun. But the same cause which renders drying in the sun beneficial to white linen renders this injurious to all dyed and printed articles, as being destructive to color. These should, therefore, be dried in the shade, and never hung in the sun: it is the sun's rays, and not merely the air, which particularly occasion colors to fade. It is not uncommon for printed cottons to suffer considerable injury for want of this precaution, either from negligence or ignorance of the principles we have mentioned. Some articles require particular modes of hanging them up to dry. Very thick articles, as quilts, waistcoats, etc., are best hung over two lines placed a few feet apart, in order that both sides may be sufficiently exposed to the air. The summer months are best for washing thick and heavy articles as blankets, counterpanes, quilts, etc., on account of the greater facility with which they may be dried out of doors in that time of the year, and thus, also, acquiring a better color. Laces require to be stretched smooth, and tacked to a piece of white calico before they are hung up. Muslin and other dresses must be stretched as smooth as possible, that they may not get wrinkled in drying. But it is unnecessary to detail all the little precautions to be observed in hanging out various articles of dress, since these are sufficiently understood by those who are practiced in it, and scarcely admit of being explained by any short directions. But, notwithstanding the superiority of drying clothes in the open air, this is not always practicable, and they are then dried within doors.

STARCHING. As it is necessary to have certain parts of linen and various articles of dress less pliable than usual, starch is employed to give the requisite stiffness.

To make the starch for use, it must be mixed with a sufficient quantity of cold water, until it is about the consistence of common paste, carefully breaking all the lumps, and rubbing it till it is quite smooth, then add boiling water in the proportion of a pint of water to an ounce of starch; put the blue flannel bag into it, and let enough color be dissolved to give the required tint. The making of starch properly requires some care. If made in a tin sauce-pan, it is a chance if it does not burn, like all thick liquids. The starch being properly mixed, put it on the fire and let it boil, taking care to stir it all the while, to prevent burning. When it is taken off the fire and poured out, cover it with a plate, to prevent a skin forming. If it be wanted stiffer than common, a little gum Arabic or isinglass dissolved may be added; and for some articles of lawn, gum Arabic alone is used, without starch. Some add a bit of white wax.

The parts of linen and other articles of wearing apparel that require to be starched are too well known to demand enumeration, and even these vary somewhat with fashion. Wet bosoms and collars in hot water, ring very dry, and starch while wet; rub the starch well in and ring in a dry towel; roll tightly together, let lie two or three hours and then iron. The process of starching consists merely in dipping the part into the starch, and squeezing it. Linen may be glazed by adding a teaspoonful each of salt and finely scraped soap, to a pint of starch.

WASHING BY MACHINES. Hundreds of attempts have been made to lessen the labor of washing by the use of machinery. Many of these are complicated and quite worthless, while others require more tact and labor to manage and use than is required to rub the clothes with the hands. There are, however, some very practical and valuable machines now manufactured. These greatly lighten labor, but so numerous are washing machines and so varied in their workings that we can give no intelligent instructions as to their kinds, uses, etc.

MARKING CLOTHES. The marking of linen being connected with the business of the laundress, we shall introduce the subject in this place. Marking has usually been practiced with the needle, and still must be for blankets and woolen articles; but linen and cotton can be more conveniently marked with an ink that is indelible by the ordinary processes of washing; observing, however, that this will be discharged wherever the bleaching liquid is used.

The best marking ink is made in the following manner, which it is useful to know, as in some places it cannot be purchased or depended upon. Get one drachm of lunar caustic, dissolve it in less than half an ounce of pure water (distilled or rain is best), having put into it a drop or two of nitric acid; but this is not essential. This forms the ink; but as it is yet colorless, the writing done with it would not be visible, and it would be too thin. To give it a little color, add to it a little indigo, or even a drop of common ink; and to give a little thickness, add a very little gum, which by itself will give a greenish color. To prepare the linen to be written upon, dissolve an ounce of salt tartar (sub-carbonate of potash, the common potash used for washing) in an ounce and a half of water. Wet the linen with this preparation, and let the place dry completely · when the part is dry, rub it with something hard to smooth the surface, and write with the ink prepared as above. The writing will be indelible.

Another is made as follows: Lunar caustic, two parts: sap green and gum arabic, of each one part; distilled water sufficient to dissolve to the right consistency of ink. Before marking the linen wet it with a solution made of soda, one ounce; water, one pint; sap green, half a drachm. Mix and dissolve. Let the solution thoroughly dry before you mark the linen with the ink. This forms the ground to write on and prevents the ink from spreading.

Any one may easily make these inks; but it must be observed that lunar caustic will burn the skin if handled; it should, therefore, be lifted by a pair of pincers or scissors. The ink also makes a black stain upon the skin, which no washing will remove; it must, therefore, be used with neatness and care. If the ink is too pale, there is not lunar caustic enough in it; if there is too much, the ink will be apt to run or blot.

The vial containing the ink should be kept from the light by wrapping paper around it, or keeping it in a case.

Clothes-lines, Pins, etc. The items of clothes lines, pins and wringers are important in themselves, yet so simple are they and so varied in their makes, etc., that nothing of value could be said upon them. Lines may be of wire or rope and must be strong and durable, and not injure the clothing. There are many good wringers made, most of which do their work well and are a great relief to the muscles of the arms. A wringer should be fastened upon the tub-rack where it will be stable, and convenient to the tub.

How to Wash Various Fabrics and Articles. The following are directions for washing many of the fabrics and articles. They are standard and have been recommended by some of the most skillful laundresses and housewives in the country.

Blankets. Take a clean barrel and place in it a boilerful of boiling soft water, to which add good soap enough to make a strong suds; then put a tablespoonful of turpentine and one of good whisky; stir well, and put not over two blankets in this, turning them about so as to be thoroughly wet and to lie loosely in the suds; cover the barrel over with something thick enough to prevent the steam escaping, then let them stand until cool enough to handle; pound them with your pounder, turning frequently; rinse in hot sudsy water, with a little indigo in the water. If blankets are much soiled, they will require pounding through more than one suds.

Have plenty of warm water in which you have previously melted, say, a quarter of a pound of white soap, free from resin, stirring well until it is a lather; add to this a quarter of a pound of borax, stir again, put in your blankets and turn them around in it for ten minutes, keeping the boiler on the range, but do not allow it to boil; take them out in clear water and rub them; rinse them in water slightly blued; wring, and snap and shake them until the water is out of them, then let them get perfectly dry and press them under damp muslin. It will require two persons to handle them.

Calicoes. Calico clothes, before they are put in water, should have the grease spots rubbed out, as they cannot be seen when the whole of the garment is wet. They should never be washed in very hot soap-suds; that which is mildly warm will cleanse them quite as well, and will not extract the colors so much. Soft soap should never be used for calicoes, excepting for the various shades of yellow, which look the best washed with soft soap and not rinsed in fair water. Other colors should be rinsed in fair water, and dried in the shade. When calicoes incline to fade, the colors can be set by washing them in lukewarm water, with beef's gall, in the proportion of a teacupful to four or five gallons of water. Rinse them in fair water; no soap is necessary, unless the clothes are very dirty. If so, wash them in lukewarm suds, after they have been first rubbed out in beef's-gall water. A little vinegar in the rinsing water of pink, red and green calicoes, is good to brighten the colors, and keep them from mixing.

Fast color prints should be washed in warm suds, scalded, if the ground is white; if dark, the scalding may be omitted. Add a little starch to the last rinsing water, to give the goods a fresh appearance without stiffening them. Iron as soon as possible.

Doubtful color prints. Two tubs of suds of hard soap, each with a handful of salt, strained; use three rinsing waters; in the last, of hard water, put forty drops of elixir of vitriol and a teaspoonful of gum arabic to each gallon, and strain; use yolk of egg on grease spots, and wash in clear, warm water till they are removed, then wash prints through the two suds, and rinse in the three waters; wring dry, and hang in the shade.

Swiss Muslin, and other thin muslins, should be gently squeezed and not rubbed. They, and all handkerchiefs, collars and small articles should be boiled in bags made on purpose, and large enough to allow them to be rinsed, ready for the clothes line, without removing from the bag.

Delaines. Wash quickly in one or two suds, with ox gall added, if possible; rinse as in "doubtful prints," using vinegar or alum for vitriol, and twice as much gum arabic.

Colored Merinoes. Wash each breadth and piece by itself, first in clear, soft water of blood heat to remove the egg used to clean grease spots; then in suds of the same temperature, after which rinse in warm rain-water and stiffen with gum arabic, a tablespoonful to the gallon.

Delicate Merinoes and Delaines. Boil a peck of bran in a boiler of soft water three hours; let it settle and cool; strain through a thick cloth and wash the goods in the water, each piece by itself; then rub through three waters, and rinse and dry.

Embroideries. Take a strong suds of good hard soap; mend broken places and soak for a day; squeeze carefully out of the suds, passing each article through the hands several times; wash in other suds in the same way till the suds are left clear. Articles should be frequently pressed under water and stirred up, so as to expose each to the sun. Rinse clear without wringing much; add a little blue to the water; dip each article and wring by pressing in a towel.

Lace Curtains. To wash and do up lace curtains, soak over night in warm suds of soft water; next morning wash in two suds, boil, suds out and rinse in water not very blue, as they are so soft they take the bluing very quickly. Make thin starch, boil a moment and strain. Do not hang them on a line, but spread sheets on your carpeted spare rooms, and pin them down tight. Then spread on the sheets the curtains. Stretch as tight as you dare without tearing and pin through upon the carpet if you can, as close as every three inches. You will be pleased with the change you have made in your curtains. When dry, you can easily erase the marks the pins have left, by gently pulling the edges of the curtains.

Woolens. If you do not wish to have white flannels shrink when washed, make a good suds of hard soap, and wash the flannels in it without rubbing any soap on them; rub them out in another suds, then wring them out of it, and put them in a clean tub, and turn on sufficient boiling water to cover them and let them remain till the water is cold. A little indigo in the boiling water makes the flannels look nice. If you wish your white flannels to shrink so as to have them thick, wash them in soft-soap suds, and rinse them in cold water. Colored woolens that incline to fade should be washed with beef's gall and warm water, before they are put into soap suds. Colored pantaloons look very well washed with beef's gall and fair warm water, and pressed on the wrong side while damp.

Delicately Tinted Hose, etc. Wash the article as quickly as possible; do not lay it out of your hands until it is well and thoroughly rinsed in two waters, the last one to be well salted.

Gentlemen's Wear. To wash gentlemen's wear, such as black and white pants, vests, coats and heavy overcoats, wash as usual, rinse thoroughly in two waters, then prepare a third water thus: To four pails water (warm or cold) add a quart of salt; when dissolved, rinse the clothing through it; turn every article wrong side out, hang in the shade to dry, and you will be well paid for the little extra trouble, when you see how nice and clear they are.

Silks. If red, use muriate of tin in the bran-water; if green, blue, crimson, maroon, or bright yellow, use oil of vitriol. When badly soiled, the bran-water alone should be used for washing, and the muriate or vitriol put in the rinsing water. Use yolk of egg for grease spots, letting them dry. Spread the silk on a clean, white wood board, and wash quickly each breadth with a sponge or woolen cloth, first on one side and then on the other; rinse in the prepared water without wringing. If very much soiled go over twice, and finish the washing without drying the egg, the second time; dry in the shade and stiffen with a little gum arabic, unless the silk is heavy.

White Counterpanes. Soak in a strong solution of soap and soda for forty-eight hours; if spotted, rub them; if not, boil an hour in a boiler of suds, with three tablespoonfuls of soda and two of turpentine. Rinse in three waters without wringing, and in the fourth put a little blue and wring the way the warp runs.

White Cotton Cloth, Directions for Washing. Table-cloths, or any white cloths that have coffee or fruit stains on them, before being put into soap-suds, should have boiling water turned on them, and remain in it till the water is cold; the spots should be then rubbed out in it. If they are put into soap-suds with the stains in, they will be set by it, so that no subsequent washing will remove them. Table-cloths will be less likely to get stained up, if they are always rinsed in thin starch water, as it tends to keep coffee and fruit from sinking into the texture of the cloth. White clothes that are very dirty, will come clean easily if put into strong, cool suds and hung on the fire the night previous to the day in which they are to be washed. If they get to boiling, it will not do them any harm, provided the suds is cool when they are put in; if it is hot at first, it will set the dirt in.

To Wash Lace. Cover an ordinary wine bottle with fine flannel and stick it firmly round the bottle; tack the outer edge of the lace to the flannel, rolling it smoothly round the bottle, then tack the inner edge smoothly down; iron over the lace with a piece of very fine flannel or muslin; rub the whole gently with clean suds. If the lace is very much discolored, fill the bottle with hot water and set it upright in a saucepan of suds and let it boil for a few minutes, then place the bottle under a running tap to rinse the lace thoroughly; make some starch about as thick as arrowroot for an invalid, melt in it a small quantity of the best white and a little loaf sugar. Plunge the bottle two or three times into this starch, pressing out the superfluous starch with the hand; then dip the bottle into cold water, remove the outer covering from the lace, fill the bottle with very hot water, and set it in the sun to dry the lace. When nearly dry take it off the bottle carefully, pick it out with the fingers, and lay it in a cool place to dry.

Laurel, a name of several species of trees and shrubs, even of different genera and orders.

1. *Laurel*, or *Sweet Bay.* (Laurus nobilis.) The home of this shrub is around the Mediterranean. It is an evergreen, bearing aromatic leaves and at the base of the leaf stems clusters of small, yellowish-white flowers. The leaves, called "bay leaves," are used to flavor certain fancy dishes for the table, and both leaves and tree yield an aromatic oil used to flavor the bay water of commerce.

2. *American Laurel; Mountain Laurel; Broad-leaved Laurel; Calico Bush.* (Kalmia latifolia.) This is also an evergreen shrub, growing from three to ten feet high, throughout the eastern portion of the United States, especially abounding on the sides of hills and mountains. The flowers are beautiful, but the leaves are narcotic-poisonous, especially to sheep. They are said to be eaten with impunity by deer, goats and partridges. Similar properties characterize other species of Kalmia, as sheep laurel and swamp laurel. All these have been used in medicine.

3. *Cherry Laurel.* (Prunus lauro-cerasus.) This laurel, belonging to the rose order of plants, is not poisonous. It, too, is evergreen, growing 15 to 20 feet high, bearing shining leaves, small, white, odorous flowers, and fruit like a small black cherry. It is a native of Asia Minor, but has been introduced into Europe. Prussic acid, for medical purposes, is obtained from its leaves.

4. *Rose Laurel; Rose Bay; South Sea Rose.* (Nerium Oleander.) Another name of the common oleander, which see.

5. *Sassafras.* (Laurus Sassafras, now Sassafras officinale): well known.

6. *Spice-wood; Spice Bush; Fever Bush.* (Laurus

or Lindera Benzoin.) This is a common wild shrub throughout the eastern portion of the United States. It is very odoriferous. The berries have been used as a substitute for allspice, and a decoction of the leaves and twigs as a stimulant and febrifuge.

Lawn, ground in front of or surrounding a residence, covered with grass. We have very fully treated of the care and decorations of the grounds surrounding the residence, in Landscape Gardening and Floriculture, and therefore in this article have but a few observations to make. Every one realizes how beautiful a well-kept lawn is. Its condition may change the whole aspect of the home from the exterior views. It costs so little and is really worth so much that farmers cannot afford to neglect their yards.

There are three modes of forming lawns. The first is to mellow the surface and sow grass seed thickly; these coming up with the weeds, the seeds of which are in the soil, much labor is required afterwards to get all these out by hand. The second is to plow and re-plow, harrow and re-harrow, for a season, in order to work out all the foul seeds, allowing time between the operations for the seeds to germinate, and remembering that many seeds will not grow if buried over an inch deep; hence the necessity of repeating the stirring many times, in order to bring all parts up to the surface. Then sow fine grass seed, such as red-top, June grass, white clover, etc., mixed, and at the rate of at least one bushel per acre, rolling it in. This is to be done as early as possible in spring, and then, when it is a few inches high, mow it closely as often as once a week the season through. This will give a handsome, green, carpet-like velvet. The third mode, usually the most expensive, but the most speedy and certain, if well performed, is to turf the surface. First make the soil deep and mellow, and even at the surface; then pare from an old pasture the turf, cut very smooth, with perfectly parallel and straight sides, and of a perfectly uniform thickness of about two and a half inches; spread this turf over the mellow

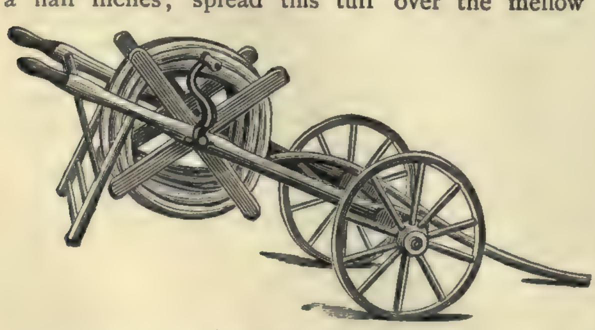


Fig. 1.—*Lawn Hose Cart.*

surface, as smooth as a floor, and roll evenly. If manure is applied to make the soil rich, it must be finely pulverized, and thoroughly and evenly worked in.

When the grass becomes thin and of weakly growth, a top-dressing of good stable manure should be laid over the surface in December. It is important that the manure should be well rotted before being used, and occasionally during winter it should be broken up and moved around some, the object being to distribute it evenly and fine enough so it will settle around the roots of the grass and nourish it. The rough portions should be removed at the opening of spring.

Do not use oats in sowing grass seed, as is often done. It robs the young grass of much nourishment and dies when the grass most needs its protection. Timothy is too coarse and

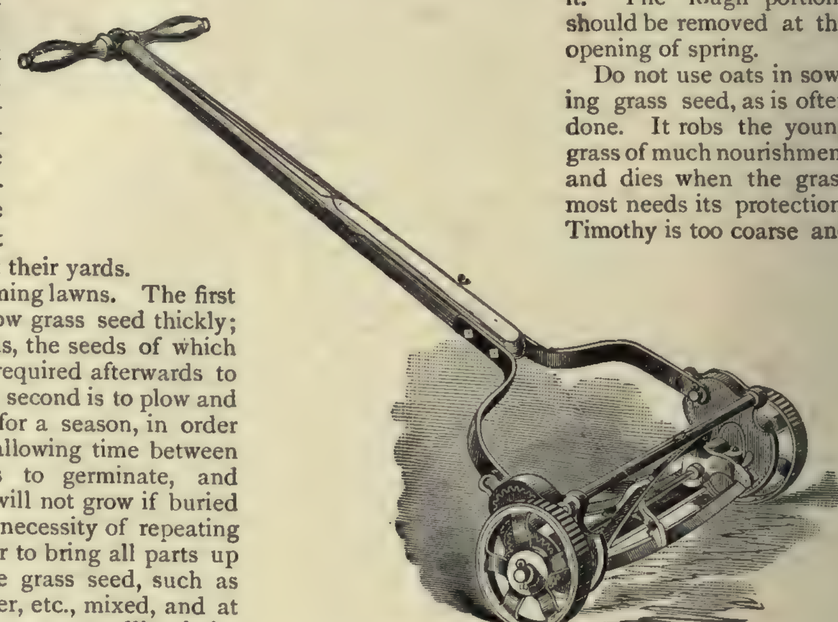


Fig. 2.—*Lawn Mower.*

uneven for the lawn. It is, however, easily killed by close cutting late in the summer. The following is an excellent mixture of grass seed: Kentucky blue grass one bushel, red-top one bushel, spear grass one bushel, and white clover two bushels. Mix and divide in two equal parts, sowing one part one way and the other half the other way. Then sow two pounds of flat turnip seed. This quantity is sufficient for one acre.

Every lawn of any pretentions should be kept smooth by a machine. Mowers are now made that leave the lawn in a beautiful, velvety condition, and the short grass falling down over the roots forms an excellent mulching. These mowers are simple, easily managed and do their work so admirably that one should be used upon every lawn of any considerable size. In this article we present illustrations of different makes of lawn mowers. Fig. 2 represents a mower made by Mast, Foos & Co., Springfield, O. It has a center cut and can be used on uneven surfaces, cutting over knolls and ridges, close up to walks and down terraces. It is of very light draft and not liable to get out of order. The wheels are 7½ inches in diameter and are both drivers, so that it runs lightly and cuts in turning to the right or left.

Fig. 3 is an illustration of a lawn mower made by E.

S. Bristol & Co., Chicago. It is made from the best material and is a speedy and close cutter.

Another thing necessary in connection with the

FIG. 3.—*Lawn Mower.*

lawn, in cases of drought during the hot summer months, is the hose and cart. We give an illustration of a good cart (Fig. 1) made by the Union Manufacturing Co., Toledo, O. It is intended for those who use 25 to 75 feet of hose. A new design and cheap.

See Landscape Gardening and Floriculture.

Lay, Ley or **Lea,** a meadow; a plain or plat of grass or clover land. A clover lay is the best ground upon which to raise most crops.

Layering consists in bending down a branch to the ground and confining it there until roots are formed and a new plant started, something in imitation of the spontaneous propagation of the strawberry by its runners. Generally, however, it is best to put the lowest angle, the joint where the roots are expected to grow, a little below the surface of the ground, or at least cover that point with good, moist earth. The bough is usually held in its place by a stake with a short prong at the upper end. Grape vines can be laid down for some distance so that several new shoots can start at once from as many joints. Cut off the end of the branch back to the buried portion. In one season the new plants will have roots sufficient to be taken up for transplanting. Layering is done in early spring.

Leach, to wash, as ashes, by causing water to pass through them, and thus to separate from them the alkali; the ashes leached; a tub in which ashes are leached: see Ashes. A "leachy" soil is one underlaid with sand or gravel, and thus is incapable of holding water.

Lead, a soft metal with a bright, silvery luster. The surface readily tarnishes when exposed to air; hence we see its natural color and luster only when fresh cut. The uses of this familiar metal are well-known. White lead is a carbonate of common lead, litharge is an oxide of lead and red lead is a peroxide of the same. Metallic lead, in the form of shot, is used by many horse dealers to relieve temporarily the heaving, or symptoms of broken wind, or heaves in horses. It is needless to say that if the lead is not speedily converted into an insoluble oxide, the animal so treated will die in a month or two.

OXIDE OF LEAD. This preparation of lead is used in the manufacture of common sticking plaster or diachylon.

IODIDE OF LEAD: see Iodine.

ACETATE OF LEAD; SUGAR OF LEAD. A solution of acetate of lead is known by the name of Goulard's Extract of Lead, and was formerly, and is still by some persons, recommended and used in cases of sprains, and as a wash for diseased eyes. Better and less injurious agents are now used by the educated veterinary surgeon. Goulard's Extract, or lead water, should never be used in diseases of the eye, as it can do no good beyond what cold water can do, but it dulls the eye by making it hazy and opaque. It will be well to remember this and act upon it, not minding what old and antiquated books and persons may say or think in regard to what we recommend.

LEAD POISONING produces a sugary, astringent, metallic taste, tightness of throat, colicky pains, violent vomiting, hiccup, convulsions and death. As an antidote, administer Epsom or Glauber's salt, or plaster of Paris, or alum, or phosphate of soda. Give also an emetic of sulphate of zinc (24 grains to ½ pint of water); leeches to belly; fomentations if necessary; and a castor oil mixture with laudanum.

Leaf Mold, rotted leaves. Leaf mold from the forest constitutes the best soil or manure for all those plants whose native habitat is the woods, as the small fruits and nearly all flowers and ornamental shrubs. Indeed, there cannot be too much leaf mold upon any farm or garden, and it should be the principal part of the soil in almost every flower pot. It is too tedious to collect for field or orchard purposes, but it is wise to supply it to flowers, strawberry beds and many special small crops.

Lean Meat is the muscle of an animal, and is the principal part eaten.

Leanness, want of flesh, both muscle and fat. When the result of disease, it is called emaciation; when it is the disease itself, it is called marasmus. Among persons of health the motto, "Fatness for beauty and leanness for utility," may prevail to a limited extent. Nearly all the heavy work of the world, both mental and physical, is done by people of comparative leanness; hence such persons need not envy the plump, whose chief physical merit consists in a "prepossessing appearance." We offer,

therefore, no remedies for leanness. See Fatness, page 441.

Lean-to, a shed attached to a building. This form of structure is referred to in the articles Greenhouse, Barn, etc.

Lease, a demise or letting of lands or tenements to another for life, for a term of years, or at will, or for any less interest than the lessor has in the property, for a rent or compensation reserved; the contract for such letting; any tenure by grant or permission; the time for which such tenure holds good; to let; to rent. See Rent. The form of a lease is simple. In drawing one up state the names of both parties, describe the land or property leased, state the time for which it is leased, for what purposes, amount to be paid, and insert any special agreement made by either party.

Leather, hides cleaned of hair and tanned.

To Distinguish Good Leather. The best tanned leather is of a yellowish drab color in the interior, being tanned with oak bark by the old process. That which is tanned by hemlock bark is reddish in the interior, and that which is tanned by the modern short process is of still a different color, and neither of the latter is so good as the other. Properly tanned leather is of the same color throughout its thickness. If, on moistening a fresh cut surface with the tongue, it shows a lighter color in the center, reject it. Beware of varnished leather; a good quality does not need doctoring. Rotten or half tanned leather is never so soft or pliable as fully tanned and good stock. In buying shoes or boots, by a little practice one can judge of the quality of the stock by moistening and rubbing a small portion of the surface. If it works up open, loose and spongy, it is poor material; if it continues hard and glossy like wood, it is too hard and liable to crack.

To Preserve Leather. Never heat it so hot that you can smell it. Patent leather, in particular, is easily injured by heating. Wear rubber over-shoes as little as possible. Do not wash leather with hot water and soap; remove the dirt with a damp sponge. For uncolored leather, moisten the sponge with a solution of oxalic acid. Keep it saturated with neat's-foot oil, avoiding all varnishes and all blacking containing varnish. Ignorant and indolent hostlers are apt to use such substances on their harness as will give the most immediate effect; and these, as a general thing, are most destructive to the leather. Full details regarding the cleaning and oiling of harness are given in the article on that subject.

To Restore the Luster of Leather. Give a new coat of "grain black," which may be obtained of harness-makers. Before putting on this substance, wash the leather with potash water until all the grease is killed, and after the black is put on, oil and tallow all the surface. This will not only fasten the color but make the leather flexible. Harness grained in this way can be cleaned with kerosene or spirits of turpentine. The luster of morocco is restored by sponging it with white of egg.

To Restore Softness to Leather. Rub in neat's-foot or castor oil. But the best oil for harness is a mixture of 1 quart neat's-foot oil, 4 ounces beef tallow and 3 tablespoonfuls of lampblack. For summer use, add 4 ounces beeswax.

Polish for Patent Leather. Take ½ pound molasses or sugar, 1 ounce gum arabic and 2 pounds ivory black; boil them well together, then let the vessel stand until quite cool, when the contents will have become settled; then bottle off. It is applied without brushes or polishing.

Leaven (lev'n), yeast, or a substance which produces fermentation, as in dough; especially a mass of sour dough which, mixed with a larger quantity of dough or paste, produces fermentation in it and renders it light; also called leavening. Literally, to leaven is to render light. Yeast is the best form of leaven.

Ledger, an account book in which all the transactions are classified under the names of the respective parties. See Book-keeping.

Leech, a small aquatic animal, which has a great capacity for filling itself with blood, by cutting through the skin of a person or an animal and sucking. It is extensively used by the medical profession (though not so much as formerly) for the reduction of local inflammations and congestions at the surface of the body. When full, the leech will disgorge itself if a little salt or vinegar be applied to its head, and it is immediately ready for another meal; but the practice of emptying them and applying them the second time has passed away, as infectious diseases have been communicated by such practice. There is one leech farm in this country, namely, at Newton, L. I. Most leeches are imported from Europe. Most drug stores keep these creatures on hand, for the use of physicians.

Leek, a species of onion and therefore cultivated as onions are. Sow in April in drills six or eight inches deep and 18 inches apart, but cover thinly; when the plants are up thin to nine inches apart in the drill; during their season of growth, gradually draw the earth around the plant until the drills are filled level with the surface. Water in times of drouth. Draw for use in October. This vegetable is used in soups or boiled as asparagus, especially in the winter. The recommended varieties are the Large Musselburg, the Early London, the London Broad Flag, the Broad Scotch, Very Large Rouen and the Extra Large Carentan. The wild leek of this country is a flat-leaved plant resembling a flag, and is often eaten by cows in the spring, giving their milk a disagreeable flavor.

Lees, dregs or sediment of liquors.

Legal Business Forms. It is quite essential that every person should have some knowledge of the various forms used in the transaction of business. One may not be engaged in active business, yet the neces-

sity for this knowledge will often arise. While a general knowledge of business forms is necessary, it is equally important that a person should have a form suited to the transaction made, and legal in all its parts. Those appended in this article are with a view both to illustrate and to serve the common purposes of business. Forms are the embodiment of principles, and also the instrument through which the business affairs of life are transacted. To secure both these objects, a careful selection has been made of those deemed the best adapted to answer the purpose of the one and meet the wants of the other.

We not only include in this article forms that are made legal by legislation, but also mercantlile and general business forms and terms in common use.

ARTICLES OF AGREEMENT.

An agreement is virtually a contract, by which a certain person or persons agree or contracts to perform certain duties within a specified time. See Contract.

It is of much importance, in all matters upon which may arise a difference of opinion, or misunderstanding, that contracts be reduced very explicitly to writing, thereby frequently saving the parties to the contract a long and expensive law-suit. No particular form is necessary.

It is the presumption of the law that a person in making a contract intends to bind not only himself, but his legal representatives. Such representatives may therefore sue on a contract, although not named in it.

A contract must show that it is made for a valuable consideration. A failure to do this renders it void in law.

Agreements written in pencil are binding in law, but it is best to write them with ink, as pencil marks are easily erased.

Fraud annuls all contracts and obligations, and the party so wronged is relieved of his obligation by law. If both of the parties to an agreement act fraudulently, neither can take advantage of the fraud of the other; nor can one who acts fraudulently set his own fraud aside for his benefit.

Every agreement should state most distinctly the time within which its conditions are to be complied with.

Copies of agreements should always be prepared in duplicate, and each party to the agreement should retain a copy.

Spelling, though bad, will not void a contract, where the intention of the parties is clear.

All contracts made in violation of a valid statute are absolutely void and of no effect.

Where a proposition is made by letter, the mailing of letter of acceptance of the proposition completes the contract.

General Form of Agreement.

THIS AGREEMENT, Made the Third day of November, 1883, between Damon Clarke of Macomb, County of McDonough, State of Illinois, of the first part, and William Hayes, of the same place, of the second part.

WITNESSETH, that the said Damon Clarke, in consideration of the agreement of the party of the second part, hereinafter contained, contracts and agrees to and with the said William Hayes, that *he will deliver in good and marketable condition, at the city of Galesburg, Ill., during the month of December, of this year, Nine Hundred Bushels of Corn, in the following lots, and at the following specified times, namely: one hundred bushels by the fifth of December, three hundred bushels by the fifteenth of December, and the balance by the thirtieth of December.*

And the said William Hayes, in consideration of the prompt fulfillment of this contract, on the part of the party of the second part, contracts to, and agrees with, the said Damon Clarke, *to pay for said corn fifty cents per bushel as soon as delivered.*

In case of failure of agreement by either of the parties hereto, it is hereby stipulated and agreed that the party so failing shall pay to the other *One Hundred Dollars*, as fixed and settled damages.

In witness whereof we have hereunto set our hands the day and year first above written.

DAMON CLARKE.
WILLIAM HAYES.

A Brief Building Contract.

CONTRACT for building, made this.......day of... . ...one thousand eight hundred and........by and between..........of.........in the County of..........and............ of........ in the County of....... Builder...

The said.........covenants and agrees to and with the said........ to make, erect, build and finish, in a good substantial, and work manlike manner,........upon........situate. ....said............to be built agreeable to the draught, plans, explanations, or specifications furnished, or to be furnished to said......... ...by............of good and substantial materials; and to be finished complete on or before the.......day of ....And said...... covenants and agrees to pay to said........for the same..........dollars as follows:.......................................

....

Security against mechanic's, or other lien, is to be furnished by said ....prior to.... .....payment by said.................... ....

And for the performance of all and every one of the articles and agreements above mentioned, the said............and............do hereby bind themselves, their heirs, executors, and administrators, each to the other, in the penal sum of........dollars, firmly by these presents.

IN WITNESS WHEREOF We, the said..........and.........have hereunto set our hands the day and year first above written.

(*Signatures.*) (*Seals.*)

Executed and Delivered in presence of

Damages for Breach of Contract.

The general rule of law respecting the measure of damages is, that where an injury has been sustained for which no remedy exists in law, that remedy shall be commensurate with the injury sustained.

In a breach of contract without actual loss, the plaintiff is entitled to judgment for nominal damages and cost.

Anticipated profits or speculations in real property cannot be recovered as damages for a breach of contract. Actual expenditures under the contract may be recovered.

In loss of goods by common carriers the measure of damages is the wholesale price of goods at the place where they were to be delivered, less the freight on same.

A failure to deliver property according to contract entitles the plaintiff to the value of such property at the time and place fixed for delivery.

A failure to convey land according to covenant entitlestheplaintiff to the value of the land at the time the conveyance was to be made.

The measure of damages on a covenant to convey real estate in the absence of fraud, is the purchase money and interest.

The measure of damages on all contracts to deliver goods on demand is the value of the property at the time of the demand.

If a party contracts to employ another for a certain time, at a specified compensation, and discharges him, without cause, before the expiration of time, the plaintiff can obtain judgment for the full amount of wages for the whole time, provided he does not engage in any other business. A claim for diminution of damages by the defendant, in such a case, would be allowed by the court.

AGENCY AND ATTORNEY.

An agent is a person employed by another to perform certain acts for him,and such acts in law are the acts of the principal.

One who is disqualified to act on his own account may be an agent for another who is competent; thus, infants, married women, and aliens may act as agents for others,

A principal is responsible for the acts of an agent, when he has given full authority to represent and act for him, when he has by his words and acts, or both, caused or permitted the person with whom the agent deals to believe him to be clothed with full authority, even though such be not the case.

Agencies are of two kinds—general and special. A *general agent* is one authorized to represent his principal in all his business, or all his business of a particular kind; the principal is bound by his acts, even though he exceed his authority, provided the agent does not go beyond the general scope of the business. If, however, the agent transcends his actual authority, and the party with whom the general agent deals is aware that the agent is exceeding his power, the principal is not bound by the acts of his agent.

A *special agent* is one authorized to do only a specific thing, or a few specified things; the principal is not bound by his acts should he exceed the authority vested in him, because the party dealing with such agent must inquire for himself, and at his own peril into the extent and limits of the authority of such agent.

Authority may be given to an agent either in writing, under or without a seal, or orally; if given in writing, this instrument is called a *Power of Attorney.*

A Power of Attorney intended to be used in a foreign country sho ld be acknowledged before a notary public, and the signature of the notary certified by the consul of the Government to which the power of attorney is to be sent.

When intended to be used in another State they should be duly proved and acknowledged, according to the laws of the State where they are executed.

A principal is bound by the acts of a general agent, even after a revocation of his agency, if such revocation is unknown to the party dealing with the agent. An agent should conform with great strictness and accuracy to his authority, otherwise his principal will not be bound; and he may be held personally liable.

An agent cannot be held personally liable if he transcends his authority if the party with whom he deals knew at the time he did so.

If an agent trusted with goods sell the same without authority, the principal may affirm the sale and collect from the purchaser, or he may disaffirm the sale and recover the goods from the buyer.

An ag nt cannot exceed or depart from his instructions without making himself liable to his principal for the censequences.

An agent cannot appoint a sub-agent or attornoy unless expressly authorized to do so by his principal.

An agent is bound to use all that care and skill that a reasonable man would use in his own business, and is bound to the utmost good faith.

For any breach of duty the agent is responsible for the whole injury thereby sustained by the principal.

If an agent embezzles his principal's property, the principal may reclaim it whenever and wherever it can be distinctly traced or identified.

An agent employed to sell property cannot buy it himself, or if employed to purchase can he buy it from himself.

The agent should keep an exact account of his doings, especially of all pecuniary transactions.

Insanity revokes authority, though if the principal was sane when authority was given his agent and a third party deals with the agent in the belief of his authority, such revocation will not be permitted to take effect to the injury of the third party.

The following forms of power of attorney are those most frequently required:

Power of Attorney.

Know all Men by these Presents, That I..........(*the name of the principal or party appointing*) of.........(*residence*)........... have constituted, ordained, and made, and in my stead and place put, and by these presents do consitute, ordain, and make, and in my stead and place put (*name of attorney*) to be my true, sufficient, and lawful attorney for me and in my name and stead to (*here set forth the purposes for which the power is given*)................. ....

....

Giving and hereby granting unto him, the said attorney, full power and authority in and about the premises; and to use all due means, course, and process in law, for the full, effectual, and complete execution of the business afore described, and in my name to make and execute due acquittance and discharge; and for the premises to appear, and the person of of me the constituent to represent before any governor, judges, justices, officers, and ministers of the law whatsoever, in any court or courts of judicature, and there on my behalf, to answer, defend, and reply unto

all actions, causes, matters, and things whatsoever relating to the premises. Also to submit any matter in dispute, respecting the premises, to arbitration or otherwise; with full power to make and substitute for the purpose aforesaid, one or more attorneys under him, my said attorney, and the same again at pleasure to revoke. And generally to say, do, act, transact, determine, accomplish, and finish all matters and things whatsoever relating to the premises, as fully, amply, and effectually, to all intents and purposes, as I,........the said constituent, if present, ought or might personally, although the matter should require more special authority than is herein comprised, I. ....the said constituent ratifying, allowing, and holding firm and valid all whatsoever my said attorney or his substitutes shall lawfully do, or cause to be done, in and about the premises, by virtue of these presents.

In Witness Whereof, I hereunto set my hand and seal this.... day of........in the year of our Lord eighteen hundred and. ......

(*Signature.*) (*Seal.*)

Signed, Sealed and Delivered in Presence of

Power of Attorney in a Shorter Form.

Know all Men by these Presents, that I (*name of principal*), have made, constituted, and appointed, and by these presents do make, constitute, and appoint (*name of attorney*), my true and lawful attorney, for me and in my name, place and stead, to (*here describe the thing to be done*), giving and granting unto my said attorney full power and authority to do and perform all and every act and thing whatsoever requisite and necessary to be done in and about the premises, as fully, to all intents and purposes, as I might or could do if personally present, with full power of substitution and revocation; hereby ratifying and confirming all that my said attorney or his substitutes shall lawfully do or cause to be done by virtue thereof.

In Witness Whereof, I have hereunto set my hand and seal this...... day of..........in the year of our Lord eighteen hundred and ....

(*Signature.*) (*Seal.*)

Signed, Sealed and Delivered in Presence of

Revocation of Power of Attorney.

Whereas I,............of the...........of............in the county of ....and State of............, by my certain power of attorney, bearing date the..........day of..........., in the year one thousand eight hundred and......., did appoint.........., of the........, my true and lawful attorney, for me and in my name, to (*here set out what he was authorized to do, using the precise language of the power of attorney originally given him*), as by the said power of attorney, reference thereunto being had, will more fully appear:

Therefore, Know all Men by these Presents, That I,........, aforesaid, have countermanded and revoked, and by these presents do countermand and revoke the said power of attorney and all power and authority thereby given to the said.............

In Witness Whereof, I have hereunto set my hand and seal this.... ....day of..........., one thousand eight hundred and....

(*Signature.*) (*Seal.*)

Sealed and Delivered in Presence of

APPRENTICES.

An apprentice is a person, usually a minor, who is bound out to serve a term of years to learn some art or trade.

A contract of apprenticeship should be in writing, and should be signed by the apprentice and his father, or in case of his death or incapacity, his mother, or lawful guardian, or by selectmen, trustees, or other public officers—his obligation being to serve his master during the term of service. The contract of apprenticeship should bind the master to teach his apprentice his trade or business. The omission to specify any trade or profession to be taught will not invalidate the instrument.

An agreement is sometimes made directly with an apprentice, and a guarantee taken from the parent or other friend that he shall perform it. While the agreement of the minor is voidable, the guaranty rests upon sufficient considerations, and may be enforced.

Apprentices are not entitled to wages, unless expressly stipulated for, but the master is, by his relationship to his apprentice, bound to pay for his medical attendance in the event of sickness, and to supply him with all the necessaries of life, as suitable clothing, etc.

The master is entitled to the earnings of the apprentice under all circumstances, and he can recover at law; as the courts hold that, having contracted for his time, the master is entitled to its avails, even though the person employing did not know of the apprenticeship.

The power of the master over the person of the apprentice is similar to that of a parent or guardian.

The master cannot require of the apprentice menial services not connected with his trade or profession.

The death of the master discharges the apprenticeship, unless in pursuance of direct statute provisions

The master cannot discharge the apprentice, even though the apprentice prove unable to learn his trade. This risk was assumed by the master.

If good cause can be shown, an apprentice may be discharged by the courts, under the regulations existing in most of the States, from service, or the master from his contract.

If the apprentice deserts his master, and contracts a new relation, which disables him from returning to his master, lawfully, the master is not bound to receive him should he return.

A party who induces an apprentice to leave the service of his master is liable to the master.

Indenture of Apprenticeship, to be Signed by the Father.

This indenture of apprenticeship between..........father of........,on the one part, and........., of the other part, *witnesseth:* That the said ...., aged.....years, on the...... day of........, A. D. 18....,is hereby bound as an apprentice under the said..........., from the date hereof until the........day of ...., A. D. 18...., to learn the trade and art of...........; and is faithfully to serve the said.........., and correctly to conduct himself during the term of his apprenticeship.

And the said........hereby covenants that he will teach the said...... the said trade and art, and will furnish him, during said apprenticeship, with board, lodging, washing, medicine, and other necessaries suitable for an apprentice in sickness and in health; and will send him to a suitable public school at least three months during each of the first two years of the said term; and at the expiration of said apprenticeship will furnish him with two new suits of common wearing apparel, and one hundred dollars in money.

In Testimony Whereof, the parties hereunto have set their hands and seals, this........day of.........., A. D. 18 ...

Executed in Presence of

.................[L. S.]

.................[L. S.]

Consent of the Minor.

I hereby consent to the foregoing indenture, and agree to conform to the terms thereof in all things on my part to be performed.

Dated, the..........day of........., in the year 18....

Consent of Father or Mother.

I do hereby consent to and approve of the binding of my son.......... as in the above indenture is set forth.

Dated the..........day of....... .., A. D. 18....

Consent of Guardian.

I,............the duly appointed guardian of............in the within indenture named, herby certify that the father and mother of the said ....are both dead [*or that the father is dead and the mother refuses to give her consent, or whatever the fact may be*], and that I do hereby consent, as his guardian, that he, the said.........., may bind himself as is set forth in said indenture.

Dated this....... ....day of............, 18...

............*Guardian of*............

Discharge of Apprentice.

State of........... }
County of......... } ss

Complaint on oath having been made to the undersigned, Justice of the Peace in and for said County, upon oath by.........., apprentice of ....of....... .., in said County, that the said...........to whom said..........is bound by indenture of apprenticeship the term of service in which is not yet expired, had cruelly beat, etc. (*as in complaint and summons*); and the said.........., by virtue of our summons thereupon issued, having been brought before us, and upon due examination of the parties and of the evidence adduced by them, it satisfactorily appearing to us that the said...........is guilty of the matters charged against him as aforesaid: now, therefore, we do hereby discharge the said............ from the service of the said............., anything in his indentures of apprenticeship aforesaid to the contrary thereof notwithstanding.

Given under our hands and seals this........day of......., A. D. 18..

.............[L. S.]
.............[L. S.]

Justice of the Peace for said............

ARBITRATION.

When two or more persons fail to agree in the settlement of a business transaction, it is usual to refer the matter in dispute to one or more disinterested persons, who should determine what is fair to each and all of the parties to the controversy. The parties to the dispute should pledge themselves to abide by the decision of the arbitrators.

Before the award of the arbitrator or arbitrators is made, either of the parties to the dispute may withdraw his offer to accept the decision of the arbitrators. He must, however, give formal notice to each and all of the other parties of his intention, or his withdrawal is of no effect.

An agreement to submit a matter to arbitration may be either verbal or in writing.

The statutes usually, and agreements of submission generally, authorize the arbitrators to award not only upon the subject matter submitted, but as to costs to be recovered by one party of the other, or to be divided between them.

A submission to arbitration voluntarily entered into by the parties, without the aid of statute regulation or rule of court, may be revoked by either of the parties at any time before the publication of the award; though this would render the revoking party liable in damages, which would include all the expenses incurred by the other party about the submission, and all that he could prove he had lost in any way by the revocation

The death of either party revokes a submission out of court, unless special provision is made in the agreement for such an event.

Form of Submission to Arbitration.

Know all men, that we,........ ...., of................... , and ....of...................., do hereby promise and agree, to and with each other, to submit, and do hereby submit, all questions and claims between us [*or any specific question or claim, describing it*] to the arbitrament and determination of [*here name the arbitrators*] whose decision and award shall be final, binding, and conclusive on us; [*and if there are more arbitrators than one, and it is intended that they may choose an umpire*] and, in case of disagreement between the said arbitrators, they may choose an umpire, whose award shall be final and conclusive; [*or add, if there be more than two arbitrators*] and, in case of a disagreement, the decision and award of a majority of said arbitrators shall be final and conclusive.

In Witness Whereof,.............have hereunto subscribed these presents this............day of............, one thousand eight hundred and............

[*Signatures.*]

In presence of

Arbitrator's Oath,

To be administered by a Judge of a Court of Record or a Justice of the Peace:

You severally swear, faithfully to hear and examine the matters in controversy between A. B., of the one part, and C. D., of the other part, and to make a just award, according to the best of your understanding,—so help you, God.

Award of Arbitrators.

To all to whom these Presents shall come: We,............, to whom was submitted as *arbitrators* the matter in controversy existing between......................as by the condition of their respective bonds of submission, executed by the said parties respectively, each unto the other, and bearing date the...........day of............., one thousand eight hundred and................, more fully appears.

Now, therefore, know ye, that we ....the *arbitrators* mentioned in the said bonds, having been first duly sworn according to law, and having heard the proofs and allegations of the parties and examined the matters in controversy by them submitted, do make this award in writing; that is to say, the said..........shall, on or before the..............day of.... ...., next ensuing the date hereof [*here insert whatever is to be done*].

And also the said arbitrators do hereby further award, that all actions depending between the said ....and.... ....for any matter arising or happening before their entering into said bonds of arbitration, shall from henceforth cease and determine, and be no farther prosecuted or proceeded in by them or either of them, and that neither party recover cost against the other.

Finally, said arbitrators do further award that the said............ ... and................shall, within the space of ....days next after the date of this award, execute, each to the other, mutual releases of all actions and causes of action, suits, debts, damages, accounts and demands whatsoever.

In Witness Whereof, ...have hereunto subscribed these presents, this............day of.............., one thousand eight hundred and........

In Presence of

[*Signature.*]

ASSIGNMENTS.

An assignment is an instrument by which a person transfers a debt, obligation, bond, or wages, or any actual interest, to another.

An assignment may be written on the back of the instrument it is intended to convey, or it may be written on a separate paper.

Form of Assignment of a Promissory Note, or any Similar Promise or Agreement.

I hereby, for value received, assign and transfer the within written (or the above written) note (*or other instrument*), together with all my rights under the same, to...............(*name of assignee.*)

(*Signature.*)

General Form of Assignment, with Power of Attorney.

KNOW ALL MEN BY THESE PRESENTS, That I,..............for value received, have sold, and by these presents do grant, assign, and convey unto............

[*Here insert a description of the thing or things assigned.*]

TO HAVE AND TO HOLD the same unto the said................, his executors, administrators, and assigns forever, to and for the use of the said................, hereby constituting and appointing him my true and lawful attorney irrevocable in my name, place, and stead, for the purpose aforesaid, to ask, demand, sue for, attach, levy, recover, and receive all such sum or sums of money which now are, or may hereafter become due, owing and payable for or on account of all or any of the accounts, dues, debts, and demands above assigned to him, giving and granting unto the said attorney, full power and authority to do and perform all and every act and thing whatsoever requisite and necessary, as fully, to all intents and purposes, as I might or could do, if personally present with full power of substitution and revocation, hereby ratifying and confirming all that the said attorney or his substitutes shall lawfully do or cause to be done by virtue thereof.

IN WITNESS WHEREOF, I have hereunto set my hand and seal the .... day of....... ...., one thousand eight hundred and........

Executed and Delivered in Presence of

.... [*Seal.*]

BILLS OF SALE.

A bill of sale is a written agreement by which a party transfers to another, for a consideration on delivery, all his right, title, and interest in personal property.

The ownership of personal property in law is not considered changed until the delivery of such property and the purchaser takes actual possession; though in some States a bill of sale is *prima facie* evidence of ownership, even against creditors, provided the sale was not fraudulently made for the purpose of avoiding the payment of debts.

Juries have the power to determine the fairness or the unfairness of a sale, and upon evidence of fraud such bill of sale will be ignored, and declared void.

Bill of Sale of Personal Property.

KNOW ALL MEN BY THESE PRESENTS, That I,............. [*name of the seller*] in the County of............, for and in consideration of the sum of..........., to...........in hand well and truly paid, at or before signing, sealing, and delivery of these presents by............[*name of buyer*] the receipt whereof I, the said.............., do hereby acknowledge, have granted, bargained, and sold, and by these presents do grant, bargain and sell unto the said........[*name of buyer*] the following articles of personal property, to wit: [*describe the property sold.*]

TO HAVE AND TO HOLD the said granted and bargained goods and chattels, unto the said ...., ...heirs, executors, administrators, and assigns, to.................only use, benefit, and behoof forever, and................, the said.........., does vouch himself to be the true and lawful owner of the goods and effects hereby sold, and to have in himself full power, good right, and lawful authority to dispose of the said............in manner as aforesaid; and I do, for myself, my heirs, executors and administrators, hereby covenant and agree to warrant and defend the title of said goods and chattels hereby sold unto the said......, ...heirs, executors, and administrators, and assigns, against the lawful claims and demands of all persons whomsoever.

IN WITNESS WHEREOF,.............., the said............, have hereunto set...........hand and seal this...........day of..........., in the year of our Lord one thousand eight hundred and....

Executed and Delivered
in Presence of

(*Signature.*) (*Seal.*)

Bill of Sale, Short Form.

I,........ ...., of.............., in consideration of........dollars paid by............., hereby sell and convey to said............the following personal property [*here name the articles*], warranted against adverse claims.

Witness my hand this.... ....day of............, A. D. 18....

Executed and Delivered
in presence of [*Signature.*] [*Seal.*]

BONDS.

A bond is a written admission of an obligation on the part of the maker, whereby he pledges himself to pay a certain sum of money to another person or persons, at a certain specified time, for some *bona-fide* consideration.

The person giving the bond is termed the *obligor;* the person receiving the same is called the *obligee.*

A bond, as defined above, is a single bond, but generally conditions are added to the bond, whereby the person giving the same must perform some specific act or acts, in which case the bond becomes void; otherwise it remains in full force and effect.

The penalty attached to the bond is usually sufficient to cover debt, interest, and cost, being generally placed at a sum twice the amount of the real debt, the fact being stated that such penalty is the sum fixed upon as liquidated or settled damages, in event of failure to meet payments according to conditions of the bond.

The bond may be so drawn as to have the penalty attach and appertain to either the obligor or obligee.

Though under ordinary circumstances the bond is in full effect, yet an act of Providence whereby its accomplishment is rendered impossible relieves the party obligated from the enforcement of the penalty.

Action on such instrument must be brought within twenty years after right of action accrues, or within such time as provided by the statutes of the different States.

General Form of Bond.

KNOW ALL MEN BY THESE PRESENTS, that I [*the obligor*] of........, in the County of . . .. , am held and firmly bound to [*the obligee*], of................, in the County of .... , in the sum of .... dollars (*this amount should be double the sum named in the condition, to cover costs and contingencies*) to be paid to the said .. ... , to the payment whereof I bind myself and my heirs firmly by these presents, sealed with my seal.

Dated the .... day of ...., A. D. 18....

The condition of this obligation is such that if I, the said........ ..... shall pay to said .. ..the sum of........dollars, and interest, on or before the ... ...day of. ...., 18...., then this obligation shall be void.

Executed and Delivered
in Presence of ....[L. S.]

Condition of a Bond to Convey Land.

The condition of this obligation is such that if the said. ... . upon the payment of...... dollars and interest by said.. . ..., within one year from this date, shall convey to said. ...., and his heirs forever, a certain parcel of land, with the buildings thereon, situate in .... , bounded and described as follows: (*here insert boundaries and description*) by a warranty deed in common form, duly executed and acknowledged, the premises then being in as good condition as they now are, necessary decay and deterioration excepted, then this obligation shall be void.

Executed and Delivered
in Presence of ....[L. S.]

CHATTEL MORTGAGES.

A chattel mortgage is a mortgage on personal property, given by a debtor to a creditor, as security for the payment of a sum or sums that may be due.

The mortgaged property may remain in possession of either party, while such mortgage is in force. In order to hold the property secure against other creditors, the mortgagee (the person holding the mortgage) must have a true copy of the mortgage filed in the Clerk's or Recorder's office of the town, city, or county where the mortgagor (the person giving the mortgage) resides, and where the property is when mortgaged.

In some States, a Justice of the Peace, in the voting precinct where such property mortgaged is located, must acknowledge and sign the mortgage, taking a transcript of the same upon his court docket, while the mortgage itself should be recorded, the same as real estate transfers.

Mortgage of Personal Property.

I,... .. .. of . ..., in consideration of..........dollars to me paid by... .. . ., of............, convey to the said..... .. the following personal property, to wit:
(*or, if the goods are too numerous to be recited, say the goods and chattels mentioned in the schedule hereto annexed*), and now in the... ...., in the town (*or city*) of... . ...aforesaid

To hold the aforegranted goods and chattels, to the said.............. and his assigns forever.

And I covenant that I am the lawful owner of said goods and chattels, and have good right to dispose of the same in the manner aforesaid.

Provided, nevertheless, that if the said . .. . .pay to the said ....or his assigns the sum of........dollars in...... ....from date, with interest on said sum at the rate of........per cent. per annum, payable............, then this deed, as also a certain note of even date with these presents, given by said............to said...........or order, to pay the said sum and interest at the time aforesaid, shall be void.

IN WITNESS WHEREOF, I hereto set my hand and seal this............ day of............., in the year of our Lord one thousand eight hundred and.........

Executed and Delivered
in Presence of ....[L. S.]

DEEDS.

An instrument in writing, by which lands and appurtenances thereon are conveyed from one person to another, signed, sealed, and properly subscribed, is termed a deed. A deed may be written or printed on parchment or paper, and must be executed by parties competent to contract.

The maker of a deed is called a grantor; the person or party to whom the deed is delivered, the grantee. The wife of the grantor, in the absence of any statute regulating the same, must acknowledge the deed, or else, after the death of her husband she will be entitled to a one-third interest in the property, as a dower, during her life. Her acknowledgment of the deed must be of her own free will and accord, and the Commissioner or other officer before whom the acknowledgment is taken must sign his name as a witness to the fact that her consent was without compulsion.

Deeds should be for a stated consideration, which may be money, goods, gift, services or marriage. If, as is often the case, the grantee does not desire the amount of purchase money paid to be publicly known, and for other personal reasons, the language used is, "in consideration of one dollar (or any other nominal amount), to me paid, the receipt of which I acknowledge, etc."

The description of the land should be minute and accurate, great care being taken in this respect.

The *grantee* should see that his deed conveys the land to himself *and his heirs*. Deeds conveying to the grantee *only*, limit his title to his life, and such land cannot be left to his heir at his death, nor can he sell it during his life.

In a deed in *fee simple* a conveyance of the absolute and entire ownership of the land is made.

In a *warranty deed* the grantor agrees to be answerable for any defect whatever that may be in the title.

In a *quit-claim deed* the grantor conveys away all the title (if any) that he may perchance to have in the land.

In a *trust deed* the grantee takes the estate upon some trust, or for some special purpose, therein specified.

For further information on this subject, see article Deed.

Warranty Deed, Short Form.

THIS INDENTURE, made this.............day of.......... ..., in the year of our Lord one thousand eight hundred and........, between...... ....of the first part, and................ of the second part,—

WITNESSETH, that the said part......of the first part, for and in consideration of the sum of................to........in hand paid by the said part....of the second part, the receipt whereof is hereby confessed and acknowledged, do ....by these presents grant, bargain, sell, remise, release, alien and confirm, unto the said part....of the second part, and...........heirs and assigns, forever, all............ certain piece...or parcel...of land situate and being in the .... of..............., County of...............and State of............., and described as follows, to wit:...

... .

Together with all and singular the hereditaments and appurtenances thereunto belonging or in any way appertaining: To have and to hold the said premises,........ ....described, with appurtenances, unto the said part.... of the second part, and to...........heirs and assigns forever. And the said ....part......of the first part, ... heirs, executors and...............administrators, do......covenant, grant, bargain and agree, to and with the said part....... of the second part,.......heirs and assigns, that at the time of the ensealing and delivery of these presents.............well seized of the above granted premises in fee simple; that they are free from all incumbrance whatever; and that..............will, and..............heirs, executors..... administrators ....shall warrant and defend the same against all lawful claims whatsoever,...

IN WITNESS WHEREOF, the said part.........of the first part ha.... hereunto set....hand...and seal....the day and year first above written.

Sealed and Delivered
in Presence of ....[L. S.]

....

....................[L. S.]

....

Acknowledgment.

State of ...., } ss
County of.............. }

On this............day of............, in the year one thousand eight hundred and............, before me, ...in and for said County, personally appeared............., to me known to be the same person... described in and who executed the within instrument, and who.......... acknowledged the same to be..............free act and deed.

................[L. S.]

MORTGAGES.

A mortgage is an instrument in writing, and is the conveyance of real property, subject to the right of redemption. It is generally given by a debtor to a creditor as security for his debt. The person giving the mortgage is called the *Mortgagor:* the person receiving it, the *Mortgagee.*

A mortgage does not differ materially from a deed in fee-simple, except in the condition attached, which consists of a clause inserted before the clause of execution to the effect that if the mortgagor shall pay to the mortgagee a certain amount of money at a certain time, then the deed shall be void.

A note or a bond may be given to be secured by the mortgage: the instrument should distinctly state which is given; also should clearly state any special terms agreed upon. A mortgage given to secure the purchase money will take precedence to any other mortgage.

The mortgagee has a valid right and title to the land immediately upon the delivery of the mortgage, and has a legal right to take possession of the land, unless, as is now common, the deed provides that the mortgagor may retain possession, the mortgagor having surrendered all his rights, except the right of redemption, at the time of executing the deed.

In former years the mortgagor could not redeem his land unless the debt was paid before or when it became due, and he had no further right. Now, however, the courts of law of the various States have adopted the same rule, giving the mortgagor three years after the expiration of the mortgage, in which he may redeem the property by paying the debt, with interest and cost: this is called his *equity of redemption.* A mortgagor may sell his right of redemption, or he may give a second mortgage, or it may be attached by creditors, or in case of insolvency it would form a part of his assets.

Mortgage deeds are now commonly drawn with a clause containing an agreement of the parties, that if the money is not paid when it is due, the mortgagee may in a certain number of days thereafter sell the land (providing also for precautions to secure a certain price that may be agreed upon) and, reserving enough to pay his debt and charges, pay over to the mortgagor his balance; such action removes all claim of the mortgagor in a court of equity. This is called a sale mortgage, and is sanctioned by law; all mortgages that do not contain the above stipulation possess an equity of redemption.

The right of redemption, or the three years of redemption, does not begin until the mortgagee has entered to *foreclose*, even though the debt has been due for a number of years. In foreclosing, the mortgagor must enter upon the property in a peaceful manner, in the presence of witnesses, or by action at law.

A mortgagor who intends to redeem must tender the debt with interest, lawful costs, and the charges of mortgagee. He will be allowed all rents and profits that the mortgagee may have received, or would have received but for his own negligence.

Another stipulation now commonly used is, that the mortgagor shall keep the premises insured in a certain sum for the benefit of the mortgagee; if this agreement is not expressed in the deed, and the mortgagee insures the buildings, he cannot recover the premium from the mortgagor.

If buildings are erected on the property during continuance of mortgage, or after foreclosure, whether by mortgagor or mortgagee, the party securing final possession gets the benefit of them all, without paying the other for them. This is the law, provided no stipulation is made in the deed, although any agreement may be made between them, but must be incorporated in the deed.

To release or discharge a mortgage it is necessary to follow the statute law governing such releases. They differ in many States: but the most common custom is, the recorder or register of deeds writes on the margin of the record of the mortgage an acknowledgment of satisfaction, release or discharge.

Mortgage Deed, with Power of Sale, and Release of Dower and Homestead.

This indenture, made the........day of.............., in the year one thousand eight hundred and........, between......... .., of..... ....., of the first part, and............, of............, of the second part, *witnesseth*, that the said party of the first part, in consideration of.........

dollars to him paid, the receipt whereof is hereby acknowledged, has granted, bargained, sold, released and conveyed, and by these presents does grant, bargain, sell, release, and convey to the said party of the second part, and his heirs and assigns forever, all that [*here describe the property*], with all hereditaments and appurtenances thereto appertaining.

To have and to hold the said premises, with the appurtenances, to said party of the second part, his heirs and assigns, to his and their use and behoof forever. Provided always, and these presents are upon condition, that if said party of the first part, his heirs or assigns, shall pay to the party of the second part, his executors, administrators or assigns, the sum of ....dollars, on or before the............day of.............., in the year.........., with interest according to the condition of a bond [*or note*] of the said .... to the said.........., bearing even date herewith, then these presents shall be void.

But upon any default in the payment of the money above mentioned, or of the interest thereon, said grantee, his executors, administrators or assigns, may sell the above granted premises with all improvements that may be thereon, at public auction in said........., first publishing a notice of the time and place of sale once each week for three successive weeks, in one or more newspapers published in said.........; and in his or their own name or names as the attorney of the said grantor, may convey the same by proper deed or deeds to the purchaser or purchasers, absolutely and in fee simple; and such sale shall forever bar the grantor, and all persons claiming under him, from all right and interest in the granted premises, whether at law or in equity. And out of the money arising from such sale, the said grantee or his representatives shall be entitled to retain all sums then secured by this deed, whether then or thereafter payable, including all costs, charges and expenses incurred or sustained by reason of any failure or default, on the part of the said grantor or his representatives, to perform and fulfill the condition of this deed, or any covenants or agreements herein contained; rendering the surplus, if any, together with an account of such costs, charges, and expenses, to the said grantor, his heirs or assigns.

And it is agreed that the said grantee, his administrators, executors or assigns, or any person or persons in his or their behalf, may purchase at any sale made as aforesaid, and that no other purchaser shall be answerable for the purchase money; and that, until default in the performance of the condition of this deed, the grantor and his heirs and assigns may hold and enjoy the granted premises and receive the rents and profits thereof.

And, for the consideration aforesaid, I, M. B., wife of the said A. B., do hereby release unto the said grantee and his heirs and assigns, all right of both dower and homestead in the granted premises.

In witness whereof, the parties to these presents have hereunto set their hands and seals the day and year above written.

Signed, Sealed and Delivered A. B. [L. S.]
in Presence of M. B. [L. S.]

[Witnessed and acknowledged like any other deed.]

A Promissory Note, to be Secured by Mortgage.

.... 18 .

........................for value received...........promise to pay to ....dollars, at...................., with interest at the rate of........per cent. annum.

This note is secured by a deed of mortgage of even date herewith from . ...to........ ...

$........ (*Signature.*)

Discharge of Mortgage.

This debt, secured by the mortgage dated.... ....and recorded with... ....deeds, lib...., fol......, has been paid to me by............, and in consideration thereof I do discharge the mortgage and release the mortgaged premises to said...........and his heirs.

WITNESS MY HAND AND SEAL...............A. D. 18....

Executed and Delivered (*Signature.*) (*Seal.*)
in Presence of

............ss.... ....A. D. 18.... The said............acknowledged the foregoing instrument to be.... ....free act and deed.

Before me,................

Assignment of Mortgage.

I hereby assign the above [*or within*] mortgage to................
WITNESS MY HAND AND SEAL, this..............of...............
(*Signature.*) (*Seal.*)

Release on Satisfaction of a Mortgage

I hereby release the above (*or within*) mortgage.
WITNESS MY HAND AND SEAL, this...........of........., 18....
(*Signature.*) (*Seal.*)

Sale by Mortgagee under Power of Sale.—Affidavit of Default, etc.

I, ...of, etc., the assignee of a certain mortgage deed given by........ ...to.. .. .., dated, etc., and recorded, etc., on oath depose and say that default was made in the payment of the principal sum mentioned in the condition of said mortgage deed and the interest thereon, the said principal and six months interest having become payable on the... ....day of.... ....last, and not having been then or any time paid or tendered to any person authorized to receive the same; and that pursuant to the provisions of said mortgage deed, I published on the first, eighth and fifteenth days of ....now last past, in the "............," a newspaper published in .... aforesaid, a notice of which the following is a true copy; (*here insert notice.*)

(*Signature.*)

Notice of Mortgagee's Sale.

By virtue of a power of sale contained in a certain mortgage deed given by.............to...... ...... , dated, etc., and recorded, etc., will be sold at public auction upon the premises [or, at the office of ...., No. ...., ...street], on..........., the........day of............, 18...., at 11 o'clock in the forenoon, all and singular the premises conveyed by said mortgage deed, namely: (*here describe property.*)

................, *Assignee of Said Mortgagee*

Affidavit of Sale.

And I depose and say that pursuant to said notice and at the time and place in said notice appointed, the said default still continuing, I sold the premises conveyed by said mortgage deed, at public auction, by..........., a duly licensed auctioneer, to............, of, etc., for the sum of........dollars; which amount was bid by the said......... and was the highest bid therefore made at said auction; and I have this day, in pursuance of said power contained in said mortgage, delivered to said............the foregoing deed of said mortgaged premises.

WITNESS MY HAND this. .. ..day of..........., A. D. 18....

[*Signature.*]

LANDLORD AND TENANT.

A landlord is the owner of lands or houses, and has tenants under him, and is known in law as the lessor, who transfers the possession and receives the rent.

A tenant is one who has the occupation or temporary possession of lands or tenements, whose title is in another, and known as the lessee.

A lease is a contract whereby one party (the lessee) takes the possession and profits of land for a certain and definite period. And the other party (the lessor) gives possession of the land and receives a rent, which the lessee agrees to pay him by way of compensation. This form of estate is never created by act of law, but always

by contract, properly called a lease. No certain form of words is necessary to create a lease; it should contain all the conditions on which the premises are granted and taken. All leases should be in writing.

A landlord is under no legal obligation to repair the house or building unless he expressly agrees to do so, no matter how dilapidated or disfigured it may be. Even if it becomes wholly uninhabitable by no fault of the house or of the landlord, as, if it burns up or is blown down. or if the overflow of a stream ruins a field or a farm, still the landlord is not bound to do anything, unless so inserted in lease, or by special written agreement.

But if the house is uninhabitable by its own fault, as if it had a noisome and unwholesome stench, or, according to one case, if it be overrun with rats, or so decayed as to be open to the weather, it would seem to be the law in this country that a tenant may leave the house, always provided, however, that the objection or defect be not one which the tenant knew or anticipated, or would have known or expected if he had made reasonable inquiry and investigation before he took his lease.

Neither a guardian nor minor can give a lease extending beyond the ward's majority, which can be enforced by the lessee, yet the latter is bound unless the lease is annulled.

A tenant is not bound to make general repairs without an express agreement.

A tenant of a farm, if his lease was terminated by any event which was uncertain, and which he could neither foresee nor control, is entitled to the annual crop which he sowed while his interest in and right to the farm continued.

If a lease be for a certain time, the tenant loses all right or interest in the land or premises when that time comes, and he must leave, or the landlord may turn him out at once. But he is a tenant at will if he holds over after a lease with consent, or occupies the land, or house, or store without a lease but with consent and an oral bargain; and a tenant at will cannot leave, nor can he be turned out, without a notice to quit. The law on this subject is not uniform. In general, however, it is this: If rent is payable quarterly, or not more frequently, then there must be a quarter's notice. If rent is payable oftener, then the notice must be as long as the period of payment. Thus, if rent is payable monthly, there must be a month's notice; if weekly, a week's notice. But the notice must terminate on a day when the rent is payable. It may be given any time, but operates only after the required interval or period between two payments. Properly, the notice should specify the day, and the right day, when the tenant must leave; and should be in writing.

When the rent is in arrear, the notice to quit may be more brief; the statutes of the different States vary on this point, but a frequent period is fourteen days.

A tenant may give notice of his intention to quit, and generally it will be subject to the same rules already stated in reference to the notice given by the landlord. A tenant should give his notice to the party to whom he is bound to pay rent, or to an authorized agent of that party.

In many States there are laws concerning leases.

In Texas all leases are recorded.

In North Carolina, all leases that are required to be in writing must be recorded in the proper county within two years.

In Connecticut, Mississippi, Oregon, Rhode Island, South Carolina, Tennessee and Vermont, leases for any term exceeding one year must be executed, attested and recorded in the same manner as other deeds.

In Ohio all leases for more than three years must be recorded.

In Maine, Massachusetts, Maryland and New Hampshire, leases for more than seven years must be recorded.

In Delaware and Pennsylvania leases for more than twenty-one years must be recorded.

The lease that specifies a term of years without giving the definite number of years is without effect at the expiration of two years.

A Short Form of Lease.

THIS INDENTURE, made the............day of..........., in the year of our Lord one thousand eight hundred and............

WITNESSETH, that I, [*name and residence of the lessor*] do hereby lease, demise and let unto [*name and residence of the lessee*] a certain parcel of land in the city [or town] of ... ., County of........... and State of.... ...., with all the buildings thereon standing, and the appurtenances to the same belonging, bounded and described as follows: [*or a certain house in said city, giving the street and number, with the land under and adjoining the same.*]

[*The premises need not be described quite so minutely or fully as is proper in a deed or mortgage of land, but must be so described as to identify them perfectly, and make it certain just what premises are leased.*]

TO HOLD the same for the term of..........from the ....day of ...., yielding and paying therefor the rent of.......

And said lessee does promise to pay the said rent in four quarterly payments on the............day of............[*or state otherwise just when the payments of rent are to be made*] and to quit and deliver up the premises to the lessor or his attorney, peaceably and quietly at the end of the term, in as good condition, reasonable use and wearing thereof, fire and other unavoidable casualties excepted, as the same now are or may be put into by the said lessor, and to pay the rent as above stated, and all taxes and duties levied or to be levied thereon during the term, and also the rent and taxes as above stated, for such further time as the lessee may hold the same, and not make or suffer any waste thereof; nor lease, nor underlet, nor permit any other persons to occupy or improve the same, or make or suffer to be made any alteration therein but with the approbation of the lessor thereto in writing having been first obtained; and that the lessor may enter to view, and make improvements, and expel the lessee, if he shall fail to pay the rent and taxes as aforesaid, or make or suffer any strip or waste thereof.

IN WITNESS WHEREOF, the said parties have hereunto interchangeably set their hands and seals the day and year first above written.

[*Signatures.*] [*Seals.*]

Signed, Sealed, and Delivered
in Presence of

Short Form of Lease for Farm and Buildings Thereon.

THIS INDENTURE, made this first day of October, one thousand eight hundred and eighty-two, between Lewis Reynolds, of the township of Deerfield, county of Fulton, and State of Illinois, of the first part, and

T. G. Merrill, of the said township and county, of the second part.

WITNESSETH, That the said Lewis Reynolds, for and in consideration of the yearly rents and covenants hereinafter mentioned, and reserved on the part and behalf of the said Lewis Reynolds, his heirs, executors and administrators, to be paid, kept and performed, hath demised, set, and to farm let, and by these presents doth demise, set, and to farm let, unto the said T. G. Merrill, his heirs and assigns, all that certain piece, parcel or tract of land situate, lying and being in the township of Deerfield aforesaid, known as lot No. [*here describe land*] now in possession of J. Mills, containing one hundred acres, together with all and singular the buildings and improvements, to have and to hold the same unto the said T. G. Merrill, his heirs, executors and assigns from the tenth day of November next, for, and during the term of, five years thence next ensuing, and fully to be complete and ended, yielding and paying on the same, unto the said Lewis Reynolds, his heirs and assigns, the yearly rent, or sum of ninety dollars, on the first day of May, in each and every year during the term aforesaid, and at the expiration of said term, or sooner if determined upon, he, the said T. G. Merrill, his heirs or assigns, shall and will quietly and peaceably surrender and yield up the said demised premises, with the appurtenances, unto the said Lewis Reynolds, his heirs and assigns, in good order and repair, as the same now are, reasonable wear, tear and casualties which may happen by fire or otherwise only excepted.

IN WITNESS WHEREOF, we have hereunto set our hands and seals.

Signed, sealed and delivered in presence of F. DARWIN SCOTT.
LEWIS REYNOLDS, [L. S.]
T. G. MERRILL. [L. S.]

Surrender of Lease.

In consideration of one dollar, to be paid me by Alex. T. Moreland, I do hereby surrender to the lessor the within written lease of the premises therein mentioned, and all my estate yet unexpired, which premises are free from incumbrances through me,—to hold the same to the said lessor and his assigns forever.

Witness my hand and seal this 1st day of January, A. D. 1883.

Executed in presence of SAML. J. CHAPMAN.
HENRY ABBOTT, [L. S.]

Landlord's Agreement.

THIS IS TO CERTIFY, That I have this first day of April, 1883, let and rented unto Austin Edwards my house and lot known as Number 85 Woodland street, in the city of Chicago, Ill., with the appurtenances, and sole and uninterrupted use thereof, for one year, to commence on the first day of May next, at the yearly rent of six hundred dollars, payable in equal sums of fifty dollars on the first day of each and every month.

ARTHUR N. COLEMAN.

Notice to Quit.

MR. E. SUMMERS:

You are hereby notified to deliver up to me possession of the house and lot known as No. 402 Randolph street, in the city of St. Louis, and to remove therefrom on the 30th day of April next, it being my intention to terminate the tenancy.

L. W. JOHNSON, Landlord.

St. Louis, March 27, 1883.

Tenant's Notice of Leaving.

MR. T. A. VAN EPP.

Take notice that I shall, on the first day of May next, deliver up to you the premises I now occupy as your tenant, known as No. 134, Madison street, in the city of Louisville, it being my intention to terminate the tenancy.

J. J. FORBES, Tenant.

Louisville, Feb. 27, 1883

Notice to Quit by Landlord, on Non-Payment of Rent.

MR. THOS. S. DILLON:

Sir:—I hereby give you notice to surrender and deliver up to me the possession of the house and lot known as No. 514 West Fourteenth street, in the City of Cincinnati, the rent of which you have failed and neglected to pay for the past month; and to remove therefrom at the expiration of ten days from this date, according to law.

Yours, etc.,
ROBERT T. GREEN, Landlord.

Cincinnati, April 23, 1883.

PARTNERSHIP.

An agreement between two or more persons to invest their labor, time and means together, sharing in the loss or profit that may arise from such investment, is termed partnership.

The partnership may consist in the contribution of skill, extra labor, or acknowledged reputation upon the part of one partner, while the other, or others, contribute money, each sharing alike equally, or fixed proportions, in the profits, or an equal amount of time, labor and money may be invested by the partners, and the profits equally divided; the test of partnership being the joint participation in profit, and the joint liability to loss.

A partnership formed without limitation is termed a general partnership. An agreement entered into for the performance of only a particular work is termed a special partnership; while a partner putting in a limited amount of capital, upon which he receives a corresponding amount of profit, and is held correspondingly responsible for the contracts of the firm, is termed a limited partnership, the conditions of which are regulated by statute in different states.

Any one who permits his name to be used by a firm, or who shares in the profits of the business, is liable as a partner.

Each individual member of a firm is liable to the whole amount of the debts of the concern.

The act of one partner binds all the others, when done in pursuance of the regular business of the firm, and in the usual course of that business, but any act not required by the nature of the business will not bind them.

Should it be desired that the executors and representatives of the partner continue the business in the event of his death, it should be so specified in the articles, otherwise the partnership ceases at death. Should administrators and executors continue the business under such circumstances, they are personally responsible for the debts contracted by the firm.

Partners may mutually agree to dissolve a partnership, or dissolution may be effected by a decree of a Court of Equity. Dissolute conduct, dishonesty, habits calculated to imperil the business of a firm, incapacity, or the necessity of partnership no longer continuing, shall be deemed sufficient causes to invoke the law in securing a dissolution of partnership, in case the same cannot be effected by mutual agreement.

After a dissolution of partnership, immediate notice

of the same should be given in the most public newspapers, and a notice should be sent likewise to every person having special dealings with the firm. These precautions not being taken, each partner continues liable for the acts of the others to all persons who have no knowledge of the dissolution.

Partnership Agreement.

THIS AGREEMENT, made this............day of.............., 18.... between............of................., of the one part, and............ of .... of the other part, witnesseth:

The said parties agree to associate themselves as copartners for a period of....... years from this date, in the business of................ ......; the name and style of the firm to be................

For the purpose of conducting the business of the above named partnership,.... .... has, at the date of this writing, invested........ as capital stock, and the said...............has paid in a like sum of ...., both of which amounts are to be expended and used in common, for the mutual advantage of the parties hereto, in the management of their business.

It is hereby also agreed by both parties hereto, that they will not, while associated as copartners, follow any avocation or trade to their own private advantage; but will, throughout their entire period of copartnership, put forth their utmost and best efforts for their mutual advantage, and the increase of the capital stock.

That the details of the business may be thoroughly understood by each, it is agreed that during the aforesaid period, accurate and full book accounts shall be kept, wherein each partner shall record, or cause to be entered and recorded, full mention of all moneys received and expended, as well as every article purchased and sold belonging to, or in any way appertaining to such partnership; the gains, profits, expenditures and losses being equally divided between them.

It is further agreed that once every year, or oftener, should either party desire, a full, just and accurate exhibit shall be made to each other, or to their executors, administrators or representatives, of the losses, receipts, profits and increase made by reason of, or arising from such copartnership. And after such exhibit is made, the surplus profit, if such there be resulting from the business, shall be divided between the subscribing partners, share and share alike.

Either party hereto shall be allowed to draw a sum, the first year not exceeding ....dollars per annum, from the capital stock of the firm, in monthly instalments of..........dollars each; which amount may be increased by subsequent agreement.

And further, should either partner desire, or should death of either of the parties, or other reasons, make it necessary, they, the said copartners, will each to the other, or in case of death of either, the surviving party to the executors or administrators of the party deceased, make a full, accurate and final account of the condition of the partnership as aforesaid, and will fairly and accurately adjust the same And also upon taking an inventory of said capital stock, with increase and profit thereon, which shall appear or is found to be remaining, all such remainder shall be equally apportioned and divided between them, the said copartners, their executors or administrators, share and share alike.

It is also agreed that in case of a misunderstanding arising with the partners hereto, which cannot be settled between themselves, such difference of opinion shall be settled by arbitration, upon the following conditions, to wit: Each party to choose one arbitrator, which two thus elected shall choose a third; the three thus chosen to determine the merits of the case, and arrange the basis of a settlement.

In witness whereof the undersigned have hereto set their hands the day and year first above written.

[*Signatures.*]

Signed in Presence of

Advertising Notices.

Notice is hereby given, that the partnership heretofore subsisting between the undersigned as..........., in........., under the style or firm of... ...., is this day dissolved by mutual consent. Dated this..... 18....

Notice is hereby given, that the copartnership formerly subsisting between us, the undersigned.... ....and ...., as.........,at........., under the style or firm of............, is this day dissolved by mutual consent, and that the said business will in future be carried on by the said...........alone, who will receive and pay all the debts of the late copartnership.

Dated this..............18....

WILLS.

The legal declaration of what a person determines to have done with his property after death, is termed a Will.

All persons of sufficient age, possessed of sound mind, except married women in certain States, are entitled to dispose of their property by will. Children at the age of fourteen if males, and females at the age of twelve, can thus dispose of personal property.

It is of the utmost importance that the property bequeathed and the condition and intentions of the testator should be clearly and accurately expressed, and unless he has good legal advice he should make a disposition of his property as simple as possible.

A married woman cannot make a will except in relation to trust property, unless the statute law of the State gives it, which is the case now in many States.

The maker of a will is called a testator (if a female a testatrix).

The testator should distinctly say in the beginning of the instrument *that it* is his *last will*. If other wills have been executed it is well to say, "Hereby revoking all former wills."

Great care should be exercised in the selection of witnesses, as this part is material; they should write their respective places of residence after their names, their signatures being written in the presence of each other, and in the presence of the testator. The States of Missouri, Illinois, Ohio, Kentucky, Arkansas, North Carolina, Tennessee, Iowa, Utah, Texas, California, New Jersey, Delaware, Indiana, Virginia and New York require *two* subscribing witnesses.

The States of Connecticut, Florida, Georgia, Louisiana, Maryland, Massachusetts, Maine, Michigan, Minnesota, Mississippi, New Hampshire, Oregon, Rhode Island, South Carolina, and Vermont, and District of Columbia, require *three* attesting witnesses.

Should any litigation follow the death of a testator, and a question arise as to his sanity, the evidence of the witnesses to the will is first to be taken, and is very important. Any person competent to do ordinary acts of business may be a witness. Married women and minors may be witnesses, but no one interested in the will, either as a legatee or executor, should witness a will, as such a bequest would be void, but not invalidate the rest of the will. The word "bequeath" applies to personal estate, and "devise" to real estate only.

The testator may appoint his executors. Executors must be of legal age at the time of proving the will; a convict, a confirmed drunkard, a lunatic, or an imbecile, cannot act as executor. No person appointed as an executor is obliged to serve.

A husband is entitled to administer in preference to any one else, upon property left by his wife, who possesses property and dies without a will, provided he be of sound mind.

If the testator leaves a bequest to his wife instead of dower, he should so state it. If he fails to so provide in the will, the wife is entitled to her dower or homestead right and the bequest. The wife is not legally compelled to accept of such bequest, but may choose between her legal rights of dower and that of will.

The will of an unmarried woman is revoked in many States by her subsequent marriage.

Form of a Will.

In the name of God, Amen. I,............., of the town of............ in the County of............., and State of............ being of sound mind and memory (blessed be Almighty God for the same!) do make and publish this my last will and testament.

I give and bequeath to my sons,................... five hundred dollars each, if they shall have attained the age of twenty-one years before my decease; but if they shall be under the age of twenty-one at my decease, then I give to them one thousand dollars each, the last-mentioned sum to be in place of the first-mentioned.

I give and bequeath to my beloved wife, ... all my household furniture, and all the rest of my personal property, after paying from the same the several legacies already named, to be hers forever: but if there should not be at my decease sufficient personal property to pay the aforesaid legacies, then so much of my real estate shall be sold as will raise sufficient money to pay the same.

I also give, devise and bequeath to my beloved wife,... .... all the rest and residue of my real estate, as long as she shall remain unmarried, and my widow: but on her decease or marriage, the remainder thereof I give and devise to my said children and their heirs, respectively, to be divided in equal shares between them.

I do nominate and appoint my beloved wife, ... to be the sole executrix of this my last will and testament.

In Testimony Whereof, I hereunto set my hand and seal, and publish and decree this to be my last will and testament, in presence of the witnesses named below, this.........day of............. in the year of our Lord one thousand eight hundred and........

....[L. S.]

Signed, sealed, declared and published by the said............as and for his last will and testament, in presence of us who, at his request and in his presence, and in presence of each other, have subscribed our names as witnesses hereto.

.... residing at............. in............county.
.... residing at............. in....... ....county.

General Form of Will for Real and Personal Property.

I, Samuel T. Allen, of the city of Chicago, county of Cook, State of Illinois, being aware of the uncertainty of life, and in failing health, but of sound mind and memory, do make and declare this to be my last will and testament, in manner following, to wit:

First. I give, devise and bequeath to my eldest son, Franklin M. Allen, the sum of four thousand dollars of bank stock, now in the First National Bank, Chicago, Illinois, and the farm owned by myself in Ontario township, Knox county, Illinois, consisting of one hundred and sixty acres, with all the houses, tenements and improvements thereunto belonging; to have and to hold unto my said son, his heirs and his assigns forever.

Second. I give, devise and bequeath to each of my daughters, Lida Louan Allen and Fannie Antoinette Allen, each two thousand dollars in bank stock in the First National Bank of Chicago, Illinois, and also each one quarter section of land, owned by myself, situate in the town of Delavan, Tazewell County, Illinois, and recorded in my name in the Recorder's office of said county. The north one hundred and sixty acres of said half section is devised to my elder daughter, Lida Louan.

Third. I give, devise and bequeath to my son, Fred Davis Allen, five shares of railroad stock, in the C., B. & Q. Railroad, and my own one hundred and sixty acres of land and saw-mill thereon, situated in Astoria, Illinois, with all the improvements and appurtenances thereunto belonging, which said real estate is recorded in my name, in the county where situated.

Fourth. I give to my wife, Tryphena Allen, all my household furniture, goods, chattels and personal property about my house, not hitherto disposed of, including ten thousand dollars in bank stock, in the First National Bank of Chicago, Illinois, fifteen shares in the Chicago, Rock Island & Pacific Railroad, and the free and unrestricted use, possession and benefit of the home farm, so long as she may live, in lieu of dower, to which she is entitled by law; said farm being my present place of residence.

Fifth. I bequeath to my invalid father, Samuel T. Allen, Sr., the income from the rents of my store building at Canton, Illinois, during the term of his natural life. Said building and land therewith revert to my said sons and daughters in equal proportions, upon the demise of my said father.

Sixth. It is also my will and desire that at the death of my wife, Tryphena Allen, or at any time she may arrange to relinquish her life interest in the above mentioned homestead, the same may revert to my above-named children or to the lawful heirs of each.

And, Lastly, I appoint as executors of this my last will and testament, my wife Tryphena Allen, and my eldest son, Franklin N. Allen.

I further direct that my debts and necessary funeral expenses shall be paid from moneys now on deposit in the Farmers' National Bank, Pekin, Illinois, the residue of such moneys to revert to my wife, Tryphena Allen, for her use forever.

In Witness Thereof, I, Samuel T. Allen, to this, my last will and testament, have hereunto set my hand and seal this third day of March, eighteen hundred and eighty-three.

Samuel T. Allen. [L. S.]

Signed, sealed and delivered by Samuel T. Allen, as and for his last will and testament, in presence of us, who, at his request and in his presence, and in the presence of each other, have subscribed our names hereunto as witnesses thereof.

Fred D. Porter, Chicago, Illinois.
Erastus Child, Oneida, Illinois.

Codicils.

An addition to a will, which should be in writing, is termed a codicil.

A codicil is designed to explain, modify or change former bequests made in the body of the will. It should be done with the same care and precision as was exercised in making the will itself.

A codicil does not revoke a will; it may consist of a further bequest or a revocation, in part, of the bequests of the will.

Form of a Codicil.

Whereas, I, Samuel T. Allen, did, on the third day of March, one thousand eight hundred and eighty-three, make my last will and testament, I do now, by this writing, add this codicil to my said will, to be taken as a part thereof.

Whereas, by the dispensation of Providence, my daughter Lida Louan has deceased, November fifth, eighteen hundred and eighty-four, and whereas a son has been born to me, which son is now christened Charles Burchard Allen, I give and bequeath unto him my gold watch, and all right, interest and title in the lands and bank stock and chattels bequeathed to my deceased daughter Lida Louan, in the body of this will.

In witness whereof I hereunto set my hand and seal this fifth day of November, eighteen hundred and eighty-four.

Samuel T. Allen. [L. S.]

Signed, sealed, published and declared to us by the testator, Samuel T. Allen, as and for a codicil to be annexed to his last will and testament. And we, at his request, and in his presence and in the presence of each other, have subscribed our names as witnesses thereto, at the date hereof.

Erastus Child, Oneida, Illinois.
E. C. Johnson, Chicago, Illinois.

COMMERCIAL FORMS.

Under this head we will give that important class of commercial forms known as "negotiable paper."

The larger part of the business of the world is conducted through the medium of bank bills, promissory notes, bank checks, etc., all of which belong to this class of paper.

Bills of Exchange.

A bill of exchange is a written request or order addressed by one bank or commercial house to another, requesting the payment of money to a third party named, or to his order. There are two kinds, domestic and foreign. When bills of exchange are drawn by parties residing in one State or country upon persons in the same State or country, they are called "domestic bills of exchange." When the parties to bills reside in different States or countries, and bills which are drawn in one country are made payable in another, they are called "foreign bills of exchange."

In issuing foreign bills of exchange, it is customary for the banker to issue a set of two or three, worded nearly alike. One of these is kept by the purchaser, to be presented by him to the foreign banker, the other two are transmitted by mail, at different times, to the same bank. Thus, if the first bill is lost, the second or third, that goes by mail, will still be available, and the holder can obtain the money without being subject to the delay of writing to America for another bill. These bills are worded as follows:

Set of Foreign Exchange.

1 *Chicago, Ill., May 1, 1883.*

Exchange for
£500. *Thirty days after sight, of this our* FIRST OF EXCHANGE (*second and third of the same tenor and date unpaid*), *pay to the order of Stephen Crosby, Five Hundred Pounds Sterling, value received, and charge the same to*

Merchants' National Bank.

To the Commercial Bank of London,
London, Eng.

No. 220.

2 *Chicago, Ill., May 1, 1883.*

Exchange for
£500. *Thirty days after sight, of this our* SECOND OF EXCHANGE (*first and third of the same tenor and date unpaid*), *pay to the order of Stephen Crosby, Five Hundred Pounds Sterling, value received, and charge the same to*

Merchants' National Bank.

To the Commercial Bank of London,
London, Eng.

No. 220.

3 *Chicago, Ill., May 1, 1883.*

Exchange for
£500 *Thirty days after sight, of this our* THIRD OF EXCHANGE (*first and second of the same tenor and date unpaid*), *pay to the order of Stephen Crosby, Five Hundred Pounds Sterling, value received, and charge the same to*

Merchants' National Bank.

To the Commercial Bank of London,
London, Eng.

No. 220.

DRAFTS.

A draft may properly be called a domestic or an inland bill of exchange. It is customary for the bankers in all large cities to make deposits with bankers in other large cities, and also for the banks in the interior towns to make deposits with some one bank in the nearest metropolis. Thus, the bankers of Chicago, St. Louis and Cincinnati have deposits in New York, so that any person wishing to pay a certain sum of money to another person East, has only to step into a bank and purchase a draft for the amount on New York, which he sends by mail to the creditor, who can usually get the amount the draft calls for at the nearest bank.

As there is but little danger of these inland bills of exchange being lost, only one is issued.

The object in purchasing a draft is to avoid the danger of loss in transmitting money from one part of the country to another. These can be obtained of any bank throughout the country upon some large city. A small amount, termed "exchange," is charged for these by the banker from whom they are bought.

Bank Draft.

No. 288. FARMERS' NATIONAL BANK,
$250. Pekin, Ill., May 1, 1883.

Pay to the order of John Maynard. Two Hundred and Fifty Dollars.

B. R. HIERONYMUS. Cashier.

TO MERCHANTS' NATIONAL BANK,
Chicago, Ill.

Sight Draft.

$375. CHICAGO, ILL., March 10, 1883.

At sight, pay to the order of B. C. Hobson & Co., three Hundred and Seventy-five Dollars, and charge the same to the account of CHAPMAN BROS.

TO W. H. LAWRENCE,
Macomb, Ill.

Time Draft.

$400. QUINCY, ILL., April 12, 1883.

Sixty days after sight pay to C. P. Powers, or order, Four Hundred Dollars, and charge the same to the account of B. F. JOHNSON.

TO MAXWELL BROS. & CO.,
Chicago, Ill.

Acceptance.

The acceptance of a draft is effected by the drawee, or the person upon whom the same is drawn, if he consents to its payment, writing across the face of the draft thus: "Accepted. April 14, 1883. Maxwell Bros. & Co."

Indorsements.

If a note, bill, or other form of negotiable paper is made payable to payee or *bearer*, it may be transferred to a fourth party by merely delivering it into his hands, and the fourth party will stand in the same position as the original payee did. But if the bill be made payable to the payee, *or order*, he cannot transfer it without indorsing it; that is, writing his name on the back, after which the payee is called the "indorser," and the person to whom it is sold or transferred the "indorsee." "Holder" is a general word applied to any person in possession of the paper and entitled to the payment thereon.

There are five different ways of indorsing paper.

1. Indorsement in Blank. This is when the indorser simply writes his name on the back of the paper. The paper thus indorsed is transferable by delivery from hand to hand, like a bank bill; so long as it continues in *blank*, it is payable to *bearer*.

2. In Full. An indorsement in full is when the name of the person in whose favor it is made is written on the back of the paper. Then none but the indorsee, or person to whom it is ordered paid, can demand payment. This mode of indorsement insures safety in the transmission of negotiable funds. The following would be an indorsement in full:

Pay to S. J. Chapman, or order.
Ewing Summers.

3. Confidential. This indorsement is such as is made subject to some condition which must be performed, or the instrument will not be or remain valid.

4. Qualified. All indorsers are liable for the amount of the paper unless they *qualify* their indorsement. An dorsement as follows:

without recourse.
L. W. B. Johnson.

would release the indorser from all responsibility.

5. Restrictive. A restrictive indorsement is one which restrains the negotiability of the instrument to a particular person or for a particular purpose. Here is such an indorsement:

Pay to J. H. Franklin.
Samuel Crosby.

PROMISSORY NOTES.

A promissory note is a written promise to pay a specified sum at a designated time, both of which are stated in the body of the note. A note is made negotiable by making it payable to a person or his order, or to his assigns, or to bearer, or to the cashier of a bank or incorporated company. A note so drawn may be negotiated, or used in payment to another person by the holder, who indorses his name on the back of the note. In the event of the failure of the drawer of the note to pay it, the holder looks to the persons who indorsed it for payment.

A note payable on a certain day is really due three days later. These three days are called "days of grace." Thus, a note for one month dated January 1st, need not be paid until February 4th, the last day of grace. Notes payable on demand are not entitled to any grace. Should the last day of grace fall upon Sunday or upon a legal holiday, it must be paid on the day previous. Thus, a note due January 1st must be paid on the 31st of December. A note made payable at a bank and held there for payment until the usual hour for closing, need not be presented to the drawer in person to bind the indorser. It may be protested immediately upon the close of bank hours. Payment must be immediately demanded of the indorser if he resides in the same place; if he is a non-resident he must be notified at once by letter.

A note is void when founded upon fraud. Thus, a note obtained from a person when intoxicated, or obtained for any reason which is illegal, cannot be collected. If, however, the note is transferred to an innocent holder, the claim of fraud or no value received will not avail. The party holding the note can collect it if the maker is able to pay it. A note given on Sunday is also void in some States.

Notes bear interest only when it is so expressed; after they become due, however, they draw the legal rate of the State. If it is intended to have the note draw more than the legal rate of interest after maturity, the words should so specify in the body of the note as follows: "with interest at the rate of —— per cent until paid." Notes payable on demand or at sight, draw no interest until after presentation or demand of the same has been made, unless they provide for interest from date on their face; they then draw the legal rate of interest of the State.

If "with interest" is included in the note, it draws the legal rate of the State where it is given, from the time it is made.

If the note is to draw a special rate of interest higher than the legal, but not higher than the law allows, the rate must be specified.

When transferring the note, the indorser frees himself from responsibility, so far as the payment is concerned, by writing upon the back, above his name, "Without recourse to me in any event."

Note Not Negotiable.

$2,000.00. *Kansas City, December 1, 1883.*

Three months after date I promise to pay Henry Palmer, Two Thousand Dollars, value received, with interest at 8 per cent. per annum.

W. H. Cummings.

Negotiable only by Indorsement.

$700.00. *Providence, R. I., Sept. 12, 1883.*

Ninety days after date I promise to pay J. J. Astor, or order, Seven Hundred Dollars, value received.

C. B. Laflin.

Negotiable Without Indorsement.

$200.00. *Chicago, May 1st, 1883.*

Three months after date I promise to pay Robert H. Bishop, or bearer, Two Hundred Dollars, value received.

Stephen Logan.

Note on Demand.

$300.00. *Sterling, Ill., June 1, 1883.*

On demand I promise to pay Martin Ward, or order, Three Hundred Dollars, value received, with interest at 8 per cent. per annum.

Thomas Jefferson.

Payable at Bank.

$500.00 *Chicago, May 1, 1883.*

Four months after date I promise to pay to the order of George Bancroft, Five Hundred Dollars, at the Merchants' National Bank, value received, with interest at 8 per cent. per annum.

John Hancock.

Note Payable in Merchandise.

$600.00. *Marysville, Ohio, June 1st, 1883.*

Four months after date we promise to pay Cook, Toler & Co., or order, Six Hundred Dollars, in good, merchantable family flour, at our mill in this city, at the market value, on the maturity of this note.

Darling, Wright & Co

Judgment Note, Common Form.

$200.00. *New York, September 24, 1883.*

Three months after date I promise to pay John Adams, or order, Two Hundred Dollars, with interest at the rate of six per cent. per annum, from maturity until paid, without defalcation. And I do hereby confess judgment for the above sum with interest and costs of suit, a release of all errors, and waiver of all rights to inquisition and appeal, and to the benefit of all laws exempting real or personal property from levy and sale.

Oliver P. Morton. [*L. S.*]

Form for Pennsylvania.

$952.00 *Philadelphia, May 1, 1883.*

Six months after date I promise to pay to the order of Gray, Field & Co., Nine Hundred and Fifty-two Dollars, at Traders' National Bank, value received, without defalcation.

Horace Maynard.

Note for Indiana.

$500.00. *Elkhart, Ind., May 1st, 1883.*

On demand, for value received, I promise to pay C. S. Judd, or order, Five Hundred Dollars, with interest; payable without any relief whatever from valuation or appraisement.

Eldridge Geary.

Form of Note for Missouri.

$400.00. *St. Louis, Mo., May 1st, 1883.*

Three months after date I promise to pay to James Gilbert Four Hundred Dollars, for value received; negotiable and payable without defalcation or discount.

Frank Fackler.

Married Woman's Note in New York.

$100.00. *New York, April 1st, 1883.*

Six months after date I promise to pay David Field, or order, One Hundred Dollars, with interest. And I hereby charge my individual property and estate with the payment of this note.

Emma E. Johnson.

Joint Note.

$1,300.00 *Austinburg, O., April 17, 1883.*

Three months after date we jointly promise to pay E. B. Webster, or order, One Thousand Three Hundred Dollars, value received, with interest at six per cent. per annum.

Charles Sharp.
J. H. Franklin.

Principal and Surety.

$489.25. *Logansport, Ind., April 23, 1883.*

Six months after date I promise to pay F. M. Chapman, or order, Four Hundred and Eighty-nine Dollars and 25–100ths Dollars, with interest, value received.

R. J. Smith, Principal.
T. W. Jordon, Surety.

OTHER FORMS OF BUSINESS PAPERS.

Orders.

For Money to Apply on Account.

$150.00 *Newport, Mich., June 3, 1883.*

Mr. A. B. Fenton:

Please pay Alexander Gardner One Hundred and Fifty Dollars, and charge to my account.

Eugene Knox.

In Full of Account.

$175.00. *Riverside, Ill., June 1, 1883.*

Henry L. Stonington:

Please pay to August Parker, or bearer, One Hundred and Seventy-five Dollars, and this shall be your receipt in full of my account.

Lorenzo Field.

For Merchandise.

$245.00 *Hyde Park, Ill., Feb. 1, 1883.*

Franklin, Field & Co:

Please pay Anthony Geary, Two Hundred and Forty-five Dollars in merchandise, and charge to

Potter Palmer.

Receipts in Full.

On Account.

$87.00. *Buffalo, N. Y., June 1, 1883.*

Received of H. F. Henderson, Eighty-seven Dollars on account.

Chapman Bros.

In Full of all Demands.

$650.00. *Galesburg, Ill., April 15, 1883.*

Received of Thomas McKee, Six Hundred and Fifty Dollars, in full of all demands to date.

Sheldon Gale.

Due Bill.

$250.00. *Lebanon, Wis., June 1, 1883.*

Due Andrew J. Benson, or order, Two Hundred and Fifty Dollars.

Campbell Bros.

Legal Tender, lawful money, or money which a successful suitor at law can be forced to take in satisfaction of judgment. Promises to pay, except those issued by the general Government, cannot be made legal tender. In the settlement of all contracts at law, legal tender, or lawful money, can be exacted and made to settle the litigation, unless the contract expressly states other considerations.

Leghorn (leg'horn), a kind of plait for bonnets and hats, prepared from the straw of a variety of bearded wheat, cut when green, and dried. It was originally made at Leghorn, Italy: whence the name. Also, the term denotes a variety of the domestic fowl. See page 525.

Legs, of the horse: see page 726 and 787.

Legume (leg'ume or legume'), the seed pod of certain plants, as the bean, pea, locust, red-bud, coffee-bean tree, peanut, etc. Such plants are therefore denominated "leguminous," and belong to the order Leguminosæ.

Leicester (les'ter), a breed of sheep: see Sheep.

Lemon. There is the greatest similarity between the lemon and orange trees in almost every respect. In size and shape of tree, foliage and bloom, in planting, cultivating, pruning, etc., there is scarcely any difference to be detected by the novice. As the lemon is propagated in the same manner as the orange, we refer our reader to that subject in this volume. Although restricted, there is a large district in California where this fruit may profitably be grown. The lemon tree being more susceptible to frost than the orange, it is not adapted to the districts described in the orange article as middle and low lands, except in well-sheltered quarters. In does well on the mesas, at an altitude of 1,000 to 2,000 feet above the level of the sea, where frost severe enough to damage it never comes.

Varieties. The only lemons worthy of cultivation are the budded varieties. The following are commended for California:

Bonnie Brae. This new variety, which we illustrate on the colored plate with the Riverside Navel Orange, is a product of San Diego, and a most promising fruit. Tree of average size, a strong grower, quite thorny. Fruit symmetrical, texture the finest, rind thin, almost seedless, acid fair, and the juice possesses a peculiar rich flavor.

The Lisbon. This excellent variety, which we also show by a colored picture, is worthy of attention. The tree is a strong grower, quite thorny, not so early in bearing as other varieties. Fruit oblong, symmetrical, strong acid; more or less seeds; rinds sweet and thin.

Sweet Rind. This was the first improved variety originated in California as a seedling. It is a fair lemon, but is excelled by others since introduced.

The Eureka. The tree makes a vigorous growth, and is thornless. Fruit sharply pointed at blossom end, fair in texture, seedless and sweet rind; acid the best.

Genoa. Tree thornless and an early bearer. Fruit good in all respects except acidity. Tests show the amount of acid to vary so much that the fruit is not looked upon with favor.

Olivia. Tree somewhat thorny, good bearer. The fruit is excellent.

Marketing. As the lemon ripens in midwinter, when acid fruits are little in demand, great care should be taken to preserve them as long as possible and in the best condition. In handling them the same general principles which apply to oranges apply to them. The fruit should be picked when dry and stored for a time, during which it undergoes a sweating and curing process. In this way the excess of moisture is evaporated from the skin, rendering it soft and pliable, with a texture somewhat like a kid glove. They will keep a long time, and are not susceptible to decay in transit cured in this way. There is no secret about the curing process. The lemons are merely spread out in thin layers in a dry, cool, well-ventilated place and left anywhere from ten days to ten weeks, as suits the convenience of the grower.

Letter-Writing. A knowledge of the art of letter-writing is certainly of great value and importance to individuals everywhere. It is one of the most difficult branches of composition. A model letter is much more rare than a perfect or elegant specimen of any other kind of writing. One should seek to write gracefully and with ease, and adapt the style to the correspondence, and while studiously avoiding all error, also to betray no evidence of having studied the letter. This art once acquired will be found ever valuable. While it is impossible to lay down any set of rules that will always be applicable, yet there are many important general directions which all should study and follow as closely as possible. These we give in this article.

General Instructions.

In general the style of expression should be similar to that of ordinary conversation, where pure language only is employed. A letter is but a talk on paper; and the variations of style will depend mostly upon the degree and terms of intimacy existing between the parties.

Be original and fresh in your phraseology. Don't use such old and hackneyed forms as, "I now sit down and take my pen in hand to let you know that I am well, and hope these few lines will find you enjoying the same blessing." Avoid ambiguity; let your sentences be short, clear and easily understood. Make the ends of sentences conspicuous by a period, space and a capital letter commencing the next sentence, if one follows. In writing pleasantries, as jokes and playful turns on ideas, facts or words, be specially careful that your expressions be clear and so worded that they will not be misunderstood or taken in a wrong spirit. It is far more dangerous to attempt jesting by letter than by word of mouth, so much depends upon tone, accent, gesture, etc.

Any abbreviations of name, rank or title beyond what are sanctioned by custom are considered rude. An insulting letter should be returned to the party who wrote it, so he will know you received it and have a thorough contempt for him. Otherwise, he might think the letter had miscarried and write again.

In mechanical execution, the letter should be free from flourishes and singular strokes of the pen. The punctuation should be as perfect as you can make it. No capital letters should be used where they are not required. The rules for their use are few and simple, and are given in all the school grammars. Ink blots, erasures, and stains on the paper are inadmissible. Be careful to dot all the i's and j's and cross all the t's and x's. Etiquette requires that you give your friend as little trouble as possible in reading your letter and making out your meaning.

Parts of a Letter.

A letter consists of the date, complimentary ad-

dress, the message (body of the letter), the complimentary closing, and signature of the party writing the letter. In business letters, the name and place of the party addressed are written before the complimentary phrase, "Dear Sir," but in letters of friendship the old form established by etiquette requires them to be written at the left-hand margin, at the close, and on the next lines below the signature. The date should end with the right-hand margin of the page; the address of the party written to, the complimentary address, and the beginning of the message should be written on successive lines, each item commencing at a uniformly increasing distance from the left-hand margin, as illustrated in the accompanying forms. The complimentary closing should be placed equidistant from the margins, and the signature on the next line, toward the right.

The Complimentary Address.

In addressing a clergyman, it is customary to commence, "Reverend Sir," or "Dear Sir." Doctors of divinity and medicine are addressed as "Dr." or "Doctor——,"—whatever his surname might be. In this case the full address, both in the letter and on the envelope, will be, "Rev. Wm. Johnson, D. D.," "Dr. F. M. Luse," or "F. M. Luse, M. D.," etc. The President of the United States and Governors of States are addressed as "His Excellency." Members of Congress and of the Legislature, and all others holding distinguished positions under the Government, are addressed as "Hon." or "Honorable." A business letter should commence with "Sir" or "Dear Sir." In social correspondence the address of a letter is regulated according to the degree of acquaintance or friendship. The usual forms are: Madam, Sir, Dear Madam, Dear Sir, My Dear Madam, My Dear Sir, Dear Mrs. McMurtry, My Dear Mrs. Caldwell, My Dear Friend, Dear Friend, Dear Freddie, My Dear Nettie, etc. When letters commence with the name, as "My Dear Mrs. Morris," it should not, of course, be immediately repeated in the "complimentary address."

The Complimentary Closing.

The complimentary closing of a business letter, addressed to a stranger, is usually one of these: Yours truly or Yours respectfully, varied with the word "most" or "very," and by inverting the order, as, Truly yours, etc. Social letters admit an almost infinite variety of forms of closing, care being taken that the salutation and closing be consistent and not tautological. For example, if your salutation be, "My Dear Friend," it would be too cold to close with "Yours respectfully," and tautological to close with, "Your friend." You may close in such a case with "Ever yours," "Sincerely yours," "Yours with esteem," "Yours faithfully," "Ever, My dear John, faithfully yours," or "Your grateful Mary," etc. The forms of

salutation and closing are both promoted by the feeling, and should be nicely adapted,—neither too formal nor too familiar.

Except in writing to strangers, a married lady should not sign herself with "Mrs." before her Christian name, or a single lady with "Miss." "Miss" should be placed in brackets a short distance preceding the name. Only letters of unmarried ladies and widows are addressed with their Christian or given names. The letters of married ladies are addressed with their husband's names.

Materials.

The kinds of paper used for epistolary correspondence are technically called "Letter Paper," "Commercial Note" and "Note Paper," the first mentioned being the largest. Dealers in stationery will show samples of each, so that their customers can make their choice. For business and legal documents, "Legal Cap," "Foolscap" and "Bill Paper" are used, and for notes of invitation, parents' excuses for children attending school, etc., "Billet Paper" is used.

White is the most elegant and tasteful color for paper, and gentlemen should use no other. Delicately-tinted and perfumed paper may be used by ladies if they choose, but it is in bad taste for gentlemen to use it. For business letters no color is allowable but pure white or bluish white.

Persons in mourning may use "mourning paper," and envelopes to match, the width of the border corresponding somewhat to the nearness of the relationship, and the recentness of the bereavement.

The envelope should be adapted, both in size and in color, to the paper. Letter paper, if used, requires the same size of envelope as commercial note,—that is, 3¼ by 5½ inches. Official letters, manuscript for newspapers, legal documents and all large communications sent by mail, should be enclosed in what are called "official envelopes," which are about 9 inches long. Gentlemen may use either white or colored envelopes, described generally as "buff," in their business correspondence. It is not allowable to send a buff envelope to a lady, nor do ladies use that kind at all. If tinted paper is used, the envelope must have the same tint. Both paper and envelopes should be of fine quality.

Both in the body of the letter and in the address on the envelope, fancy inks should not be used, but good black ink. An ink such as "Arnold's Writing Fluid" flows well, and, although not very black at first, will soon become so. The best ink for fine penmanship is seldom found at the stores; and when found, it will probably cost more than ten cents a bottle. All kinds of ink are more or less injured if permitted to be frozen or to stand long exposed to the air or sunlight.

The best pen for fine penmanship is a sharp, stiff-pointed steel pen, if otherwise properly made; and the cheapest pens are scarcely ever of this description. For what is termed the "Ladies' Epistolary Style" of writing, the best pen is not only of the character above described, but is also very small. All steel pens soon corrode and become unfit for use. For business writing many persons like gold pens the best.

Superscription.

This is the address upon the envelope, and should be written plainly and evenly. All the writing upon the envelope should be perfectly legible, as some delay may be occasioned, and even the loss of the letter, where the address is not plain. In writing the superscription, commence the name a little to the left of the center of the envelope. The town, on a line beneath, should extend a little to the right of the name. The State, next below, should stand by itself still further to the right. The county may be on the same line with the State, toward the left side of the envelope.

For the convenience of the mailing clerk in handling the letter, the postage stamp should be placed at the upper right-hand corner of the envelope.

If the town is a large metropolis, the county may be omitted. In that event the street and number are usually given, or the postoffice box. Each should be written very conspicuously upon the envelope, for the convenience of the postoffice clerk and and the mail-carrier.

Upon the following page we give a number of specimens of the various forms of superscriptions, with their uses outlined just above each. From among these you will be able to select a form for almost every case.

Extensive practice enables business men to write comparatively straight upon the envelope, without the aid of a line. The inexperienced penman may be aided in writing on the buff-colored envelope by lead pencil lines, which should never be used, however, unless completely erased by rubber after the ink is dry.

For light-colored envelopes, a piece of paper a little smaller than the envelope may be ruled with black ink over the ruled lines, making a heavy mark, and placed inside.

Care should be taken to write upon the envelope very plainly, giving the full name and title of the person addressed, with place or residence written out fully, including town, county, State, and country if it goes abroad. The designation of the street, number, drawer, etc., when written upon the letter, is explained elsewhere.

Where you are uncertain of your correspondent's address, or wish to recover the letter in the event of its failure to reach the person for whom it is intended, you should write in the upper left-hand corner of the envelope the words, "Return to (giving your name and address) if not called for in ten days." Business men usually have these words printed on their envelopes, as shown in "Special Request" envelope illustrated on the following page.

Letter directed in the care of Some One.

STAMP

Miss Ella V. Scott,

Oneida,

Knox Co.,

Care of G. H. Scott, Esq. Ill.

Letter to a Person who is Traveling or Changing Residence.

STAMP

Col. R. P. Thomas,

DesMoines,

If not called for in 5 days, P. M. please forward to Red Oak, Iowa, care of Geo. Pierson.

Iowa.

Direction describing the Person's Occupation, partly to insure an Earlier Delivery of the Letter, and Partly to Advertise the Business.

If not delivered in 5 days, return to

CHAPMAN BROS.
PUBLISHERS,
CHICAGO.

STAMP

R. G. Carter

Agent for "American Encyclopedia,"

Indianapolis,

Ind.

Letter Directed in the Care of Some One, in a City.

STAMP

Rev. G. B. Webster,

Detroit,

Care of Col. H. S. Wilson,
98 Court Street.

Mich.

Direction when the Street or Place and Number, in a City, is known.

STAMP

C. T. Streator

No. 12 Aldine Square,

Chicago,

Illinois.

"SPECIAL REQUEST ENVELOPE."
Direction Requesting Return if not Delivered within a Given Number of Days. The Name of the County is also given.

If not delivered in 10 days, return to
F. S. DE HASS,
Millville, Orleans Co., N. Y.

STAMP

Alex. D. Carson, Esq.,

Collinsville

Lewis Co. N. Y.

Direction when the Number of the Postoffice Box or Drawer is known.

STAMP

Mrs. Maria Mercer,

Springfield,

Box 342. *Ill.*

Letter, on the Envelope of which obligation is Acknowledged to the Party Delivering it.

H. G. Middleton, Esq.,

By the Kindness of
Mr. A. Langtry.

Presented.

Miscellaneous Facts and Suggestions.

Observe carefully the following facts and suggestions:

See that every letter and package sent by mail is securely folded and fastened. Use only good strong envelopes and wrappers. Heavy articles should be secured with a string.

Never send money (except in very small amounts) or other articles of value in an unregistered letter

See that every letter contains your full name and address (inside), as previously advised in this work.

See that the outside address is full and plainly written. On foreign letters, not only the name of the town or city, but also the name of the country, should be written. Letters directed to "London" are often sent to London, Canada.

When dropping a letter or paper into a street letter-box, see that it does not stick fast.

Cut stamps, stamps cut from stamped envelopes, mutilated postage stamps, and internal revenue stamps cannot be accepted in payment of postage.

To use, or attempt to use a stamp that has already been used, is punishable by a fine of fifty dollars.

A double rate of six cents for each half ounce is chargeable on every letter that reaches its destination without having been fully prepaid—deducting the value of the stamp affixed.

To enclose any written matter in printed matter subjects the mailing party to a fine of five dollars, unless the party addressed pays letter postage on the package.

BUSINESS LETTERS.

Business letters should be to the point, clear and distinct in their meaning, and plainly written. These are three very necessary requisites of a business or mercantile letter. Come at once to your subject, and state it so clearly and explicitly that your meaning may not be mistaken. Form the letters plainly, avoiding all flourish of penmanship. Fine writing, rounded periods, rhetorical flourishes and elaborate sentences are out of place in a business letter.

A letter on business should be answered at once, or as soon as possible after receiving it. It is allowable, in some cases, upon receiving a brief business letter, to write the reply on the same page, beneath the original letter, and return both letter and answer together.

Give the name of your town, county, State and date explicitly and write your name plainly. Read your letter carefully when finished, to see that there are no omissions or mistakes. See also that the address upon the envelope is properly made, that it is closely sealed and the stamp attached.

Forward money by draft, express, registered letter, or P. O. Money Order, and always state in the letter the amount and how sent.

In sending orders for goods, be very explicit to state the kind, quality, amount, shape, color, size, etc., and the conditions or terms upon which you want them. If these points, or so many of them as are necessary, are clearly stated, your order will generally receive the more prompt attention. If you have complaints to make, or any matters foreign to the order to include in the letter, let them be stated on a separate sheet of paper, or at the close of the letter.

We give a few specimens of business letters, which will show the form in which they should be written:

Letter with an Order for Books.

BROOKFIELD, MO., May 1, 1883.

MESSRS. A. S. MAXWELL & CO.

Chicago, Ill.

Gentlemen: — Enclosed find P. O. Money Order for $32.75, for which please forward me, by United States Express, the following:

5 copies	Conduct of Life, by R. W. Emerson. Pub. by Osgood & Co.; at $1.50	$7.50
1 copy	Gleanings of Past Years, by Gladstone. Published by Putnam's Sons	1.25
10 copies	Smiles' Self Helps. Harper Bros., Publishers; at $1.00	10.00
10 "	Plain Talks, by J. G. Holland. Scribners' Sons; at $1.25	12.50
3 "	Golden Legend, by Longfellow. Porter & Coates; at 50c	1.50
	Total	$32.75

Thanking you for your usual promptness in filling my orders, I am

Very truly yours,

CHRIS. H. MAYNARD.

Letter Dismissing a Teacher.

COLUMBUS, MO., Jan. 10, 1883.

Dear Sir:—It becomes my duty to inform you, that the committee controlling the school have found it necessary to retrench its expenses, and in doing so are compelled to dispense with your services as a teacher.

Regretting the expediency of this measure, and wishing you every success, I am,

Very truly yours,

J. P. GRAHAM,

Chairman.

Professor S. T. Joyce.

Notice of Draft.

CHICAGO, ILL., Jan. 16, 1883.

MESSRS. GROVE & WHITNEY,

Pittsburg, Pa.

Gentlemen:—We have this day deposited in bank for collection three days sight draft on you for five hundred dollars ($500), which please honor and oblige

Yours truly,

CHAPMAN BROS.

Ordering the Address of Paper Changed.

WINCHESTER, IND., March 27, 1883.

CENTRAL BOOK CONCERN,
St. Louis, Mo.

Gentlemen:

Having removed from Oakland Valley, Franklin Co., Iowa, to this place, please be kind enough to change the direction of the "Christian Evangelist" accordingly, and oblige

Yours respectfully,
F. A. WANNER.

Complaining of an Error in a Bill.

PLANKINTON, DAK., May 1, 1883.

MESSRS. MARSHALL FIELD & CO.,
Chicago.

Dear Sirs.

Upon examining bill accompanying your last lot of goods, I find that I am charged with five dozen linen handkerchiefs which I never ordered nor received. I enclose the bill and copy of the invoice of goods, that the error may be corrected.

I am, gentlemen,
Yours very truly,
H. B. MOORE

LETTERS OF INTRODUCTION.

Letters of introduction should be brief and carefully worded. Give in full the name of the person introduced, the city or town he is from, intimating the mutual pleasure that you will believe the acquaintance will confer, adding a few remarks concerning the one introduced, as circumstances seem to require. They are left unsealed, to be sealed before delivery by the one introduced. A letter of introduction should not be given unless the person writing it is very well acquainted with both parties.

That the person receiving such a letter may know at a glance its character, the letter should, on the envelope, be addressed thus:

Grover Cleveland, Esq.,
450 Broadway,
Albany.

Introducing

Benj. F. Templeton,
of Chicago, Ill.

Presenting the letter of introduction at the private house, send it by the servant to the person addressed, accompanied with your card.

At the business house, send the letter to the counting-room, accompanied by your card.

Introducing one Lady to Another.

ANN ARBOR, MICH., April 10, 1883.

Dear Emma:

I take this occasion to introduce to you the bearer of this letter, Mrs. Potter, who is on a visit to her relatives in your city. Mrs. P. is my very dear friend, of whom you have often heard me speak. Believing that your acquaintance with each other would be mutually agreeable, I have urged her to call upon you during her stay. Any attention you may bestow upon her during her visit, will be highly appreciated by

Your friend,
MAY ABBOTT.

Short Form of Introduction.

OSWEGO, N. Y., May 1, 1883.

My Dear Sir:

I have the honor of introducing to your acquaintance Mr. Willis Esterbrook, whom I commend to your kind attention.

Very truly yours,
EUGENE WENTWORTH.

Mr. Dudley Gould,
Philadelphia.

Introducing a Young Man Traveling on Business.

INDIANAPOLIS, Mar. 1, 1883.

HENRY HOWARD, ESQ.,
Savannah, Ga.

Sir:—We recommend to your particular favor and attention, the bearer, Mr. Milton McKenzie, eldest son of Mr. Henry McKenzie, of the highly respectable house of McKenzie, Gleason & Co., of this city.

Our esteemed young friend is about to visit the Southern States, by way of Savannah, on business for the house; we therefore request you, most urgently, to afford him your advice and assistance, and to render his stay in your city as agreeable as possible. He is clever, steady, and unassuming, and we are convinced that on a near acquaintance he will prove himself deserving of your esteem and good will.

Command us freely in similar cases, and be assured that we will use our best endeavors to do justice to your introduction.

We are, respectfully yours,
ABBOTT & MILLS.

From a Lady in the Country to a Young Friend in the City.

POMROY, Aug. 25, 1883.

My Dear Nettie:

I am afraid I am getting stupid, for I cannot recollect whether I am in your debt a letter, as well as for the pretty things you were so kind as to purchase for me. They are quite new fashions here. Many thanks for them.

I am writing these few lines to let you know that Harry is in Minneapolis, on a visit to a friend on Madison avenue. A good match, dear. He has a nice little income and a good business. There is one drawback, however: he has a temper of his own and is rather small in stature; but a kind and affectionate wife would improve his temper. He is very kind-hearted.

I see by advertisements in the papers that dresses for winter wear are cheap; should you see two that would

Wichita, Kan., April 19, 1883.

Messrs. S. J. Foster & Sons,

Kansas City, Mo.

Gentlemen:

Learning from a friend of mine that your trade in fruits has increased so greatly that you may probably need additional help in the shipping department of your store, I beg to offer myself as a candidate for a situation therein. The enclosed is a copy of a recommendation from my former employers at Lawrence, for whom I worked almost three years, seemingly with entire satisfaction to them. I would also refer you to Messrs. Rollo, Clark & Co., dry goods dealers in your city

Hoping that I will receive a favorable answer from you soon,

I am most truly yours,

W. H. Martin

suit Mollie and myself (you know our favorite colors) will you please purchase them for me? I hope it will be no inconvenience to you to do so; if it be, decline at once. All unite in most affectionate love to your uncle.

Believe me, my dear,

Yours affectionately,

CARRIE.

To Miss Nettie Marsh.

APPICATIONS FOR SITUATIONS.

Advertisements like the following are seen in every issue of a city daily paper:

WANTED—AN HONEST, INDUSTRIOUS, SOBER man to drive delivery wagon and take care of two horses; must be fond of horses and a good driver; permanent situation. Address G 45, Tribune office.

WANTED—AGENTS TO SELL THE BIG BONANZA Stationery Package; large profits; quick sales; samples mailed for 20 cents. Address for one week, W. G. BROWN, Waterloo, Iowa.

WANTED—A YOUNG MAN TO SELL MY GOODS; capital required, $3. Address for one week, with stamps, W. G. BROWN, Dayton, Ohio.

WANTED—IMMEDIATELY—TWENTY GOOD agents; none but those of experience need apply. For circular and particulars send two 3-cent stamps. For particulars address GEORGE BUCK, Lock Box 349, Marshalltown, Iowa.

Those who write the best letter in reply to any of the above are the most likely to obtain the desired situation. Letters in reply to advertisements should be written immediately, else they may be too late. Paste the advertisement at the head of your letter, that it may be exactly known to what you have reference. You need not say much in praise of yourself, but you should give your references, your experience in the line of business alluded to, and the advantages you have had. Write your application yourself, your hand-writing and manner of expression being the test by which the advertiser will judge you. If you have written testimonials, copy them, marking them as such, and send the copies in the letter. The originals, of course, you will want to keep in your possession.

The letters given below and the one in script on the following page will give you a proper outline for letters answering advertisments as above, and making applications for situations.

From a Young Man Applying for an Agency.

CHARLES CITY, IOWA, April 28, 1883.

MR. GEORGE BUCK,

Marshalltown, Iowa.

Sir:

I clip the above advertisement from this morning's News; and feeling that I would succeed well as salesman for your line of goods, I hasten to apply for an agency and for circular, enclosing stamps.

I am eighteen years old, have been at school most of the time, winters, for the past nine years, and understand bookkeeping pretty well. During the summer and fall, for several years past, I have been salesman for A. G. Case & Co., of this city, to whom I would refer as to my character and qualifications for commercial business. W. L. Eastman, coal dealer in your city, is also acquainted with me.

Very respectfully yours,

JAMES H. HARPER.

Application for Clerkship.

FREEPORT, ILL. Feb. 10, 1883.

MESSRS. SCOTT & SMITH,

Davenport, Iowa.

Gentlemen:—Hearing through a friend (Mr. H. S. Foster) of the vacancy of the position of junior clerk in your house, I take the liberty of making application for the same. I have had but little mercantile experience, yet I am not entirely unacquainted with business customs, having often assisted in my brother's store at this place. I am eighteen years of age and have relatives in your city with whom I would make my home.

For information as to my character, please inquire of W. J. Kerr, Esq., and E. J. Edmeston, Esq., both of your city.

Very respectfully,

JAMES D. HALSTEAD.

LETTERS OF COMMENDATION.

Recommendations are those in which the writer, for the purpose of promoting the interest, happiness or benefit of another, commends, or favorably represents, his character and abilities. Such a letter should be composed with care. It is a guarantee to the extent of language; and the party recommended, therefore, should never be sacrificed to condescension, false kindness or politeness. These testimonials are often received, and the bearer of them taken into service or confidence upon the representations contained in them, without further questions as to antecedents, etc.; therefore, never recommend an unworthy person. It may be hard to refuse a testimonial, but it is dishonorable to give a false one.

Recommendations may be *special* or *general*. A letter of recommendation addressed to some particular person, like an ordinary letter, is *special;* when not limited as to person or occasion, it is *general.*

General Recommendation.

BUSHNELL, ILL., Feb. 25, 1883.

To whom it may concern:

The bearer, Mr. E. J. Clark, is personally known to me as a young man of sterling worth. He graduated at Monmouth College, and as a student distinguished himself for his diligence, accuracy, integrity, and conscientious discharge of duty. As a member of society, he, being of a good family, and with a character unblemished, is highly esteemed. I cordially recommend him to good people everywhere, and especially to those to whom he may offer his services, whether commercially or socially.

Very respectfully,

AUGUSTUS CHANDLER.

Letters of Friendship and Relationship.

Letters to relatives and intimate friends do not require such formality in their form and wording as those we have already given. They should be dignified, but natural, free and unrestrained. "We all delight to talk of ourselves; and it is only in letters, in writing to a friend, that we can enjoy that conversation, not only without reproach or interruption, but with the highest propriety and mutual satisfaction." In such letters, above all things, a natural and lucid expression of the sentiments of the writer is necessary. Friends expect our thoughts and feelings, not a letter filled with unmeaning verbosity; and though, where excellence is aimed at, considerable attention must be paid to the disposition of the words and sentences, it must not be at the sacrifice of the energy resulting from free expression.

Frequent correspondence between friends and relatives will keep strong and bright the ties that bind each to the other. When a child leaves home, the eyes of his parents can no longer watch over him, nor can their lips any longer give him instructions. For the future their counsels must be written ones, and the child at first will often find it necessary to apply to them for advice; but, surrounded by new acquaintances, and attention taken up by change of scene, it is more than likely that for a time he will neglect and forget his parents. Not so, however, the parents their child. They follow him away, they miss him from the table, their thoughts are frequently sent after him, and they have many an anxiety which nothing but his attentions can alleviate. No friend can feel so deeply interested for his welfare, and none is so well qualified to advise, and make allowance for the errors of youth, to judge with candor, to censure with mildness, to point out the right path, or to reclaim from the wrong one.

Letter of LaFayette to Mr. George Flower.

LA GRANGE, LA., Nov. 3, 1814.

Dear Sir:

I have been much obliged by your kind inquiries on a subject most interesting to me. The pleasure of a meeting with Mr. White would be one of the highest I can enjoy. I hope that it is only postponed.

Your departure for England has prevented my returning our thanks to you and Mr. Birkbeck for the honor of your visit to La Grange, where it shall ever be affectionately remembered. Be pleased to receive and present to them the best compliments and wishes of the whole family. Our Irish friend has been lately in a dangerous state of health, but has now recovered.

This letter will be conveyed to you by Mr. Crawford, who shared with us the pleasure to receive you at La Grange. He is bound for Scotland, but means also to visit London, hoping he may be able to wait upon you,

The long expected rain has come in time to be of great advantage to us in sowing our wheat. My lot of swine is now in the pasture, and more fit to be seen than when presented for your inspection.

Accept, my dear sir, the sincere attachment with which I have the honor to be

Yours,

LAFAYETTE.

TO MR. GEO. FLOWER,
Marsden, England.

A Letter of Response and Inquiry.

Cold Spring, Wis., March 12, 1883.

Mr. L. A. Ingersoll,
Live Oak, Fla.

Dear Friend:

I have just received your postal card of the 5th inst., informing me of your arrival in the "Land of Flowers," and of your improving health. I am surprised to learn that you have gone so far away, but delighted at the news of your good fortune and better health.

Now, you must not only write to me at length your first impressions of that country, but, after you have been there some time, relate also your experiences and the peculiarities of the people and of the country, as I am still as much as ever interested in the features of that peninsula and its climate.

Hoping to hear from you soon, I remain,

Most truly yours,

Frank Moore.

LETTERS OF CREDIT.

A letter of credit is one in which the writer's character or reputation procures or entitles trust to be given to another for a certain amount within a given time, promising to be responsible for same if the person receiving credit fails to make payment.

It closely resembles a letter of introduction,—in fact the two are often combined,—that is, a letter of introduction often contains a clause asking that credit be given if the bearer desires it.

The signature of the person receiving the credit should be appended at the lower left-hand side, so that he may be identified as the person named in the letter.

Letter of Introduction and Credit.

DETROIT, Sept. 30, 1882.

MESSRS. G. H. FOLSOM & CO.,
Chicago.

Gentlemen:—I beg leave to introduce to you the bearer, Mr. T. D. Manford, of the firm of Manford Bros. & Co., this city. He is visiting Chicago for the purpose of purchasing cattle; and, although not expecting to be in want of funds, should such an exigency arise, we will thank you to accommodate him on our account, to the extent of two or three thousand dollars ($2,000 or $3,000), drawing upon us at short sight for your advances. We append Mr. M's signature.

We are, yours respectfully,
ROBERTS, HARDY & CO.

Mr. Manford's Signature,
T. D. MANFORD.

LETTERS OF EXCUSE.

It is often necessary to write a letter of excuse or apology. In such a case, to be of any value, it should be written as promptly as may be. The writer must not forget that almost as much depends on the time as the manner of making an excuse. It may be too late to be effective, or so mistimed as to aggravate the previous offense; such a letter is not very pleasant, as it is called forth by some neglect or impropriety of the author. If the apology appear forced, or made unwillingly, it cannot be effective; but if written in sincerity, and gracefully expressed, in all ordinary cases it will insure forgiveness.

Apology for Failing to Keep an Engagement.

IRVINGTON, IND., June 1, 1883.

MR. CHARLES H. COLGROVE,
Dear Sir:

I was very sorry to be obliged to break my engagement with you yesterday afternoon. I would not have done so had I been able to leave my house; but yesterday morning I was seized with a sudden indisposition which rendered me unable to walk, and which still confines me to the house.

Be good enough to appoint another day for our meeting. Suit yourself as to the time.

Yours truly,
MILTON HUBBARD.

Form of Excuse for a Pupil.

THURSDAY MORNING, Feb. 10, 1883.

MR. SAWYER:

You will please excuse James for non-attendance at school yesterday, as I was compelled to keep him at home to attend to a matter of business.

MRS. ELEANOR BATES.

LETTERS OF FAVOR.

In asking a favor do not urge your claims too strongly, for should you be refused you will feel the more deeply humiliated.

A letter granting a favor should be cordial and hearty, that the recipient may see that it is a pleasure to grant his request. It should avoid any expressions that would tend to wound the feelings. It is possible to grant a favor in such a manner as to offend, or to decline one in a way that is really gratifying.

Letters refusing a favor should be very kindly worded, and while expressing regret at the necessity of refusal, if possible state the reason why.

A Letter Requesting a Loan of Money.

UTICA, N. Y., Aug. 3, 1883.

FRIEND ALBERT:

Through unforeseen and unavoidable circumitances I am compelled to raise a certain sum of money without delay, and which I cannot do without some assistance from my friends. If you can, without inconvenience to yourself, lend me fifty dollars for thirty days, I will give you my note for the amount, and feel ever grateful for the accommodation.

Truly yours,
LEWIS JOHNSON.

A Favorable Answer.

UTICA, Aug. 4, 1883.

FRIEND LEWIS:

Yours of yesterday just received. It is with pleasure that I grant your request, and enclose you my check on the Merchants' National Bank for the amount. You can send me your note at your convenience.

Your friend,
ALBERT BROWN.

Declining the Loan.

UTICA, Aug. 4, 1883.

FRIEND LEWIS:

Yours of the 3d at hand. It is with greatest regret that I find myself unable to comply with your request. I have a considerable amount of money to raise to-morrow, which will require every dollar I have, or can raise myself. If not for this I would certainly take pleasure in accommodating you.

Hoping that you will have no further difficulty in securing assistance, believe me

Yours, very truly,
ALBERT BROWN.

Requesting the Loan of a Book.

WEDNESDAY MORNING.

Dear Fannie:

Will you lend me your copy of Longfellow's Hiawatha? I will take good care of it, and return it in a few days.

Yours,
MAY RINARD.

Reply Granting the Request.

WEDNESDAY MORNING.

Dear May:

I send with this the copy of Hiawatha. I hope it may prove as great a source of pleasure to you as it has been to me. Keep it as long as you wish, and return it at your convenience.

Yours affectionately,
FANNY MORRIS.

LETTERS ACCOMPANYING GIFTS.

Notes or letters accompanying gifts, and their answers, are more formal than ordinary letters. They are usually written in the third person, and should be brief. Among intimate friends and relatives, however, an exception may be made, and an easier form may be adopted. A note acknowledging a gift should be given immediately.

Accompanying a Birthday Gift.

HILLSDALE, May 1, 1883.

Dear Agnes,—Accept this little token of love and esteem from an old friend. Many happy returns of the day!

Your loving friend,
ANNA OGDEN.

LETTERS OF SYMPATHY.

Letters of sympathy and condolence are difficult to write, and require great tact as well as good taste on the part of the writer. Properly written and inspired by a genuine sympathy, they may be of great comfort to your friend.

The letter should not be too long, and should be earnest and simple in tone. Do not underrate the sorrow of your friend, but deal with it tenderly, admitting its magnitude, administering such consolation as may be appropriate to the occasion, and pointing your friend to the One who can heal all sorrow.

To a Friend on the Death of a Wife.

HOPEDALE, ILL., March 10, 1883.

Dear Sanford:

It is with deepest regret, my dear Sanford, that I learn of your deep affliction. Hard, indeed, it must be, to lose a partner in life, with whom you have enjoyed so many hopes in common. A more faithful wife never lived, and few men, I venture to say, ever enjoyed a greater degree of domestic tranquillity than yourself.

A true wife and a devoted mother! No higher eulogy can be pronounced upon any woman. How the little motherless children will miss her tender care! How those little girls will miss her sweet presence at the evening hour, when the ominous gloom of darkness creeps stealthily upon them! and how they will also miss the wonted sweet accents of her voice that used to soothe their ruffled spirits when in trouble!

Truly, the great central sun of your household has gone down, and I deeply, yea keenly, sympathize with you in your affliction. Let us hope, however, that in the golden Summer of another life, children, mother and father will gather again, in a sweet re-union, where partings are unknown. Though the days are dark now, Spring will come once more.

Your sympathizing friend,
STEWARD WARD.

To S. S. Howard.
Langsburg, Ill.

Love Letters.

This class of letter writing is perhaps the most difficult of all correspondence to make entirely satisfactory to both parties and at all times. The affection in the heart of one may not be so intense as that glowing in the heart of the other, or the power of portraying the feelings may not be so great. Then there is the thought that possibly after all the tender feelings may die out, indifference, coldness and even hatred replace it. If such a change should occur one would regret that he had ever given expression to his feelings in such a manner and in as hape so enduring, and which might be afterwards shown to his disadvantage or detriment. Therefore a certain amount of restraint and dignity should characterize such letters, especially those from a lady. She should remember that though an engagement should exist at the time of writing, it may be severed, or other parties might see the letters intended for only one. Her intended will respect her more for a quiet, affectionate dignity in writing than if she put too much of the most sacred of all feelings upon paper. After all, a love letter should not be stiff or constrained. The charm in all friendly correspondence arises from the freedom and ease which characterizes the relation between true confiding friends, and the harmony of tastes of the writers, and, in this class of letters, from genuine affection.

It is best to avoid any extravagant flattery, lest it disgust the reader, as well as degrade the writer, and create a suspicion of one's sincerity, which is the death-blow of all true love.

A loving heart naturally imparts its glow to the written page, and this warmth is communicated by the mysterious power of words to the heart of the reader, and this should not be clouded by too great restraint. It is this pleasure that excites the affections and awakens dormant friendships. How the heart beats with expectation in the perusal of a letter from one we love! How endeared becomes our connection by this spiritual communion, in which our minds with ardent zeal and devotedness become united, and an eloquence and freedom indulged perhaps never more felicitously.

As to the form of love letters, they should be similar to those of friendship. They are so varied and must be prompted by the feelings and controlled by surroundings to such an extent that any set of forms would be useless.

Lettuce. This salad persistently demands a rich and rather moist soil. The rows should be about 12 inches apart, and the plants thinned from 8 to 12 inches apart for the heading varieties. Sow as early as possible. This plant is well adapted for forcing. When heads are not desired it may be grown in a mass. The more rapid the growth the better the quality. There are later kinds adapted for summer use, which, of course, may be sowed later. Lettuce sowed late in autumn and mulched or covered with

boards during the winter, will come forward unusually early in the spring.

VARIETIES. *Black-Seeded Tennis Ball.* Hardy, earlier than Silesia; large heads.

FIG. 1.—*Early Curled Silesian.*

Boston, or *White Tennis Ball.* One of the most popular.

Early Curled Silesian. Very tender and sweet, and one of the best for forcing and for early market; one of the best for garnishing.

Prize Head. Said to be the best of all; leaves tinged with a rich wine color.

Red-Edged Victoria. One of the best for early sowing.

Drumhead. Very large, crisp and tender; a standard sort.

Large India. Resembles Drumhead, but later.

Brown Genoa Cabbage. Of medium size, round head, stained with red about the top; one of the best for either summer or winter use.

White Cabbage. Chiefly valuable for its hardiness; may be sown in the fall in alternate rows with spinach, and the same slight covering will protect them both through the winter; in the spring, after the spinach is cut, the lettuce will yield a fair crop of fair quality.

Versailles. Fine summer variety, with large heads; green.

Neapolitan. A good summer variety.

Perpignan. Heads sometimes seven inches in diameter; one of the best summer varieties; not inclined to go to seed.

FIG. 2.—*Early Cabbage Lettuce, or Dutch Butter-Head.*

Early Cabbage, or *Dutch Butter-Head.* Excellent. Has speckled leaves.

White Paris Cos. The best of the Cos varieties.

Stone-Head Golden Yellow. A new variety promising to bear the palm.

Rival seedsmen, of course, advertise many other varieties of lettuce, for the sake of winning custom, but they all know that three to five varieties are enough for any family, although professional gardeners may want a few more.

Lever (lev'er or le'ver), a bar or rod for raising weights, resting on a point called a fulcrum.

Library, a collection of books arranged on shelves for ready reference. The most important observation we have to make under this head, is, that the few books which most people have are generally so poor —at least for their purpose—that their possessors have but little interest in them, and therefore but little interest in literature generally; and when a friend, especially a traveling agent, offers a really good and practical work, it is regarded with indifference or suspicion. Hence the difficulty of getting a family started in the right direction in the selection of good books. They do not take pains to post themselves on the characteristics of a good work, and from a lot of books spread out before them they are actually more apt to select the poorer than the better class. See Book.

At the same time, there are many valuable things in most libraries that are unknown to the owner, simply for the reason that he does not take as much time as even two or three hours a week for a month or so to ascertain the contents. Many a time a farmer travels for miles, or spends dollars, or otherwise suffers considerable loss for not knowing what he might have known by laying his hand on the proper book in his possession and turning to the right page. One should be so familiar with the contents of all his books that he can in a moment turn to any desired subject. To those who read but little, the best books for the library are encyclopedias, for in them is the gist of all knowledge, so far as may generally be required, within the scope of the different ones. Besides, the information they contain is more accessible, even to one unaccustomed to consulting books.

One is more apt to use his books if he has a neat little case in which to keep them. Books are often neglected because they are scattered around and difficult to find.

Lice, parasitic insects, especially those which infest mammals. They have a sucking mouth, and do not undergo any metamorphosis in their development. The presence of lice, especially on the human head, is generally considered indicative of a want of cleanly habits, although they are occasionally found in the heads of children of exceptional cleanliness, being transmitted from other children in the school-room, or on the play-ground.

TO DESTROY VERMIN IN CHILDREN'S HEADS. Take 1 ounce each vinegar and stavesacre, ½ ounce each honey and sulphur and 2 ounces of sweet oil. Make into a liniment, and rub the head with it. Insects are immediately suffocated by benzine. Those sometimes found in the heads of human beings are destroyed by it at once, without any inconvenient result being perceived. It has been employed very sucessfully in banishing the insects which infest domestic animals. The use of stavesacre for the destruction of the insects infesting the human head is a time-honored application among country people, beds of the plant being cultivated frequently for the express pur-

FIG. 1.—*Head Louse.*

pose of furnishing material for the decoction. The efficiency of this remedy seems to depend on the presence of the alkaloid called delphine, which appears to be a poison especially fatal to insects.

Body Vermin, or Body Lice. These are a little broader than the common head louse, and are so called because they are scattered over the body. Change of clothes and frequent washing of the body will soon rid one of these pests.

Fig. 2.—*Body Louse.*

The Crab Louse confines itself to the genital regions, is still broader in proportions, and it is killed by the use of unguentum, red precipitate, or other mercurial preparation. One should not, when using these remedies, expose himself to "colds" or exhaustive labor.

Lice on domestic animals and on plants are numerous, for the treatment of which see respectively the animal and plant in this work, and the article Insects, pp. 878, 892. A general remedy for all lice everywhere is kerosene, sometimes diluted with water, but it is often more unpleasant or dangerous than necessary; hence we give other and better remedies in specified cases.

Lichen (li′ ken or lich en), a plant of a very low organization which grows on rocks or the bark of trees, where it forms a kind of incrustation, or upon the ground, where it consists of irregular lobes parallel with the earth's surface. Occasionally, in all situations, it divides into branches. The several species of lichen abound in the cold and temperate parts of the world. The reindeer moss is one species, and constitutes an article of food for the reindeer; and Iceland moss, when deprived of its bitterness by soaking in alkali and boiled, is an article of diet sometimes recommended to invalids. Other species of lichen are used in tonic medicines and in dyes. All the species abound in starch.

Licorice, or **Liquorice** (lik′o-ris), a plant of southern Europe, having a root of sweet and pleasant taste, mucilaginous and slightly bitter and aromatic. Some species grow in northern Africa and western Asia, and one in this country. A species of bedstraw (*Galium circæzans*), has a definite licorice taste in its leaves, and is common throughout the United States. It is sometimes called licorice root. The medicinal herb from the old country is used chiefly as a demulcent in catarrh and expectorant in coughs. It is best in the form of a decoction. The root of the apothecary shops is sold in long pieces. The best are those which have the brightest yellow color internally and are not worm-eaten or decayed. Many confections are flavored with licorice, as with horehound.

Light. There are different theories as to what light really is, but the one prevailing at the present day among scientists is the theory of molecular motion, or that luminous bodies have the property of causing vibrations or undulations in an ethereal fluid that fills all space, and thus an effect is produced upon the eye analogous to that on the ear in sound, which is known to be the result of invisible undulations or waves formed in the air by sonorous bodies.

Sunlight. As nearly all organisms (plants and animals) have come into existence and attained their present degree of development under the direct influence of sunlight, they are consequently dependent upon the same influence for their highest perfection and welfare. This law of nature is often overlooked by the husbandman, as well as by all other persons, and many trees, shrubs, plants, domestic animals, and especially human beings are avoidably left to suffer too much shade. Excepting mushrooms and possibly one or two other crude and unimportant species, the more sunlight all our plants have the better they are for all purposes; and the more our residences, both inside and out, are exposed to sunlight, the more healthful they are. Sunlight purifies the air, invigorates the cells, strengthens the nerves, cheers up the spirits, toughens the skin and builds up every organ.

Artificial Light. Artificial light is probably as ancient as the human race or the use of fire; but the means employed to produce it among savage tribes have scarcely advanced beyond burning branches of trees or splinters of wood. Torches were probably an improvement upon these; and lamps, even of the simplest kind, display a great advance in refinement, requiring a combination of contrivances, such as the preparation of oil, a vessel to hold it, and a proper substance for the wick.

It is not a little remarkable that the ancient nations, who evinced such skill and taste in several of the elegant arts, should have made no improvement in the simplest kind of lamp, except that of its form. Although antique lamps have been found in Herculaneum, Pompeii, and other places, of almost infinite variety, made of baked clay or of bronze, from the most simple forms to those of the most studied description, exhibiting a surprising variety of designs, and admirable for the beauty of their workmanship, yet the principle of the lamp scarcely varies from what must have been the original contrivance—an open vessel, with a wick laid in the oil. The light which these supplied must have been weak and unsteady; and, as there were no means for destroying the smoke, this must have been annoying in closed apartments when the oil was bad. The lamp was sometimes suspended, and occasionally was placed upon that elegant piece of furniture, the candelabrum, or stand, of which some of the most beautiful forms in marble and bronze are still preserved.

Simple as is the contrivance of candles, they do not appear to have been generally known to the ancients, who continued long to make use of the lamp only. We read, however, of a species of candles sometimes used among the Romans, made of strings of papyrus, or rushes, dipped in pitch and surrounded with wax. Wax and tallow candles were, according to Pliny, likewise occasionally employed in religious offices.

Torches and flambeaux were used at all times; and in the early part of the modern period we find that at great entertainments, halls were lighted up, not only with lamps, but with flambeaux held in the hands of domestics kept for the purpose. In the twelfth century, candles of wax and chandeliers were generally seen in churches; and, as refinement increased, they came gradually into use among the nobility and wealthy all over Europe, as did those of tallow among the middle classes. The discovery of Argand, by which the smoke of lamps was destroyed, produced a new era in artificial illumination; and these implements, which had long been laid aside in the best apartments, were again introduced.

Various modifications and inventions have later been made in lamps, especially since the introduction of kerosene in our own country. This of course caused a radical change in the modes of using artificial light. Likewise did the introduction of gas, which is largely used in cities. At the present day kerosene is more generally used throughout the country than any other substance for producing artificial light. Electric light is being used in the cities, and it will doubtless soon be found the cheapest and best light in every establishment which runs a steam engine at night for other purposes at the same time. As soon as a cheap chemical battery can be invented that will be effectual, electric light will be the cheapest form of illumination even for all ordinary dwellings.

Lightning. Lightning, the result of electricity accumulated in the clouds, is due to evaporation from the surface of the earth, to chemical variations in the air and on the earth, and probably to friction between currents of passing air differing in temperature. Zigzag lightning is caused by the spark leaping from one conducting point to another,—either of moisture of the opposite electricity. If the space through which the flash passes is small, this does not occur. Sheet lightning is the effect seen when the flash itself is invisible, and we only perceive the glare of its light upon the clouds. Lightning also assumes other forms which are less common, including that of a globe, and what is called the brush form. Air being a non-conductor of electricity, the electricity consequently becomes visible in the flash; if it were not a non-conductor it would neither be seen nor heard. The flash of lightning is instantaneous, but thunder usually continues for some seconds, and often a half a minute. This results from the comparatively slow progress of sound, four and a half seconds being required for it to travel a mile; and when the flash is several miles in length, the sound is a half minute or more in coming from the remote portions of the flash. The distance of a thunder-storm from the spectator may be nearly determined by counting the seconds between the flash and thunder, and allowing about four and a half seconds to the mile, or thirteen miles for a minute. It is well known that when the electric current passes through the body of a man, or a beast, the animal fluids being excellent conductors, its action upon the nerve is so violent that life is either endangered or at once destroyed. For this reason any person out in a storm of lightning ought to shun the path of the electric fluid, and be cautious to avoid certain objects by which it might be attracted or discharged. It is well known that trees should be avoided on such occasions, but it is not so well known why, and consequently many people ignore all precautions in connection with that fact. Attracted by the tree, the electric fluid will run down it through the sap under the outer bark, the sap being a conductor of electricity; but if a better conductor be near enough, such as the human fluids would be, the lightning will leave the tree and pass into the body of the unfortunate who chanced to have sought that shelter. For the same reason it is dangerous to be near water during a thunder-storm, water being so good a conductor that the lightning might take his body on its way to reach it. To lean against a wall at such a time is also dangerous, because the fluid will run down a wall to reach the man because he is the better conductor of electricity. Bell-wire being an excellent conductor, it has sometimes been found a source of danger from lightning to those who pull it. For the same reason all substances which act as conductors of electricity should be avoided during a thunder-storm,—putting up an iron shutter-bar, the exposure on the person of metal chains, keys, brooches, etc. When wet a person is in less danger from the lightning than when dry. The lightning-rods or conductors set up serve, by their height, to discharge the lightning, and at the same time the metal conducts it harmlessly away.

The relative value of different metals as conductors of electricity may be expressed in the following figures: Lead, 1; iron, 2.6; zinc, 4; copper, 12. One lightning conductor to a building of average extent is found to afford sufficient protection. Couductors defective in the principles of their construction have often been found rather to increase the danger than to diminish it. If the rod is not sufficiently thick to conduct the whole of the electric current to the earth, its metal becomes fused, and the building injured. Lightning turns milk sour by disturbing its electrical condition, and effecting its decomposition.

There is no doubt that the safest place for shelter during a thunder-storm is the interior of a dwelling-house or other enclosed building, at a distance from windows and street-doors; and in a cellar, perhaps, for choice, not only is the chance of being struck infinitely less, but the risk of serious injury is also much diminished. The popular objection to take shelter under a tree in a storm we have shown to be well founded, especially if the tree be isolated. A low tree, or a hedge with several high trees in its proximity, is less objectionable, as the lightning will generally be attracted by preference to the most prominent objects. Trees standing near taller ones are seldom struck. The electric cloud coming within the attraction of a mass of trees, probably discharges itself insensibly through the innumerable points of foliage. A wood, therefore, is not an unsafe

place, though even there it may be well to keep away from a tree which is higher than its neighbors. Many persons have been killed while standing under a hay or corn rick; these, therefore, should be avoided. From their dryness they are worse conductors than the human body, so that the current passes from them to the latter, as the readiest channel by which it can reach the ground. But is it safer to remain in the middle of a large open space? This is a doubtful question; for a man in the erect position, though less prominent than a tree, still offers a dangerous point of attraction when no other object is near, and, if struck, the whole force of the stroke will pass through his body, entering probably by his head; whereas under the tree the current is likely to be divided and split up, so that though the chance of being struck may perhaps be greater, the risk of fatal injury is considerably less.

It appears to be pretty generally agreed that the safest plan, supposing shelter within a house to be unattainable, is to remain near some prominent object, such as a tree, but on the side opposite to that from which the storm is proceeding, and at a distance sufficient (say twenty or thirty yards) to avoid the risk of the electricity being attracted from the tree to the person. Under any circumstances the recumbent is undoubtedly safer than the erect position, elevated and prominent situations being of course carefully avoided. Additional security may also be obtained by depositing watch and chain, money, or other metallic substances which attract electricity, at a safe distance. Wet clothes are not without a compensating advantage; they are all the better conductors of electricity, and, if they do not convey safely the whole of the current, they will transmit a much larger proportion of it, so that there will be all the less risk of personal injury. A gun is a very unsafe companion; nothing could well be worse than to walk about in a thunder-storm with a gun over the shoulder. Neither is it wise to walk along an exposed road under an umbrella, especially one with metallic stem and frame-work.

It is a common opinion that a barn full of fresh hay is more liable to be struck than other buildings, on account of the column of vapor passing upwards from the hay. It has even been asserted by high authority that an ice-house is peculiarly liable to be struck, because the evaporation from the melting ice forms a partial conductor. A little reflection will show the fallacy of these opinions. There is not so much vapor passing off from nearly dry hay as from an equal surface of moist earth over all parts of the farm; and the cold moisture in an ice-house would not furnish a larger amount of vapor than a warm surface of earth.

When a person has been struck by lightning and is apparently dead, the treatment for restoration should be as follows: Dash cold water repeatedly over the whole body, including face and head, continuing to pour it on the latter for some time, letting it run down over the body. Should the patient not revive in a few moments, dig a hole in the ground, remove all clothing and place him in it in a half recumbent position, and cover the body, all except the face, with fresh earth. The moment there is indication of life and the eyes begin to move, shade the face, and when he breathes freely, place him in a light and airy room, and wash the body with cold water. Or, if this cannot be done, apply friction to the spine with strong liniments and mustard poultices to the feet, using the water as above indicated.

Lightning-rod, a metallic bar by which an unusual amount of atmospheric electricity in the vicinity of a building may be safely conducted to the earth and dissipated in it. Few questions perhaps have been more puzzling to the farmer than that of lightning-rods. A farmer who has erected a fine residence, or has a good barn well stored with grain and filled with valuable stock, has fears lest either may be struck by lightning and consumed by fire, and yet from the varying and contradicting reports of the value of rods, he really knows not whether his buildings are safer with than without. Then "the absolute worthlessness, and even danger," of rods made by different companies are shown by the glib agents of other companies, until the farmer, who really is anxious to protect his property and family, and willing to expend the necessary amount for lightning-rods, is so bewildered and unsettled that he knows not what to do. In this article we shall discuss in the simplest way all the practical features of this perplexing question; nor shall we do this in the interests of any lightning-rod company, or, indeed, any one but the farmer. When besieged by agents of such companies who show up such glowing records for various rods or "insulators," let him ponder over the facts herein stated and judge of its merits from such basis and not by what the agent may say. In the article on Swindle we show up the manner in which many agents dispose of their rods, and what gross impositions they practice upon the farmers.

As to whether lightning rods are really beneficial in protecting buildings from lightning, we can confidently say, that, if properly made, they will afford protection; but if improperly constructed, will do no good and may be a positive harm. In support of the former statement we may refer to the following as well-known examples: The monument in London, which is over 200 feet high, and has stood two centuries, has never been struck by lightning, which has often fallen on the lower buildings around it. The metal connections which unite the different parts of the monument, afford a free passage for the electric fluid to the moist earth below; the other buildings have no such connections. A church in Carinthia, standing on a hill, was struck on an average five times a year, and in one instance several times a day. It was deemed unsafe to celebrate service within its walls. A lightning-rod was then placed upon it, after which it was struck but once in five years, and in this instance no harm was done, the stroke falling on the metallic point without damage. The church of St Michael, in

Charlestown, Mass., was frequently damaged by lightning, but after the erection of a rod it had escaped for fourteen years. St. Mark's steeple, in Venice, 340 feet high, was often struck until protected by a rod, after which it escaped. The celebrated Strasbourg cathedral was struck three times within a quarter of an hour in 1833, causing damages which required millions to repair. In the year 1835 lightning conductors were erected, since which no harm has occurred. The cathedral at Geneva, the most conspicuous and highest in the city, has entirely escaped for centuries, while another tower much lower has been frequently injured. The great central tower of the cathedral is built entirely of wood, but covered with metallic plates, which are connected with the roof of metal, and this, through the rain pipes, with iron drain pipes imbedded in the earth.

To substantiate the latter assertion, it is well known that many buildings have been struck with lightning, although furnished with rods, and in some cases destructive conflagrations have been the consequence; but in all these instances, where an examination has been made, obvious and glaring defects have been discovered in their construction. It has been estimated that more than half the lightning-rods now in use throughout the United States are of little or no value, and some may be even positively detrimental; probably not one in ten proves as safe and efficient as it might easily be made.

It having been decided that a good rod, properly put up, is a benefit, and that a bad one may be harmful, the next questions arising are: What are good rods? and how should they be put up? A word may be necessary as to what a lightning-rod should do, and the relative values of the different metals as to their powers as conductors.

Clouds charged with electricity are often two or three miles high, or even more; and when this is the case, the lightning rarely or never strikes the earth or the objects at its surface, but the discharges are from one cloud to another. Sometimes, however, their lowest surface may be within half a mile or less. When very near the earth, there is greater danger to buildings, trees and animals. There is no doubt that the moisture in apparently clear air may sometimes contain much electricity, but less than dense clouds. Buildings and trees, although they are imperfect conductors, may be sufficiently so as to invite the discharges of lightning in their downward course, but not enough to afford a perfect passage, and hence they may be torn or shivered to pieces, or set on fire. The object of lightning-rods is to provide a safe and complete passage for the discharge by using metal, which is thousands of times a better conductor than moist wood, stone or brick.

As to what are the essential features of a good rod, the following observations may be made. The conducting power of a metallic bar of a given length and of uniform size is proportional to its cross section. Thus an iron bar two inches square will conduct electricity as well as a copper bar one inch square, because it has four times the sectional area. By increasing the diameter of the bar of a poor conductor, we may make it equal in conducting power to a bar of better conducting material but of smaller size. While copper has four times the conducting power of iron, it costs much more than four times as much as iron. Iron is found in the market in the form of long bars, well suited for use as lightning-rods, while copper has to be specially manufactured for such use, whereby its cost is still more increased because a material which is manufactured for a special use costs more than the same material manufactured for general use. Bar iron will cost from 3½ to 4 cents a pound, while bar copper will cost about 50 cents. With ordinary bar iron we may therefore obtain the same amount of conduction at far less cash cost than we can with copper. Another point in favor of iron is that it is so difficult to melt, the melting point of iron being more than 1,200° above the melting point of copper. A lightning-rod should not melt or become red hot by any stroke of lightning which may fall upon it.

There are a large number of different rods made and sold through the country, many of which seemingly were constructed by parties who absolutely knew nothing about electricity or its conductors. There are rods made of fine copper wires and coarse zinced iron wires twisted together. Then there are wires made by twisting together three or four wires of tin. Tin is comparatively a poor conductor, and melts at a very low temperature. Some rods are made of copper tubing, or twisted copper wire, or of iron fluted and twisted into a spiral, some galvanized and others not. There are other styles and of all shapes imaginable. There are some special advantages claimed for each, for which the farmer must pay a good, round price. The rod, as recommended by some of the best scientists in the world as the best, and it is certainly the cheapest, is a solid round bar of iron, not less than three-fourths of an inch in diameter. There is no danger of such a rod melting, and it will safely conduct any flash of lightning to the ground. Such a rod, which may be put up by any farmer if he will observe the principles laid down in this article, will conduct the electric current many thousand times better than the common materials of which houses and barns are built, and the current will take this metallic course in preference to the building. If the rod is high enough above the building, so that any discharge may find it before reaching the building, it will be carried safely downward, provided there is no break or interruption in the rod, and provided it reaches a permanent conductor at the bottom, to convey the discharge into the earth.

These then are the three essential parts: 1. Height above the building. 2. Continuity throughout. 3. Connection at the bottom with permanently moist earth or water.

1. If the rod is not high enough, there will be danger that the lightning may strike the chimney the soot of which is a conductor, or it may strike,

other elevated portions. As a general rule, the top of the rod should be at least as much above the roof as half the length of the roof from the rod. In other words, a rod will commonly protect a horizontal space the diameter of which is four times as great as the height of the rod above it, if the rod stands in the middle; or twice as great, if the rod is at one end. If the rod is attached to a chimney nearly at the center of the roof, it must be half as high as the distance between the chimney and the farther end of the building. Sometimes it may be more convenient to place the rod at one end, a more direct connection being thus obtained with the earth. In this case the rod must be twice as high as when placed at the center. Probably a still better way would be to place a rod at each end, and secure a direct communication with the earth at both ends. Or, if the two are well connected by a metal bar on the roof, this arrangement will be nearly as good.

2. The importance of a continuous rod is self-evident; for if made up of several parts or sections, and one is displaced, the rod would do more harm than good, by inviting the discharge without conveying it from the building. Paint the rod, and especially all the joints, to keep it from rusting.

3. For the same reason, a sufficient earth terminal is absolutely essential, to convey the discharge away from the building. If defective in this particular, no rod, however perfect in all other respects, can be of any use, but would be a source of danger. Nearly all the cases of failure in conductors are doubtless from this cause. They afford a partial passage for the discharge, or convey it into the building. In this way buildings have been crushed, torn, and set on fire by the lightning, and water and gas pipes torn up and melted at the joints.

Water and moist earth are conductors, while perfectly dry earth has scarcely any conducting power at all. The rod must therefore penetrate the ground deep enough to reach permanently moist earth. In most localities a depth of six or eight feet will be enough, if branching in various directions at the bottom, so as to dissipate the electric discharge. The rod may have a terminus in a well if convenient, but never put into a cistern. The water, however, will rust the iron, and therefore damage it in time. If put into a cistern it might go dry and then the connection would be worthless; or if the cistern was surrounded with dry earth the escape of the discharge would be nearly prevented. If the rod is put in the ground fill the hole around it with powdered charcoal, it being a better conductor than the soil, is slower to dry when wet and prevents the rod from rusting.

For most buildings it is best to weld the different pieces together, which makes the rod stiffer, and less liable to become separated into parts than if simply screwed together, or connected by staples or links. Any owner of a building who is about to erect a rod should measure with a cord or tape-line the distance from the top of the house to the ground where the rod is to pass, and then add to its length eight or ten feet for the portion beneath the surface; and also for the height above the building one-quarter or more of the length of the roof if the rod is placed at the center, or one-half the length if placed at one end. The pieces of rod sufficient for this length may be easily welded together by a blacksmith, and it may then be taken home by fastening the pointed end to a wagon and dragging the length on the ground. Two or three men can then erect it and place it in position on the building. Spike or clamp the rod securely against the side of the building. If you have a good rod it is unnecessary to have it insulated from the building. The ordinary glass collars, three-quarters of an inch thick, will certainly not prevent a stroke of lightning leaving the rod and striking the house, when it can penetrate a mile of air (the very best of insulators), shiver vast oaks, and split rocks into fragments. Faraday, the greatest electrician the world has ever known, says upon this subject:

"Some persons conceived that it is desirable to insulate the conductor from the wall of a building by glass; but all such contrivances are absurd, since the distance to which the metal could be removed from the wall by the interposed insulation was altogether insignificant compared with the distance through which the lightning must pass in a discharge from the clouds to the earth."

The rod should be brought in connection with the eave troughs, or any other metallic substance, so that any electricity they may draw will be conveyed to the ground.

As to the point, much is said by lightning-rod men, and many different kinds are made. Most of those sold through the country are made of platinum, because of its infusibility. As a matter of fact, however, it is not as good as copper, for the latter has more than seven times the conducting power for electricity that platinum has, and, further, having but one-seventh the conducting power of copper it would under the same circumstances be heated seven times hotter by a flash of electricity, and a flash that would heat a copper wire to its melting point (1,996° Fah.), would heat a platinum wire of the same size 13,072° Fah.,—a temperature greatly in excess of the melting of platinum. Of the two metals, therefore, platinum would be in greater danger of being melted by a flash of lightning than copper. For this reason and because it is cheaper, a point made of copper with its surface nickel-plated or gilded, is preferable. This, made of solid copper, conical shape, two inches in height and one inch in diameter at the base, will be all that is required.

High-priced and patented lightning-rods have been made with various points and angles, wings, corrugations and spiral coils, with the claim that the angles and points would draw the electric fluid and increase the safety, when in fact they would equally tend to discharge it from those points into the building. None of these patents are better in any respect than the simple round rod described above. If square or

flat bars are used, instead of round bars (and they will also answer a good purpose), they may be screwed to the sides of the building in the same way, by means of staples and screws. This mode answers well when the building is partly made of iron.

Employing a common lightning-rod agent or vender is one of the many errors commonly committed. Most of them, knowing little of the science, erect imperfect rods, with many needless appendages, at a cost to the owner of seveial times that of a good, simple rod. To make one which shall be both cheap and efficient, every owner should construct and put up his own, according to established principles.

The owners of all buildings on which rods have stood many years should occasionally examine them, to see that the earth terminals have not become unsafe by rusting away.

See Lightning.

Lilac, a well-known and popular ornamental shrub, putting forth its fragrant, purplish flowers early in spring. It is quite hardy in the Northern States and easy of cultivation. A rarer species has white flowers. A Parisian kind is more profuse in flowering, and has been used for ornamental hedges, as it bears shearing tolerably well. The peculiar and beautiful color of the flowers of the common kind has given name to the color called "lilac."

Lilium candidum.

Lily, one of the most popular flowering plants, the most of which bear very large and gorgeous flowers.

To keep posted in the new varieties from year to year one must consult florists' catalogues. The lily is handsome in all its stages of growth, and not a little graceful when completing its height and swelling its flower buds; and after it bursts into bloom, its flower is one blaze of color and outshines the most brilliant hings in the garden. There are several genera of lilies, many species and a vast number of varieties.

The Pond Lily.

Lima Bean: see article Bean. A gardener has recently given his experience that he can raise this species of bean better without poling, by keeping the tendrils nipped off. By this means the vines are kept low and bushy and the fruit made to mature earlier than by the usual method. We should judge that the same principle would work as well with the other running varieties.

Lime. This is composed of but two chemical or primary elements, namely, calcium and oxygen. It is a highly acrid, alkaline and caustic earth, more soluble in cold than in hot water; hence boiling precipitates it as a lining on the inside of the vessel. The acids readily unite with lime, forming many of the most useful compounds; as, carbonic acid, combined with lime, forming carbonate of lime, or chalk and marble; sulphuric acid, forming sulphate of lime, or gypsum; phosphoric acid, forming phosphate of lime; nitric acid, forming nitrate of lime, etc. Water poured upon quicklime, combines with it and forms the hydrate of lime. The process, as is familiar to everyone, is attended with considerable heat. Chlorine combines with this base, forming the celebrated disinfectant chloride of lime. "Milk of lime" is simply water and lime mixed together so as to have the appearance and consistency of milk. The various salts of lime (phospate, sulphate and carbonate) constitute the mineral or solid elements of bone; and lime in nearly all its forms enters largely into various medical compounds. Pure lime diluted in water is a popular remedy for certain forms of dyspepsia. Of course, lime, in its various combinations, is an essential constituent in all vegetable products; and it is from vegetable sources alone that herbivorous animals obtain all the limy (calcareous) elements of their bones and tissues.

Lime dust is one of the most popular remedies against insects of almost all kinds. The following is the best method of applying it to destroy slugs, mildew, etc.: To a peck of fresh lime, broken up into small pieces, add four pounds of flowers of sulphur, and just boiling water enough to slake the lime to a

dry powder, covering the vessel as soon as the water is poured on. When needed for use, mix water with it sufficiently to make a whitewash, and apply to trees, cellar walls, etc., with a whitewash brush.

Limitation, Statutes of. By this term is meant a certain period limited by statute, after which a claimant cannot enforce his claim by suit at law. No such limit exists in moral law, where a debt is due until it is paid, no matter how long it runs. Time begins to run with the date of the instrument, or promise upon which the claim is based. Limitations are fixed by State law, and they vary in the several States, as, with reference to the most common causes, are given in the following table:

LIMITATIONS OF ACTIONS.

STATES AND TERRITORIES.	Assault, Slander, Replevin, etc. Years	Open Accounts. Years.	Notes. Years.	Judgments. Years.	Sealed and Witnessed Papers. Years.
Alabama	1	3	6	20	10
Arkansas	1	3	5	10	10
California	3	2	4	5	5
Colorado	1	2	[illegible]	3	3
Connecticut	1	6	6	6	17
Dakota	2	6	6	20	20
Delaware	1	3	6	20	20
District of Columbia	1	3	3	12	12
Florida	2	5	5	20	20
Georgia	1	4	6	7	20
Idaho	3	2	4	5	5
Illinois	1	5	10	20	10
Indiana	2	6	20	20	20
Iowa	2	5	10	20	10
Kansas	1	3	5	5	15
Kentucky	1	5	5	15	15
Louisiana	1	3	5	10	20
Maine	2	[illegible]	20	20	20
Maryland	3	3	3	12	12
Massachusetts	2	6	20	20	20
Michigan	2	6	6	10	10
Minnesota	2	6	6	10	20
Mississippi	1	3	6	7	7
Missouri	1	4	5	5	10
Montana	2	2	4	5	4
Nebraska	2	6	20	20	10
Nevada	2,6	[illegible]	20	20	20
New Hampshire	1	–	—	10	10
New Jersey	2	6	5	20	20
New Mexico	1	3	10	10	10
New York	1	[illegible]	15	15	15
North Carolina	1	3	10	10	10
Ohio	1	6	15	15	15
Ontario (Upper Canada)	1	5	5	30	30
Oregon	2	1	6	10	20
Pennsylvania	1	6	6	20	20
Quebec (Lower Canada)	1,2	5	5	30	30
Rhode Island	1	6	6	20	20
South Carolina	2	6	6	20	20
Tennessee	1	6	6	20	—
Texas	1	2	4	10	10
Utah	1	2	4	5	7
Vermont	2	6	14	8	8
Virginia	5	5	5	10	20
Washington Territory	2	3	6	9	20
West Virginia	5	5	6	10	10
Wisconsin	2	6	6	20	20
Wyoming	1	6	15	10	21

Lin, Linden, etc., a name of the basswood tree. See page 512.

Linch-pin, a pin inserted through a hole in the end of a bolt to hold a wheel or other parts of machinery from slipping off.

Lincoln, a variety of sheep. See Sheep.

Linen. The cloth so named, from the Latin *linum* (flax), is the principal fabric manufactured from flax. The fineness of linen is determined by the relative length of yarn in a given weight, and also by the number of threads of warp contained in a certain space of the reed in weaving, to which the threads of weft in a similar space must bear a fixed and regular proportion. In judging of linen of whatever fineness and price, particular attention should be paid to the evenness of the threads, and also to the firmness and closeness of the texture. The color should be very white, and the surface glossy; but this gloss should be principally, if not wholly, the effect of the calender employed in finishing the cloth. Many inferior fabrics are rendered marketable by a large proportion of starch, from which they receive not only a fine gloss, but also a factitious hardness, or body, as it is termed, qualities which disappear after the first washing; and the cloth, having lost in this ordeal all its vellum-like consistency, becomes, to use a familiar expression "as poor as a rag." Hardness and smoothness, therefore, can never be safely depended upon as a criterion; the eye must be rather closely applied to discern whether these qualities actually proceed from the strength and fineness of the fabric. The threads must not only be even, but must have a certain wire-like roundness; a magnifying glass is very useful to examine the texture of linen by; but the purchaser should be in the habit of using it, otherwise he will be misled. Some linen is sold free, or nearly so, from this dressing, and such is to be preferred. See Laundry, Bleaching and Stains.

Line of Deposit, the average amount kept by one to his credit in the bank. The "line of discount" is the average amount borrowed by him from the bank.

Liniment, a soft ointment, or a medicated and thickened oil designed to be rubbed upon the skin and to act as an anodyne, an emollient or local stimulant, for the relief of deep-seated pains and inflammations. The following are receipts for making some excellent liniments:

COMPOUND SOAP. Take Castile soap, oil sassafras, gum camphor, spirits of hartshorn, and spirits of turpentine, each 1 ounce; alchohol, 2 ounces; mix. A good liniment for swelled glands, inflamed tonsils, sore throat, quinsy, mumps, and inflamed female breasts.

RHEUMATIC. Take alchohol, 4 ounces; gum camphor, oil hemlock, oil cedar, and spirits turpentine, each ½ ounce; mix. Use freely in rheumatism, pains, swollen joints, sprains, etc.

RHEUMATISM OF THE JOINT. Take oil of linseed, oil of cedar, and oil of amber, each, 1 ounce; gum camphor, ½ ounce, dissolve in ½ ounce of sweet oil, by rubbing in a mortar, first adding to the camphor a few drops of alcohol, so as to powder it; spirits of turpentine and laudanum, each, ½ ounce; mix, shake well, apply and rub in well. One of the best rheumatic liniments known.

Nerve. Take oil of sassafras, tincture of Cayenne, spirits of hartshorn, oil of pennyroyal, oil of hemlock and laudanum, each, ½ ounce; mix, shake well, and bottle for use. Useful in all acute pains, as in neuralgia, headache, spasms, toothache, gout, rheumatism, sore throat, inflamed breasts of females, and all nervous pains.

Arnica. Take tincture of arnica, 1 dram; alcohol, 4 ounces; mix, and shake well in the bottle. unequaled for pains in the feet and limbs, from walking; for all fresh and recent sprains, bruises, and contused wounds, and for rheumatism of the joints, and gouty pains.

German Liniment. Take chloroform, olive oil, and aqua ammonia, of each 1 ounce; acetate of morphia, 10 grains. Mix, and use as other liniments. Very valuable.

Stimulating Liniment. Cayenne, 1½ ounces; salt, 1 tablespoon; spirits of wine, 2 ounces; camphor, ½ ounce; spirits of turpentine, ¼ pint. Bottle, and shake now and then during one day. Then add ½ pint of vinegar. It is excellent for sponging the body in cases of pain, debility, inflammation, rheumatism, gout, sore throat, numbness, neuralgia, etc.

Cook's Electro-Magnetic Liniment. Best alcohol, 1 gallon; oil of amber, 8 ounces; gum camphor 8 ounces; Castile soap, shaved fine, 2 ounces; beef gall, 4 ounces; ammonia, 3 F's strong, 12 ounces; mix, and shake occasionally for twelve hours, and it is fit for use. This will be found a strong and valuable liniment, and also cheap. It may be used in swellings, strains, etc., and rubbed upon the throat, breast, and lungs, in asthma, sore throat, etc.

Liniment after Shaving. 1 ounce of lime water, 1 ounce of sweet oil, 1 drop of oil of roses; shake well before using and apply with fore-finger.

Lime Liniment. Linseed or common olive oil and lime-water, equal parts, to be well shaken before using, is good for scrofulous or other sores, and still more for burns or scalds.

Horse Liniment. Common liniment for horse, 4 ounces linseed oil; 2 ounces spirits of turpentine; 1 ounce aqua ammonia. Mix. Good for sprains and bruises.

Another: Creasote, laudanum and olive oil, equal parts. This is excellent for sprains.

Another: 1 pint vinegar; 1 drachm nitric acid; 1 ounce oil turpentine; 1 drachm oil sassafras; shake well before using, excellent for grease heels, scratches or any external application where a liniment is required.

Another: Take spirits of turpentine and dissolve as much gum camphor as it will take. This will be found good to remove calluses.

Link, a ring, generally elongated, several of which compose a chain; a short wire or small rod, a number of which constitute a chain, as in the "surveyor's chain." In surveying, a link is 7.92 inches, being the 1-100th part of a four-rod chain.

Linseed, flaxseed. Ground flaxseed makes the best poultice, as it is less irritable and retains its moisture better than most articles used for that purpose.

Linseed oil is pressed out of ground flaxseed by a powerful hydraulic press, and is almost the only oil used in mixing paints. The fresher it is the better it will dry. It is a good and safe purgative for the horse, and should be given by farmers and non-professional persons in preference to any other article. The English veterinary surgeons use linseed oil for colic in the horse in the following combination: Linseed oil, one pint and two ounces each of oil of turpentine and laudanum. In cases of choking in either horses or cattle, a half pint of linseed oil should be poured down the throat, so that by its emollient properties the substance may pass readily down the gullet. For horses, one or two pints is the dose used for a purgative. For scalds and burns, linseed oil is mixed with lime water.

Cake Meal. That portion which is kept after the oil has been expressed from the seed, is a good feed for horses and cows, given occasionally.

Linsey-Woolsey, a coarse fabric made of thread for warp and its woof worsted, generally one blue and the other white, or mixed with red

Lint, flax; linen raveled, or scraped into a soft substance, and used for dressing wounds and sores.

Lintel, a horizontal piece of timber or stone placed over a door, window, or other opening: a head-piece.

Lipped and Harled, built without mortar, but afterward having the joints filled with mortar, and the whole rough-cast or harled. Said of walls.

Liquidate, to finally settle the affairs of a commercial house; to pay a debt.

List, among other meanings, signifies the outer edge or selvedge of cloth; a strip of cloth forming the border, particularly of broadcloth and serving to strengthen it; a strip of cloth; a fillet. List carpet is the finest sort of rag carpet.

Literature, or **Letters**, learning; in its widest sense it embraces all composition except that which relates to the positive sciences, as mathematics, mechanics, etc.; but it is usually confined to works of taste, sentiment, poetry, history, etc., in which expression itself becomes an art. What we have to say under this head, appropriate to this work, will be found under the heads of Book, Education, Library, etc.

Lithotomy, the operation of cutting into the bladder for the removal of urinary calculi. For the operation on the horse, see page 747.

Live Paper, paper (of obligation) which has not matured. Over-due or protested paper is termed "dead."

Liver, the chief blood-depurating organ of the body, situated around and behind the stomach. It is of a brownish-red color, lobed, unsymmetrical in

form, and heavy. In it is situated the gall (or bile) bladder and duct, the contents of which are derived from the impurities of the blood, taken out by the liver. This large organ is subject to several diseases, as follows:

CONGESTION. This is known by a sense of weight and a moderate pain in the right side, both in front and under the right shoulder blade, constipation and lead-colored stools, nausea, furred tongue, bitter taste in the mouth, a yellowish skin and white of the eye, and headache or dizziness. In the chronic form these symptoms are not so prominent, are not constant, but are fixed. In the early stages the regular profession recommend blue mass at bed-time, two or three grains at a dose, for two or three nights. Keep the bowels open. Others recommend extract of dandelion, in pills, one grain of leptandrin to each pill, one pill to be taken every night. For the advanced stages, give three or four drops, twice or thrice daily, of nitro-muriatic acid. The "Hygienic" system urges the importance of sweating baths, chest compress, friction, passive exercise and abstinence from condiments and doubtful articles of food and drink.

INFLAMMATION. The symptoms of this affection scarcely differ from those of congestion. The pain in the side is greater, there is fever, and sometimes vomiting and diarrhœa. Avoid mercurials. Take saline cathartics, rest in bed, vegetable diet and cooling drinks, as lemonade without sugar.

JAUNDICE: see page 879.

FATTY DEGENERATION. The liver is enlarged, the pain is not severe, there is oppression of breathing, etc., but the evidences of this particular affection are too obscure, even for a skilled physician. Preventive hygiene is the only resort for mitigation of the malady, which is indeed incurable.

Other diseases of the liver are waxy liver, cancer, syphilitic fever, fungoid growths, etc., which are too difficult of diagnosis and treatment.

Often one has a cough and fears he has incipient bronchitis or consumption, when the whole cause is the pressure of the enlarged liver upon the lungs. When the cough is dry, non-expectorating and not severe, oppression by the liver is probably the only cause.

Live Stock: see Stock.

Loam, a soil chiefly composed of silicious sand, clay, chalk, lime and a little oxide of iron, magnesia and various salts, and also decayed vegetable and animal matter, giving proportionate fertility. It is the standard soil for the purposes of cultivation. See Soil.

Loan, money lent. Some persons loosely use this word in the sense of "borrow," and thus unnecessarily obscure their meaning. "Lend" and "borrow" are words of definite signification, which all persons clearly understand.

Lobelia, or **Indian Tobacco.** This is an annual or biennial plant, native throughout the United States, and contains most valuable medicinal properties. It is emetic and stimulating, and from its action on the great sympathetic nerve, its effect is felt throughout the whole system. It exerts a peculiar action upon the trachea and bronchial vessels, expelling all collected mucus. It must, therefore, be very valuable in asthma, croup, whooping-cough and consumption. The greatest benefit from it has been found in dyspepsia, coughs, asthma, liver complaints, etc. It has relieved asthmatic subjects when on the point of suffocation by accumulated phlegm, cough, etc; also in pneumonia of infants.

Lobscouse, a hash of meat with vegetables of various kinds; an olio.

Lobster, a large crustacean, of the appearance of a common crawfish. It is of a greenish color, but when boiled becomes a bright scarlet red. They are used as a fancy article of diet to a small extent in the cities.

Lock-jaw, or **Locked-jaw,** a violent contraction of the muscles of the body, but particularly of the jaw, by which its motion is suspended; a variety of tetanus. It is generally caused by intense pain in the extremities, as when a nail is run into the foot. Narcotic poisons sometimes produce it. Occasionally lock-jaw makes its appearance suddenly, shortly after the injury has been received, but generally comes on gradually, beginning with a slight stiffness in the back part of the neck, which soon increases so as to render it difficult and painful to move the head. Soon there will be pain at the root of the tongue, tightness across the chest and pain shooting through the back. The muscles of the jaw then become stiff and soon locked so tightly that it is impossible to open the mouth. There may or may not be contraction or stiffness in the limbs and other parts of the body.

Prevention. Forthwith bind on a wound in the bottom of the foot or palm of the hand a rind of salt pork. If the part swell, bathe it in strong wormwood tea, and bind on another pork rind; rest till healed. Or, soak the limb well in warm lye, and apply a hot Indian-meal poultice, wet with lye. Renew it when cold.

Treatment. Sweating is of the first importance in this complaint. As soon as the symptoms are sufficiently strong to indicate the disease, get the patient under the influence of lobelia as soon as possible. This will relax the muscles. Give tinctures of lobelia and Cayenne, in tablespoonful doses, two parts of the former and one of the latter. If the jaws are so set that they cannot be opened, pour the mixture down by the side of the teeth, and close the lips. If it finds its way into the mouth and throat it will relax the muscles. Repeat the dose until relaxation is effected. Should the case be very severe and serious, give also injections of lobelia, Cayenne and laudanum.

Lock-jaw in cattle: see page 231; and in horse, page 789.

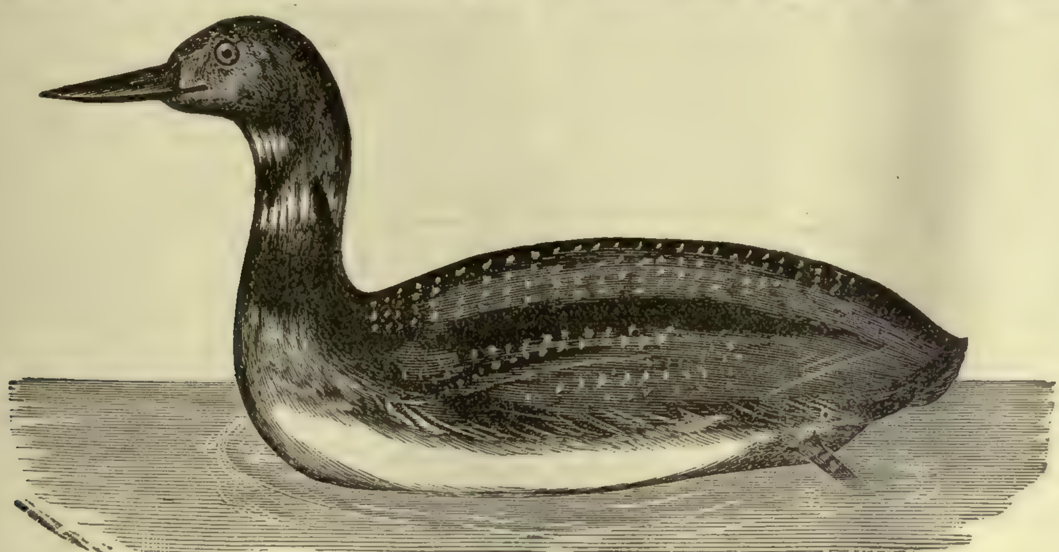
Locust, a well-known insect, usually termed the

"grasshopper." See page 860. Also, a tree, of which there are two species,—the Common and the Honey Locust. The Common does well as an ornamental or shade tree in most parts of the United States; but in the prairies of the Northwest the wind and the locust borer injure it and render it very unsightly. The Honey Locust is a native of the central portion of the United States, and does well for hedge-fencing in Wisconsin and Minnesota, possibly better than the Osage orange.

Logs, To Measure: see Lumber.

Logwood, a small leguminous tree of Central America, the wood of which is extensively used in dyeing, producing a deep red color that becomes dark by exposure. It has a slight peculiar odor and sweet but somewhat astringent taste. Medicinally it is a mild astringent and styptic, antiseptic, being very valuable in diarrhœa, dysentery, foul ulcers and wounds, etc. It is sold at the drug stores in the form of chips, is very cheap and convenient to prepare and apply. The extract is a popular form for both dyeing and medical uses. The decoction is made by boiling 2 ounces of chips in 1 pint of water; allow it to stand till cold, then strain through a cloth or a fine sieve; for horses and cows this quantity will make one dose. For calves with scours 1 to 3 ounces will be the dose, which repeat if the case demands it. It is a safe and cheap remedy.

Loon. Frequently the Loon, or Great Northern Diver, is seen in the streams and lakes of some parts of the United States. Its cry at night is wild enough; and at times, when a storm is approaching, becomes absolutely terrifying. So dismal a note is seldom heard in the mountain solitudes. The clanging noise of the wild goose, the harsh croak of the crane or the hooting of the owl are nothing like as wild and weird as the cry of the loon. The bird is about three feet long from the point of its bill to the end of its tail, with a spread of wings of about five feet. The illustration given on this page plainly shows the outline of its body. Its color is brownish black, though the feet are grayish blue. It is unable to walk well on land, its legs being so short, but it is an excellent swimmer and diver, remaining for a long time under water, and swimming rapidly while beneath the surface. When alarmed, it swims very low in the water, not more than an inch of the line of the back with the neck and head being visible. It is almost impossible to shoot these birds, as they dive instantly upon seeing the flash of the gun, and rise to the surface a considerable distance away after a lapse of some time. The bird then keeps turning its head in every direction, watching for danger, and diving again upon the next flash of the gun. When followed by the hunter it does not attempt to fly, but relies upon diving and on its ability to remain under water for its safety. Besides the Great Northern Diver there are two other Loons, named respectively the Black-throated Diver and the Red-throated Diver. Both of these are considerably smaller in size than the first-named, but their habits are similar.



Loon.

Lotion, a medicated liquid for washing or bathing any diseased part of an animal. Lotions are used principally in cutaneous diseases, and in case of external inflammation. But some are anodynes, and contain the same kind of sedative or narcotic principles as anodyne liniments; some are stimulants, and contain principles for rousing indolent tumors or ulcers; and some are refrigerants, and contain either saline principles which reduce the temperature at the moment of their being applied, or spirituous and volatile

substances which occasion cold by their evaporation. Both the sedative ones and the stimulating ones, if wrongly applied, may be dangerous; all the refrigerating ones require to be repeatedly or even frequently applied; and some ordinary ones which quacks prescribe as remedies for many or most cases of external disease, are sometimes very mischievous, and may oftener do harm than good.

Lubricants: see Oils.

Lucern (lu'cern), or **Alfalfa**, a species of clover which thrives on the Western plains and in the Pacific States, and constitutes one of the best forage plants for cattle and swine. In many sections of the West it is more profitable than any other species of forage, as it stands drouth better than other clovers. It wants old, rich and well-drained land, clear of weeds. Prepare the ground thoroughly by plowing and harrowing; sow 10 to 20 pounds of seed to the acre, about the middle of April, for the latitude of Kansas; harrow in lightly, following with the roller, if possible. The plants make a feeble growth the first season. The weeds should be mowed down, running the scythe just over the tops of the alfalfa. After the first season this plant will take care of itself and keep possession of the ground for many years. Its greatest enemy is the common mole, and it should not be too severely pastured by cattle and hogs in late summer and fall. When well established it will yield three or four crops each season. Plowing under a crop of this clover is said to be the best method of reducing the lands of the West.

In the South lucern will yield more provender to the acre than any forage plant in the North, one acre producing enough for five horses a year. Raising forage in this way is far cheaper than to pull blades of corn, and some cheaper even than cutting corn-stalks in the field, all losses considered.

Lucern should be top-dressed every third year with some manure free from the seeds of weeds. Ashes are very suitable for it. The lucern field should be near as possible to the stables, as work-horses, during the spring and summer, should be fed with it in a green or wilted state.

The roots of this plant go down deeper into the earth than those of any other herbaceous plant, and hence brings up more nutritive elements to the surface. It is therefore the best plant in the world for renovating old soils.

Lumber. Under this head we will include sawed and hewn timber in the rough, and the only practical remarks to be made in this connection consist of the best ways of measuring lumber in its various marketable shapes.

Board Measure. Sawed lumber as joists, plank and scantlings are bought and sold by board measure. The unit of this measure is a superficial foot one inch thick, or one foot of lumber is as if it was one foot long, one foot wide and one inch thick. To find the contents of lumber by this measure, multiply the breadth in inches by the thickness in inches, and that by the length in feet and divide the product by 12, and the quotient will be the contents.

Timber Measure. Round, sawed or hewn timber is bought and sold by the cubic foot. Round timber when squared is estimated to lose one-fifth; hence a ton of round timber contains only 40 cubic feet.

To measure round timber, take the girth in inches at both ends, add them, and divide the sum by two for the mean girth. Then multiply the length in feet by the square of one-fourth of the mean girth in inches, divide the product by 144, and the quotient will be the contents in cubic feet.

Example. What are the cubic contents of a round log 16 feet long, 28 inches around at the small end and 44 at the large end? Solution: 28 plus 44 equals 72, which divided by 2 gives 36, the mean girth. The square of one-fourth of this is 81, which multiplied by 16, the length of the log, gives 1296. This divided by 144 gives 9, the cubic feet in the log.

To measure square timber multiply the breadth in inches by the depth in inches, and that by the length in feet, and divide the product by 144, and the quotient will be the contents in cubic feet.

Example. What are the cubic contents of a square log 20 feet long, by 22 inches broad and 18 deep? Solution: 22 multiplied by 18 gives 396, and this by 20, the length in feet, gives 7920, which divided by 144 gives 55, the number of cubic feet.

Spars from 4½ to 10 inches in diameter inclusive, are measured by taking the diameter, clear of bark, at one-third of their length from the large end. Spars are usually bought and sold by the inch diameter; all under four inches are considered poles. Spruce spars of seven inches and less should have five feet in length for every inch in diameter.

For the convenience of those who may have occasion to measure lumber we give the following

Table, showing the Number of Feet, Board Measure, of Joist, Scantling and Timber of given Lengths and Sizes:

Size in Inches.	Length in Feet.									
	12	14	16	18	20	22	24	26	28	30
2x4	8	9	11	12	13	15	16	17	19	20
2x6	12	14	16	18	20	22	24	26	28	30
2x8	16	19	21	24	27	29	32	35	37	40
2x10	20	23	27	30	33	37	40	43	47	50
2x12	24	28	32	36	40	44	48	52	56	60
3x4	12	14	16	18	20	22	24	26	28	30
3x6	18	21	24	27	30	33	36	39	42	45
3x8	24	28	32	36	40	44	48	52	56	60
3x10	30	35	40	45	50	55	60	65	70	75
3x12	36	42	48	54	60	66	72	78	84	90
4x4	16	19	21	24	27	29	32	35	37	40
4x6	24	28	32	36	40	44	48	52	56	60
4x8	32	37	43	48	53	59	64	69	75	80
4x10	40	47	53	60	67	73	80	87	93	100
4x12	48	56	64	72	80	88	96	104	112	120
6x6	36	42	48	54	60	66	72	78	84	90
6x8	48	56	64	72	80	88	96	104	112	120
6x10	60	70	80	90	100	110	120	130	140	150
6x12	72	84	96	108	120	130	144	156	168	180
8x8	64	75	85	96	107	117	128	139	149	160
8x10	80	93	107	120	133	147	160	173	187	200
8x12	96	112	128	144	160	176	192	208	224	240
10x10	100	117	133	150	167	183	200	217	233	250
10x12	120	140	160	180	200	220	240	260	280	300
12x12	144	168	162	216	240	264	288	312	336	360
12x14	168	196	224	252	280	308	336	364	392	420
14x14	196	229	261	294	327	359	392	425	457	490

Lunar Caustic, fused and mold-cast nitrate of silver. It is prepared for the purposes of pharmacy by a series of operations with silver, nitric acid, and distilled water, but may be summarily regarded as nitrate of silver liquefied by heat, and cast in small cylindrical molds. The little cylinders of it are solid and dark grey, and when broken across show a crystallized structure. It is inodorous, and has an intensely bitter, caustic, metallic taste, and gives a black tinge to skin and hair. Lunar caustic is preferable to all other caustics for rubbing over a rabid dog's bite upon horses, and is excelled only by butter of antimony for destroying fungous growths in the wounds and ulcers of horses. It is used for giving a black stain to red or light hair, and is the basis for indelible ink for marking linen.

Lungs. For diseases of the lungs, see Consumption, page 280; in Cattle, pages 226 and 234; in Horses, page 790. For bleeding of the lungs, or spitting blood, take a teaspoonful of dry salt occasionally and bathe the feet in warm water. In very severe cases keep the patient quiet and give powder composed of 1 grain of Cayenne and ½ grain each of opium and ipecac every two or three hours ununtil relief is afforded. Or give one tablespoonful each of vinegar and paregoric in a cup of cold water every half hour. Sponge the chest with cold water and keep the shoulders raised. Do not permit the patient to talk. Hemorrhage of the lungs may be easily distinguished from that of the stomach, the latter of which is less dangerous. Blood from the stomach is much darker in color, more or less mixed with the contents of the stomach, and is vomited up, while the blood from the lungs is thrown up in small quantities by coughing or hawking, is more or less mixed with mucus, and is of a florid color.

Lute, in chemistry, a pasty matter used to fill cracks in vessels, or coat their surfaces from fire. Clay, putty, dough, lime, white of eggs and melted India rubber are variously used for this purpose.

Lye, a fluid saturated with potash or other salts.

Lymph, the fluid of the lymphatic vessels. It is slightly milky, but becomes pink on exposure to air, and divides into a clot and fluid part. It is the surplus nutritious fluid returned from every part of the body to the blood through the thoracic duct.

M

MACARONI, edible paste dried in tubular form, for preservation and the market. It is prepared for the table in various ways. 1. Simmer it in water in which some pepper and allspice tied up in muslin have been previously boiled together, with a piece of butter and some salt. When nearly done, pour off the liquor and let it steam for a while. 2. Boil four ounces of the macaroni in veal broth until tender; drain off the broth and two tablespoonfuls of cream, an ounce of fresh butter, and two tablespoonfuls of grated cheese, with some salt and pepper. Mix well together over the fire for a few minutes, and it is then ready to serve. 3. Macaroni pudding: Pour a pint of cream boiling hot on the crumbs of a penny loaf, or French roll; cut one pound of beef marrow very thin; beat four eggs well; add a glass of brandy, with sugar and nutmeg to taste, and mix all well together. It may be either boiled or baked, 40 or 50 minutes; cut two ounces of citron very thin, and place the slices all over the pudding.

Macaroon (mac-a-roon'), a small cake composed chiefly of almonds and sugar.

Mace, the spicy covering of nutmegs, used in flavoring.

Machinery. The utility of machinery in its application to manufactures consists in the addition which it makes to human power, the economy of human time, and in the conversion of substances apparently worthless into valuable products. The forces derived from wind, from water, and from steam are so many additions to human power.

Experiments have shown that the force necessary to move a stone on the smoothed floor of its quarry is nearly two-thirds of its weight; on a wooden floor, three-fifths; if soaped, one-sixth; upon rollers on the quarry floor, one thirty-second; on wood, one-fortieth. At each increase of knowledge, and on the contrivance of every new tool, human labor is abridged; the man who contrived rollers quintupled his power over brute matter. The next use of machinery is the economy of time, and this is too apparent to require illustration, and may result either from the increase of force or from the improvement in the contrivance of tools, or from both united. Instances of the production of valuable substances from worthless materials are constantly occurring in all the arts; and though this may appear to be merely the consequence of scientific knowledge, yet it is evident that science can not exist, nor could its lessons be made productive by application, without machinery. In the history of every science we find the improvements of its machinery, the invention of instruments, to constitute an important part. The chemist, the astronomer, the physician, the farmer, the painter, the sculptor, is such only by the application of machinery.

Applied science in all its forms, and the fine and useful arts, are the triumph of the mind, indeed, but gained through the instrumentality of machinery.

The difference between a tool and a machine is not capable of a very precise distinction, nor is it necessary, in a popular examination of them, to make any distinction. A tool is usually a more simple machine, and generally used by the hand; a machine is a complex tool, a collection of tools, and frequently put in action by inanimate force. All machines are intended either to produce power, or merely to transmit power and execute work. Of the class of mechanical agents by which motion is transmitted, the lever, the pulley, the wedge, it has been demonstrated that no power is gained by their use, however combined. Whatever force is applied at one part, can only be exerted at some other, diminished by friction and other incidental causes; and whatever is gained in the rapidity of execution is compensated by the necessity of exerting additional force. These two principles should be constantly borne in mind, and teach us to limit our attempts to things which are possible.

Madder, a shrub the roots of which are used in the process of dyeing fabrics. This can sometimes be profitably raised in the Northern States. The soil should be a rich, sandy loam, free from weeds, roots, stones, etc., and containing a good portion of vegetable earth. Alluvial bottom land is the most suitable, but it must not be wet. Plow deeply in the fall and spring, and roll and harrow. Next, plow the land into beds four feet wide, leaving alleys between, three feet wide. Madder sets, or seed roots, are best selected when the crop is dug in the fall. The horizontal uppermost roots, with eyes, are the kind to be used; these should be separated from the bottom roots, and buried in sand in a cellar or pit. They should be cut or broken in pieces containing two to five eyes each, that is, three to four inches long. Plant about the middle of April, in the beds prepared as above directed, three rows to each bed, and 10 inches apart in the row, and covering them two inches deep. Eight or ten bushels are required for an acre. Weed and hoe carefully and thoroughly during the summer, fill-

ing the vacancies by sections of the stronger roots, in June. When the plants are 10 or 12 inches high, bend the tops down to the surface of the ground, and cover all except the tip end with earth from the alleys, bend the shoots outward and inward in every direction so as in time to fill all the vacant space on the beds, and about one foot on each side. Cultivate the alleys, and as soon as the plants are about a foot high again bend down and cover them as before. This process is repeated the third time during the first season, the last time being as late as September. The object is to fill the ground as full of roots as possible. Repeat these processes the second year, taking care to keep the edges of the beds as high as the middle, to retain somewhat of the rains. Pull out what weeds appear, and plow the alleys. Very little attention is required the third year, at the end of which, or of the fourth year, the roots may be dug the first part of September. With a sharp shovel cut off and remove the tops, with half an inch of the surface of the earth; then take a plow of the largest size, with a sharp coulter and a double team, and plow a furrow outward, beam deep, around the edge of the bed; stir the earth with forks, and carefully pick out all the roots, removing the earth from the bottom of the furrow; then plow another furrow, and proceed thus until the work is done.

As soon as possible after digging, wash the roots in a running stream, or under a pump spout. Convenient vessels for washing are half-bushel boxes with a wire-screen bottom. Stir the roots about in the water and pull them apart. When washed clean, lay them out upon platforms to dry. After the second or third day's drying the madder should be protected against dews at night and rain, placing the platforms upon one another and covering the uppermost one. Five or six days of ordinarily fine weather will dry the madder sufficiently, when it may be put away till it is convenient to kiln-dry and grind it.

The size and mode of constructing the kiln for drying madder may be varied to suit the circumstances. A good and cheap plan for drying a ton of roots at a time is the following: Set four strong posts in the ground 12 feet apart one way and 18 the other, the front two 14 feet high and the others 18; put girths across the bottom, middle and top, and nail boards perpendicularly on the outside as for a common barn. The boards must be well seasoned, and all cracks and holes should be otherwise stopped up. Make a shed roof of common boards. In the inside put upright standards about five feet apart, with cross-pieces to support the scaffolding, the first cross-pieces to be four feet from the floor, the next two feet higher, and so on to the top. On these cross-pieces lay small poles about six feet long and two inches thick, four or five inches apart. On these scaffolds the madder is to be spread nine inches thick. A floor is laid at the bottom, to keep all dry and clean. When the kiln is filled, take six or eight small kettles or hand furnaces, and place them four or five feet apart on the floor, but on bricks or stones; in these make charcoal fires, but not so large as to scorch the madder over them. A person must be in constant attendance to watch and replenish the fires. In 10 or 12 hours the madder will be sufficiently dried, when it will be as brittle as pipe-stems. Immediately after it is dried it should be threshed with flails or broken by machinery, so that it will feed in a common grist-mill. If not immediately ground it will gather dampness and become too tough for grinding. Any common grist-mill can grind the roots properly. When ground finely it is fit for use, and for market may be packed in barrels like flour.

In one crop of four years' growth 2,000 barrels per acre have been raised, at a net profit of $200.

Mad-dog, Bite of: see Bites and Hydrophobia.

Mad Staggers, of horse: see page 790.

Magnesia, an alkaline earth employed in many medicines and sometimes in household receipts. The salts of magnesia, as carbonate, sulphate etc, are also extensively used. If too much magnesia is swallowed by mistake, let the patient take vinegar or lemon juice.

Magnetism, the force of attraction and repulsion acting between substances. There are the varieties of "animal" magnetism, electro-magnetism, terrestrial, cosmical, etc. The first two are of considerable importance in Hygiene, which see.

Magpie. This crafty and well-known bird is found on both continents, though it is much more limited in its range in America, being confined to the northern and western regions. In its habits and manners it much resembles its brethren, the crows; like them, it indiscriminately feeds on both animal and vegetable food; it is peculiarly destructive to eggs and young of the feebler tribes of birds. It is about 18 inches in length and weighs from eight to nine ounces. It has a black bill, wings and tail, but the latter are variegated with white, green, purple and blue of different shades. The construction of the nests of these birds shows great art; they have a thorny cover and the entrance is at the side. The female lays from five to seven pale greenish eggs, closely spotted with black. When taken young they readily become domesticated and learn to repeat many words and even sentences, as well as to imitate every noise within hearing.

Majolica (ma-jol'i-ca), a kind of fine pottery or earthern-ware with painted figures.

Mallenders: see page 790.

Mallow, Indian: see Indian Mallow.

Malt, grain, especially barley, which has been soaked in water to the verge of sprouting and then dried. It is a cheap form of sugar, used as the basis of beer and ale.

Mandible, the upper jaw of a biting insect. It consists of one piece, and is more like a pair of strong, notched teeth than a proper jaw, and forms the chief instrument in breaking and triturating the insect's food. It is generally large and horny in beetles, min-

ute and membranous in moths and butterflies, and long, slender and lance-like in hemipters, and often entirely wanting in flies, yet very distinct in gnats and gadflies.

Mandrake, belladonna or May-apple,—two very different plants; but the word is used in both senses.

Manege (ma-naizh'), or **Menage** (ma-nazh'), the art of horsemanship, or of training horses; also, a school for teaching these arts.

Mange (mainj), the scab or itch, in domestic animals. For mange in the horse, see page 790; in cattle, see page 231.

Mangel Wurzel (mangl wurzl), a species of beet, particularly valuable for stock and for sugar-making. Nothing is better for milch cows during the winter.

CULTIVATION. Drill the seed for horse culture two and a half feet apart, and when the plants are well up or the size of a good cabbage plant, thin them to about one foot apart, leaving the strongest plants; keep down the weeds at the start with a hoe or hand cultivator, and you will soon be able to manage them with a shovel-plow. For hand cultivation, plant them about 20 inches between rows, and thin to about 15 inches apart in the row. In this way you can raise from one pound of seed about four tons. Have a safe place to store them from frost, and as handy to feed out as possible. With a corn-knife, cut them up small enough for cows to eat, and feed them raw. They should be pulled up, the tops twisted off, and laid in the sun long enough to let the dirt dry on them, and hauled at once to where they won't freeze or even get frosted. They need the same care as potatoes. Haul the tops to the brood sows and pigs. Now, the next year plant them in the same place. If you keep them clean this year you will have less trouble the next year with weeds.

VARIETIES. *Improved American Sugar* or *Lane's*. A long white variety for stock.

The Long Red. One of the best for all purposes.

Carter's Mammoth. Very large.

Carter's Orange Globe. The best variety of yellow globe.

Yellow Globe, *Red Globe* and *White Sugar*. Succeed better than the long sorts in sandy soil.

Vilmorin's Improved French White Sugar. One of the best for sugar.

Yellow Ovoid. Symmetrical and free from rootlets.

Red Giant Ovoid. Very large and pulls up free from dirt.

Norbiton Giant. A new English variety which tends less to a hollow neck than the old long red kind.

Knauer's Improved Imperial. The standard German variety for making sugar.

Manger, a fixed trough at the head of a stall for holding the hay, the chaff, fodder, etc., for the horse or the cow. A horse's manger is generally made to extend from side to side of the stall but really does not need to be more than about 20 inches long and 16 inches wide, and may, in many instances, be most conveniently placed in one of the corners of the stall; and it ought, in every case, to be a movable fixture, so that it may readily be taken out to be cleaned. A cow's manger ought to be placed high enough above the floor to prevent any straining of the lower jaw or the fore legs when the animal is grappling with the food, and ought also to be wide enough for a horned cow to prevent her from rubbing and wearing the tips of her horns against the wall.

Man-hole, a hole through which a man may creep into a drain, cess-pool, steam boiler, etc., to clean or repair.

Manila (ma-nil'a), a fiber from a plant of the Philippine Islands, used in cordage, ropes, etc.

Manioc (ma'ni-oc), **Manihot**, etc. (the word is variously spelled), the plant from which cassava and tapioca are prepared; also, the cassava itself. Can sometimes be found on sale at groceries and provision stores.

Manipulate (ma-nip'u-late), to treat or work anything with the hands; to manage in hand-work. A cook manipulates flour to make pastries; a nurse manipulates a patient by the kneading, rubbing, etc., of the various parts of the body.

Manna-croup, ground wheat consisting of large, hard grains which remain in the bolting machine after the fine flour has been sifted out: used for making pudding, soups and the like.

Mansard-roof, a curb roof: see example in article Barn.

Manufactories. A country which is exclusively agricultural remains comparatively poor in respect to many of the luxuries and refinements of civilization, —mostly for the reason that it pays a heavy tribute to manufacturing nations or centers for the manufactured articles they use; and furthermore, they have not the means, the machinery or the skill to manufacture for themselves. At the other extreme is the nation that is dependent mainly upon its manufactures. When other nations begin to take care of themselves and withhold their patronage, this exclusively manufacturing nation suffers. America, until some time in the nineteenth century, was an example of the former, and Holland and England are striking examples of the latter. Between these two extremes, blessed is that people who have manufactories enough for themselves, but who are not dependent upon foreign patronage. This is the point which America has now attained,—bating a few luxuries which the spendthrifts of the cities still send abroad for.

Some years ago the question arose, Why should the people of the South and the West send East for all their manufactured goods? and the answer was, There is not sufficient reason for pouring our wealth into the lap of the East, and we will take care of ourselves and make our own clothes, tools, fancy articles, furniture etc. These agricultural sections, therefore,

have established many factories among themselves; but they find that they are struggling, especially in certain lines, against the low-priced labor of poor people in the older sections, both in this country and in Europe, where the capitalists are thus enabled to manufacture and ship into the interior of this country at a cheaper rate than Westerners can afford to make for themselves. In other words, the people of the newer sections can make more money by other labor than working in a factory. Hence, whiggism, tariff, protection etc.

Moreover, some sections remain long deprived of manufacturing industries because the people there are either unenterprising or are dangerous. Being ignorant and suspecting, they imagine the immigrant capitalist has come in to rob them, overturn their customs or do them harm, and the worst of them mask themselves some night and burn the factory. Of course moneyed men will keep away from such sections.

It appears, therefore, to be the interest of every community, to manufacture for itself all it needs, but to be cautious how it renders itself dependent upon exports for existence. Exporting is all well enough when there is an opportunity to gain by it, but it is not a steady and lasting support of national existence, or of national thrift. An agricultural community can live without the manufacturing people, but the manufacturing people cannot live without the agricultural.

Manure. In the virgin land of our prairies, the expedients adopted in older countries for refreshing and invigorating the land are found to be wholly unnecessary. The early settlers in Virginia and Kentucky and the Carolinas raised prime crops throughout a series of from 20 to 50 years without once using any kind of manure. The successors of the original cultivators of some parts of Illinois continued even longer to raise cereal crops without manure; and the settlers in Iowa and other regions of the West are pursuing the same easy and luxurious course. When the tract in the Green Mountains in Massachusetts was first settled the same exuberant fertility was attributed to it that has since characterized Kentucky and many other States. From those regions the paradise traveled to the western parts of the State of New York, to Connecticut, to the countries on the Ohio, to the Southwest, to the valley of the Mississippi, and is now making its progress beyond the Missouri river. In consequence of the long accumulation of vegetable mold, those regions, even if naturally sterile, held out at first the promise of an abundant return to the cultivator. In consequence, too, of the accumulation of azotized and phosphatic substances from the excrementation of birds, the exuviæ of reptiles, and the bones of many kinds of vertebrated animals, and still more of the vast native store of saline substances derived from transmutations of the surface rocks, and from other sources, the virgin lands of the prairies possess a vastness of fertility which the most scourging husbandry could not possibly, for a long period, exhaust or even seriously reduce; but without due attention and proper regard it can and will finally be done, leaving a barren soil.

Now, the earliest inhabitants of the post-diluvian world, and all the first settlers in all the arable regions of the old Continent, such as the first Phœnician colonists in Greece, and the first Greek colonists in Italy and Spain, would find themselves placed in the same luxurious agricultural circumstances as the first settlers of our own prairies, and when they had cropped any tract to exhaustion, by any such process as would simply remove their herds and habitations to some new piece of virgin land. The marvelous ease with which they extracted produce from the soil, the constant succession and the great plenteousness of their cereal crops, and the facility of their immigrations upon tract after tract of the most productive land, seem, in fact, to have been the very elements of the well-known day-dreams of the earliest Greeks of the historical period respecting a golden age.

But the time would come when they could no longer live solely upon virgin land, when they would be prevented, by the increase of population and the difficulty of travelling, from abandoning the lands which they had exhausted, and when they would feel compelled to attempt the re-fertilization of these lands by manuring, to imitate, on a large scale, those natural processes of accumulating the mold of decayed vegetation, the droppings of animals, and the gathering together of all sorts of organic refuse by which the lands had been originally enriched. The great majority of the population became eventually obliged to remain stationary, and required, as truly as the agricultural inhabitants of the old countries of the present day, to practice manuring in order to maintain productiveness in the soil, or to render agricultural labors remunerating.

Homer mentions an old king as found manuring his field with his own hands, and describes a dog as laying upon a heap of dung with which the laborers were about to manure the farm. Cicero observes that no notice of manuring is taken by Herod. Augeas is celebrated as the discoverer of the use of manure in Greece, and Stercutius, the son of Faumes, as the discoverer of it in Italy. Xenophon represents earth which has long been under water as a fertilizer of the soil, and recommends leguminous crops to be grown for the purpose of being plowed into the ground as manure, and remarks, in reference to them "that they enrich the soil as much as dung." Virgil indicates some slight acquaintance with the ameliorating effect of a change of crops, and recommends nitrum, not saltpeter as most translators say, but carbonate of soda or carbonate of potash, in mixture with the dregs of oil, as a steep to make the seed grain swell; and suggests the advantage of scattering ashes over exhausted land; evinces, altogether, a surprising amount of acquaintance with the methods of artificial fertilization; and speaks, not only of such ordinary manure as dung, but of such rare and almost special manure as pumice-stone and shells. Pliny says, "There are many different kinds of manures, and the thing itself is very ancient." Varro so comprehensively and min-

utely enumerates animal manures as to notice even the dung of blackbirds, thrushes, and other birds kept in aviaries. Cato and Theophrastus and Columella write still more fully and knowingly, displaying a knowledge of at once organic, inorganic and mixed manures which would have been creditable to distinguished American farmers of fifty years ago, and occasionally dropping hints which might be serviceable to many a considerable farmer of the present day.

The Greeks and Romans of the periods immediately preceding and following the Christian era, associated all ideas of successful husbandry with the careful accumulation and the liberal use of manures. They consider the application of manure as one of the principal operations of agriculture, and placed it next to plowing. They were so sensible of the advantage arising from manuring their fields, that they were very careful in finding out and collecting such things as were found proper for the purpose. They carefully gathered the dung of their cattle; they carefully littered their cattle with straw or stubble, which was carried with the dung to the dung-hill; they collected all kinds of ashes; they used different kinds of earth; they burned trees, shrubs, and stubble in their fields; and they frequently sowed pulse to be plowed in while green. There are some passages in Cato and Columella that show with what care all kinds of dung, and all other things fit for manure, were collected. "You may make manure", says Cato, "of these things: stubble, lupines, straw, bean stalks, chaff, haulm and oak leaves." "I am not ignorant," says Columella, "that there are some farms in the country in which neither the dung of cattle, nor of birds is to be got. However even in such places he is a slothful husbandman that has no manure. He may collect any kind of leaves, the cuttings of briers, and rakings of high-ways; he may cut ferns, which though on the fields of his neighbors will be rather an advantage than an injury to him, and mix with the cleanings of the court-yard; he may dig a hollow place, and throw into it ashes, the dirt of the kennels and jakes, all kinds of straw, and everything that is swept from the house." But the ancients not only used various kinds of animal and vegetable substances for manure; they also mixed earth of different qualities. "Some advise," says Theophrastus, "to mix together earth of different qualities: for example, light with heavy, and heavy with light; fat with lean, and lean with fat; in like manner, red and white, and whatever has contrary qualities; because this mixture not only supplies what is wanting, but also renders the soil, with which another is mixed, more powerful: so that what is worn out, being mixed with a fertile kind of earth, begins again to carry crops as if renewed, and what is naturally as barren as clay, if mixed, is rendered fruitful; for one kind mixed with another, in some measure serves as dung."

The use of farm-yard manure and of all the ordinary composts appears to have little improved, and not much varied from the times of the classic Romans till the early part of the present century.

The notions entertained of manures by almost all farmers, and even by the vast majority of scientific agriculturists, down to the quite modern epoch of agricultural chemistry, were altogether empirical. Men observed that the accumulations of the farm-yard, when distributed over fields and incorporated with the soil, produced very important effects upon crops; and they continued, from year to year, and from age to age, to make and apply these accumulations, without troubling themselves with any inquiry as to their mode of action.

The term manure nowadays signifies any decaying material which when added to the soil becomes plant food, while the term "fertilizer" is applied to those chemical elements, as salt, ashes, etc., which render that food available. This distinction, however, is not absolutely strict, as all manures act as fertilizers to some extent, and all fertilizers supply plant food. Under the head of "manure" here we will treat of "organic manures," or decaying vegetable and animal substances for enriching the soil.

The most important article under this head is "barn-yard" manure, and the first consideration in its management is to secure it against all waste. The most profitable question to the farmer is, "How can I produce the most manure on the farm, at the least cost?" Its bulk, solubility and peculiar tendency to fermentation render it a matter of considerable study how to preserve it perfectly and conveniently. A part of the droppings of the cattle are necessarily left in the pastures, or about the stacks where they feed, though it is better, for various reasons, that they should never receive their food from the stack. The manure thus left in the fields should be beaten up and scattered with light, long-handled mallets immediately after the grass starts in the spring, and again before the rains commence in the autumn. With these exceptions, and the slight waste which may occur in driving cattle to and from the pasture, all the manure should be dropped either in the stables or yards. These should be so arranged that cattle may pass from one directly into the other; and the yard should, if possible, be furnished with wells, cisterns or running water. There is twice the value of manure wasted annually on some farms in sending the cattle abroad to water, that would be required to provide it for them in the yard for 50 years. Many stable yards are mistakenly situated upon the brow of a hill, where the rains wash nearly all the manure down into the streams and carry it off beyond reach. The premises where the manure is dropped should be kept as dry as possible; and the eaves should project several feet beyond the side of the building so as to protect the manure thrown out of the stables. The barns and sheds should all have eave-troughs to carry off the water, which, if saved in a sufficiently capacious cistern, would furnish a supply for the cattle. The yard should be dishing toward the center, and if on sandy or gravelly soil, it should be tightly covered with tenacious clay to prevent the leaking and escape of liquid manure. The floors of the stable may be so made as to permit the urine to fall on a properly

prepared bed of turf under them, where it will be retained till removed; or it should be led off by troughs into the yard or to a muck heap.

It is better to feed the straw and coarse fodder, which can always be advantageously done by cutting and mixing it with meal or roots. When it is not thus consumed, it may first be used as litter for the cattle; and as it becomes saturated with the droppings it should be thrown into the yard. If the cattle are fed under sheds, the whole surface ought to be covered with such straw, refuse forage, etc., as can be collected; and if there is a deficiency in these, peat, or any turf well filled with the roots of grass, and especially the rich wash from the road-side, may be substituted. During the winter manure may be allowed to accumulate, unless it be more convenient to carry it to the fields. When the warm weather approaches, a close attention to the manure is necessary. The escape of the frost permits circulation of the air through it, and the increasing heat of the sun promotes its decomposition.

Manure intended for garden beds, or for loose, light soils, or as a top dressing for meadows or any crops, or if needed to kill any noxious seeds incorporated with the heap, should be fermented. For hoed crops in clay or loamy soil, it should be used in as fresh condition as possible. Loose soils are still further loosened for a time by fermented manure (called also "long" manure), and much of its volatile part is lost before it is reduced to mold, while adhesive and compact soils are improved by the coarse vegetables which tend to their separation, and all the gases which are set free in fermentation are combined and firmly held in the soil. The fermentation of manure should go forward when thoroughly blended with all the vegetable and liquid fertilizers about the premises, including urine, brine, soap-suds, gypsum and coal-dust. Ashes should not be added to a manure or compost heap, as it sets the ammonia free and allows it to escape. Over all these should be placed a good coating of turf, peat, or fine mold, which will absorb any gases that escape the gypsum, etc. Old mortar or effete lime may also be added for the formation of nitric acid. If required to hasten decay, and especially if there be intractable vegetables, as corn-stalks, or such as have seeds that ought to be destroyed, they may well be moistened and thrown together in layers three or four inches thick, and on each a liberal coating of fresh, unslacked lime reduced to powder. This promotes decomposition, and when it is far enough advanced, the whole may be sparingly added to the general mass, as the lime will by that time have become mild. These coarse materials, when remote from the cattle-yard, may be buried in furrows where the ground will not be disturbed till they are entirely rotted; or they may be burned. When thoroughly decomposed, the manure heap will have lost half its original weight, most of which has escaped as water and carbonic acid. It may then be carted upon the ground and at once incorporated with it; or if intended for a top dressing it should be scattered over it immediately before or during wet weather. The drier the manure, the less the labor of hauling. By hauling directly from the stables and plowing under, more of the virtues of the manure are retained than by any other method. Sun, wind and rain waste the virtues of barnyard manure as long as it is exposed.

Tanks for holding liquid manure have long been in use. They should be convenient to the stalls and yards, and tight drains should convey into them every particle of the urine and drainage from the manure. In compact clay they may be made by simply excavating the earth and the sides kept from falling in by a rough wall, or by planks supported in an upright position by a frame-work or joist. But in all cases the cisterns should be closely covered to prevent the escape of the ammonia. In warm weather, gypsum or charcoal should be thrown in to absorb the ammonia. A few days after the decomposition commences it should be pumped into casks and carried out upon the land. If intended for watering plants, it must be diluted sufficiently to prevent injury to them; but much less dilution is required in wet weather than in dry. The stables and troughs leading to the tank should be frequently washed down and sprinkled with gypsum. The sooner this liquid is used after proper fermentation, or "ripeness," as it is termed, the greater will be the economy. It will save considerable labor to keep the urine above ground and mix it at once with the manure; but in this case vegetable or earthy absorbents must be adequately supplied, and the muck heap ought also to be frequently sprinkled with gypsum or charcoal. Rich turf, the wash of the road-side, tan-bark or saw-dust, and all refuse vegetables may be used for this purpose, and so placed that the liquid can run upon them, or be deposited where it can be poured over it. When fully saturated with the urinary salts, and all is properly decomposed, it may be carried out for use, or closely covered with earth till wanted. The decomposition is in a great measure arrested by covering with compact earth thoroughly trodden down. This prevents the access of air, which is essential to the progress of decomposition. Forty gallons of drainage from the stable is reckoned equal in value to an ordinary car-man's load of manure.

Horse dung is the richest and easiest to decompose; and in large heaps, even in the winter time, will decompose so rapidly as to lose a part of its value. Next in this respect is sheep dung, which is rich and very active. The manure of cattle and swine, being of a colder nature, may be thrown in with that of the horse and sheep in alternate layers. If fresh manure be intermixed with straw and other absorbents, as vegetables, peat, turf, etc., constantly added, the recent coating will combine with any volatile matters which fermentation develops in the lower part of the mass. Frequent turning of the manures is not advisable, as it facilitates the escape of the nutritious gases. There is not so great a difference in the values of manures from different animals

as in that of the same animal at different times and under different circumstances.

The excrements of fowls are valuable, and should be husbanded with economy and care. Dead animals, the refuse of slaughter houses, woolen rags and the waste of woolen manufactories are all rich and valuable manures.

Green manures are vegetable crops plowed under. They are sometimes the cheapest, and it depends upon a variety of circumstances whether it is in any given case the best thing to be done. If, for instance, all other manures are costly, the system of green manuring is a convenient substitute. It should be commenced before the land is entirely exhausted, so that a good crop can be obtained for plowing under. The most popular plant for this purpose is red clover. Its power for renewing the soil is so great that crops of it may be taken from the ground while it continues to enrich the soil. It returns to the soil nineteen times as much as it takes out of it. It is customary to adopt a three or four years' course of cropping, in which grain, roots, corn, etc., alternate with clover and barnyard manures. When clover is raised it may be pastured in the fall. In other countries other plants are used, but for this country clover is so much better that we need not mention them here. The old practice of "fallowing," which consisted in permitting the land to produce a crop of weeds and plowing them under, is now generally discarded. Naked fallowing is sometimes necessary, as it is the best means of killing out the wire-worm and some other pests. In this process not a single weed or blade of grass should be allowed to grow.

Green manuring also renders the soil more porous in two ways: first, by the growing roots, and secondly, by the decaying plants. Clover roots grow to an immense depth—five feet and over—and bring up nutritious elements to the soil, leaving it there, and the leaves collect nutrition from the air and deposit that also in the soil. Sometimes it pays to cut down the wild herbage of swails and swamps and cart it upon the land. Buckwheat is also good for green manuring and for killing out weeds and grass. Probably the best method of killing out blue-grass or witch-grass sod, is to turn it over with the plow and sow immediately upon it a crop of rye; pasture this to cows in the latter part of summer, re-plow and sow to wheat. When it is desired to follow a wheat crop with corn the next season, a good plan is to plow the stubble and sow to winter rye, which will furnish some fall feed or winter pasturage for sheep. This plan works better on sandy and other well-drained soils.

Cornstalks in the manufacture of manure are much better handled by first running them through the cutting machine. The cattle will eat a greater proportion of them, and the remainder will be in good shape to spread out upon the fields in the summer and plowed under. See Green Manure.

HEN MANURE. The first thing is to provide proper reservoirs for the manure. Old barrels are just the thing, but strong goods-boxes will do if protected with oil or gas tar. Coating them inside and out with light crude petroleum will fill the pores with the oil, and make them as good as cedar for durability; but if the contents are likely to be moist, gas tar inside will be better. There should be one for every ten hens. Then fill all but one with road dust, which is the very best absorbent you can get; and, if dry, the barrels may stand anywhere under shelter without the freezing of the contents. If dry earth or dust cannot be obtained, the next best is finely pulverized soil, which will, of course, contain a good deal of moisture, and must be kept in barrels or boxes in the cellar so as not to freeze.

Now, having your barrels all ready, the rest of the operation will be simple and easy. All you have to do is to place a stratum, say an inch or two, in the bottom of one empty barrel, and then throw in the cleanings of the hen-house; then another stratum, then another layer of cleanings. The thinner each layer of the two is, the more perfectly they will become diffused together in standing. The precise quantity of each is not very essential—only you must have enough absorbent to hold all the volatile parts of the hen manure, of which you may usually judge by the odor, which may be corrected by adding more of the absorbent. Proceed in this way with each successive barrel. In the spring your barrels will be filled with a very powerful and most valuable manure.

By a little care and timely attention, you will secure a supply of manure, the value and quantity of which will surprise those who first make the trial. All you will have to do in the spring will be to pulverize and work over the mass, so that it may be evenly and finely applied.

Several estimates and experiments make the value of dry hen manure, in gardening, about $50 per ton; each fowl on an average consumes about one bushel and three-fourths of corn annually, or a little less than a gill and a half a day; and it has been found that one hen will yield about a bushel to a bushel and a third of manure per year. Various estimates make this worth from seventy cents to a dollar for each animal. It is very easy to save it, by placing the scrapings or cleanings of the hen-house in a barrel with thin alternating layers of road dust.

Maple, an important family of trees. The varieties indigenous to the United States are the rock, or sugar, or, as it is also called, the hard maple, the red or swamp maple, the white or silver maple, and the ash-leaved maple or box elder. All of these are more or less abundant throughout the United States, and some of them are prized for their excellent timber, others for saccharine juices and their beauty as shade-trees. The bird's-eye maple is a sport of the sugar maple. There are other members of this family, some of which have been imported, and are really of little value except as ornamental trees. These are the mountain maple, the striped, the Japanese maple, the Norway maple, etc. The mountain maple is a tall shrub growing in clumps in rich moist woods. The striped maple, known also as moosewood, is a

small, slender tree, with light-green bark, striped with dark lines. The Norway is a native of Europe, and is more beautiful in foliage than our native varieties. We cannot, however, advise its planting, as in general our own sugar maple and the red and white varieties are preferable. No tree affords a more beautiful foliage in summer than the sugar maple, and all are magnificent in their varying foliage after the frost has touched their leaves in the autumn. The box-elder, or ash-leaved maple, is a very rapid grower, not so ornamental as the sugar maple, but desirable where rapid growth is wanted. The seeds of these trees ripen in September and October, while those of the silver or white maple ripen shortly after the leaves attain their full size, and should be sown immediately afterwards. Should it be desired to keep them through the winter, put them in moist sand (not wet) and keep in a cool place.

The sugar maple is a beautiful tree and deserves to be more extensively planted for its sugar, its beauty and its shade. It is a hardy tree and will easily grow in nearly all parts of our country. It usually attains about four-fifths of the height of the sycamore. Its leaves stand on pretty long footstalks and are broad, thin and five-lobed; their edges are cut into minute segments; their upper surface is smooth and of a lightish-green color, and their under surface is whitish. The flowers have a yellowish color and bloom in April and May. In the South, however, it will not yield as much sugar as in the North. This is owing to the absence of a sufficient degree of frost. The sugar is made from the sap of the tree in the latter part of winter and early in the spring.

The practice with the sugar maple is to bore two auger holes, three-fourths of an inch in diameter and half an inch deeper than the bark, in an obliquely ascending direction, on the south side of the tree at the height of about 18 or 20 inches from the ground, in February or March, while the snow is on the ground and the cold is still intense, and to insert into the holes elder or sumac tubes, partially laid open, eight or ten inches in length and one-fourth of an inch in diameter, communicating at the lower end with troughs of two or three gallons in capacity, for the reception of the sap. Four gallons of sap are usually sufficient to yield one pound of sugar, and from eight to sixteen gallons are usually obtained in a season from a single tree. The flow of sap is rich and copious enough for the manufacturer during about six weeks, and it then both declines in quality and diminishes in quantity.

For the insect infesting the maple, and their parasites, see pages 856 and 864.

Maple Sirup. The process of making maple sirup is fully described under the head of Maple Sugar in the article on Sugar.

Maple Sugar: see Sugar.

Marble. To remove iron mold or ink spots from marble, take ½ ounce butter of antimony and 1 ounce oxalic acid, and dissolve them in a pint of rain-water; add flour until this becomes a paste. Let a portion of this mixture remain on the stained spot a few days. This process may have to be repeated once. To remove copper stains from marble, wash first with diluted sulphuric acid and ammonia, then with water and ammonia. To remove match stains from it, apply carbon sulphide. Oil stains may be removed by common clay saturated with benzine. Many other stains may be taken out with a mixture of ox-gall, lye, turpentine and pipe clay, permitted to lie on the marble for a time. Grease should first be softened with petroleum. General cleaning of marble is best done with a mixture of quicklime and strong lye.

Mare. The mare of almost every variety or breed is quite as useful as the gelding. She possesses both excellencies and defects which the latter wants, and is in consequence preferred to him by some persons, and regarded as greatly inferior to him by others; but, on a fair or comprehensive average of useful properties, she may be pronounced almost exactly his equal. She is not, like almost all other mammals, either incommoded by bulkiness of udder, or permanently kept down by inferiority of size or inferiority of constitutional strength; and she possesses a comparatively large breadth of pelvis, and expanse of hind-quarter, and power of propelling muscle, which fully compensate for the disadvantages directly accruing from her sex.

The mare was more celebrated and achieved greater feats in the Olympic games than the male horse. The Scythians of ancient times preferred the mare; and so do the red-skin Arabs of the present day. The South Americans, on the other hand, almost condemn the mare, and think it a disgrace to saddle or ride her; and commonly employ her only for breeding and for a few trifling purposes of economy. Among sportsmen, the prejudice against mares has been very strong; but if we look back to the great performances on the road against time, we shall find that by far the greater number and the most celebrated of them, were by mares: as Flora Temple, Goldsmith Maid, Lula, American Girl, Maud S. and others. They have always been found to endure hunger and thirst, and most other privations better: and, although, in our climate, horses are seldom put to the test in this respect, yet when traveling between the tropics in a desert, it must be a valuable consideration. In a race, it is true, mares are put on a par with geldings; but it must be admitted they are more perfect in their nature, and with the exception of the period of genial desire, we conceive them to be more than equal to them in any kind of exertion on the road and in the field.

Margin, in stock transactions, the money deposited with a broker to protect him against loss by the depreciation of stocks held by him for the depositor; any allowance made for contingencies; also, gross profit or surplus.

Marigold. There are species of marigold in several different families of plants, but the old standard

marigold is Calendula, so called because it can be made to flower every month in the calendar. Marigold is a corruption of "Mary's gold," because of its value as a pot-herb to English cottagers' wives. It is now held in but slight estimation. Some of the double varieties are beautiful, and it is easily cultivated.

Besides the above species of marigold proper there are four or five species of wild marigold abounding throughout the country, which have very showy flowers, namely: the fig, bur, marsh, fetid, etc.

Tincture of Marigold is a good application for sores, ulcers and abscesses on stock. It is applied with soft cloths saturated or moistened with it, and laid over the affected part. It is a new remedy in burns and scalds.

Marjoram, a genus of well known, pungent, and gratefully aromatic herbs. The plants are all of easy cultivation; the shrubby kinds are increased by cuttings or slips; the herbaceous species by dividing at the roots. The species generally cultivated are the common or pot marjoram, the sweet or summer marjoram and bastard or winter marjoram. A light, dry and moderately fertile soil is required for their healthy growth; and if it is one that has not been cropped for a considerable time, it is the more favorable for them. If the soil is wet or rich, they are deficient in their essential qualities, and the perennials are unable to withstand severe weather. The sowing is performed either in drills, six inches apart, or broadcast, in either case the seed being buried not more than half an inch deep. The tops and leaves of all the species are gathered when green, in summer and autumn, for use in soups, etc., and dried in July or August, just before the flowers open, for winter's supply.

Marketing. To the farmer the marketing of his crops is a most important item. He may be able to raise good crops, or well-fatted stock, but fail to realize the greatest profit by his loose, unbusiness-like way of disposing of them. One of the chief requisites is to keep constantly posted as to the market prices of the various farm products, the condition of such crops throughout the country and the present and probable demand. Demand and supply always regulate the price of everything. Every farmer should note the various changes made in the prices of the various products during the different seasons of the year. He will find, as a general thing, that they vary but little. That at certain seasons, annually, certain cereals, vegetables or stock, are higher or lower in their value. This would not be so if all consumers took advantage of the low market and all producers of the high market.. This is not done, however. Over one half the people make no provisions in seasons of plenty for days of stringency; nor do a vast number of farmers sell their produce during the period of high markets. This has always been the case, and you may rely on its continuing to be.

There is occasionally a sudden local demand, or perhaps it may extend throughout the country, for a certain article or line of produce. The price may be greatly advanced, but the demand may be only momentary; and unless a farmer is posted, unless he takes the papers, he may lose the best opportunity of the season to dispose of his produce. Some years ago the price of wool suddenly advanced several cents, which of course reading farmers knew as soon as any one else did; but in a certain portion of Illinois it was known that a large number of the farmers took no paper, and consequently knew nothing of the rise. Some shrewd dealers, on the first advices of the advance in the price, immediately set off for this district and bought up all the wool the farmers had, making clear profit of many thousands of dollars a day.

Another very important feature to be observed, besides knowing the best time to do your marketing, is to have your produce or stock in the best possible marketable shape when offered for sale. Always remember that even a good article put upon the market in bad shape or condition, will bring no more, and often not so much, as a poor article in excellent shape. This will apply to all produce in all sections. Another advantage in having it in an excellent condition, besides the enhanced price, you will find a readier sale.

Farmers will find it the safest way, in general, to dispose of their produce when they can realize a good price. Do not expect in seasons of peace for produce to reach a price very far beyond what it has generally done during the same seasons of previous years, when there has been a fair crop throughout the country.

Farmers should be able to grade their produce, and to know as well as any commission man or dealer exactly what it is worth in the existing market. To be a good judge of the quality of stock or grain is of the greatest importance to the farmer; it is truly an accomplishment worthy his closest attention. Should there be no competition in your market, so much more the necessity of your knowing the precise money value of the article you have to sell. Be posted as to what the article is really worth and not misrepresent anything to the buyer.

One of the commonest and most serious mistakes in the agricultural community, is, on witnessing a high price for some particular product, to enter the business of raising that product; for eight or nine times in ten, by the time the farmer has it raised its price in the market has gone down to a very low figure; and *vice versa*. It is therefore safe to stick to your favorite line, through all the years.

We cannot lay down any rules as to the proper style of arranging vegetables and other produce for the market more than are described in the articles on the respective kinds, but always have them in the best possible shape. You will be well repaid for the little extra labor, both in the increased price and the satisfaction of seeing your produce well received by the better classes.

Marking Clothes: see page 907.

Marl, a light, limy clay found as a deposit in some lakes and swamps. It is valuable for the enriching of those lands which are wanting in such elements, especially sandy or gravelly land.

Marmalade, the pulp of fruit reduced to consistence by boiling with sugar. All acid fruits should have about three-fourths of a pound of sugar to one pound of pulp: others a little less. If too much sugar is used they crystallize, or "candy," and if too little, they ferment. Keep in a cool, dry place. Choose ripe, sound, juicy fruit, cut into pieces and place in a preserving kettle, with layers of sugar, beginning with fruit at the bottom. If the fruit is not juicy, add a little water. Watch that the fruit does not burn. When the mass begins to look clear, and is thick when cool (which can be ascertained by cooling a little on a plate), it is done and ready for the jar. When cold, cover tightly with oiled paper. Marmalades and jams should be madewhile making preserves and jellies, using the rejected fruit in case of the preserves, and the pulp from the jellies.

Quince and Crab-apple Marmalade are both made in the following manner: Rub the fruit well with a rough cloth, cut out the stems and flower end and quarter the fruit without removing the core or skin; stew it on the fire with a very little water till soft enough to rub through a sieve. Strain the pulp and add a pound of sugar to a pound of fruit; set the mixture on the fire and cook it slowly till done, which should be 15 or 20 minutes longer. Some stew the skins, cores and seeds separately, and when almost cold, pour the juice off into the sliced fruit, which is then stewed and stirred until soft; then proceed as above.

Orange Marmalade. Boil the rind for two hours, then cut it into fine shreds. Press the peeled oranges through a sieve just fine enough to prevent the passage of the seeds and skin. Then, for every five oranges add the grated rind and juice of one lemon; put all into the kettle with the sugar, and cook until the marmalade is quite solid and thick. Place in preserving jars and cover closely.

Strawberry Marmalade, or jam. To each six pounds of strawberries add one pound of ripe currants and five pounds of sugar; mash the currants in a gill of water in a preserving kettle, and boil; add the picked strawberries; after a few minutes press the mass through a fine sieve into an earthen jar; boil the sugar into a thick syrup; add the pulped fruit and place over a brisk fire for 20 minutes, stirring continually. Skim off the jam and pour into earthen pots to keep.

Marmalades and jams are also made, by similar methods, from most other fruits. "Quince cheese" is marmalade boiled down very thick and packed in small pots. It thus becomes solid enough to be cut into slices like cheese, and is excellent for tea or luncheon.

Marriage. For the etiquette of the marriage ceremony, see Wedding, page 416.

Marrow, the fatty matter in the tubes and cells of the bones. It abounds most in the tubes of the long bones, and in the spongy tissue of the articular extremities of the long bones and the short rounded bones. It has an oily consistency, and is contained in collections of minute vesicles. Its grand office seems to be the lubrication of the bones, and the consequent prevention of dryness and brittleness. The spinal cord is often called the spinal marrow; and the interior and whitish part of the brain is usually called medulla, a word synonymous with marrow.

Marsh, a piece or section of land always or generally soaked with water. Most marshes render the air above and around them exceedingly unhealthful: and some very extensive ones are so pestiferous as to make the districts in which they lie altogether uninhabitable. Some forms of disease greatly prevail, and the average of human life is comparatively low, in the vicinity of such marshes as exhale much gaseous produce of organic decomposition; and cattle which are depastured on the borders or in the neighborhood of even meadow-like marshes, are seldom so healthy as cattle which feed on dry or well-drained pastoral districts. "Marshes," remarks an eminent writer, "are the ulcers of the earth, which blur the fair face of nature, where all should be beauty; and from these infectious sores the languor of death extends far and wide over all that should live and flourish." Some of the low, flat, alluvial districts of England, which thorough drainage and general georgical improvement have dried from all excess of water, and rendered as salubrious as districts of undulating surface or of pastoral heights, were formerly infested, all the year round, with fever and ague and other forms of disease.

To Reclaim Marsh Land. If the land consists of soft muck, drain by ditching, making the banks of the ditch very sloping, say at an angle of 40° to 50° from a perpendicular, and the ditch about four feet deep. It should be narrow at the bottom, for a broad-bottomed ditch will not drain as well as one with a narrow channel, as it fills up more readily. If the bog is clayey and solid enough to hold tile in place, then "tile-drain" it instead of running open ditches through it. See Drainage. Be sure to take advantage of the heights and depressions of the land, and find a proper outlet if possible; otherwise the ditches will contain standing water the most of their length and fail to drain. It is estimated that nine-tenths of the marsh lands of the Northern and Western States can be thoroughly drained; and it has been found that such land when drained and cultivated becomes the best for most agricultural purposes. When neighbors can agree to a system of draining and outlets, it saves the expense of employing commissioners, which sometimes is considerable, and incurred for services not very satisfactory.

The next thing is to cut down all the trees and shrubs. Pasture the land, and the stock will keep most of the sprouts eaten down and thus cause the stumps to rot. The autumn succeeding this treat-

ment, during dry weather, burn off the ground. Then, by the aid of a little grubbing here and there, the ground can be plowed and sowed to rye or buckwheat: if very wet ground still, sow to grass. The next year the land will be ready for almost any kind of crop. Some low grounds, especially in the Lake region, are too densely occupied by trees to be reclaimed without many years of pasturage and many burnings, and probably a few tracts of this description are not worth reclaiming at all. With the best of marsh, much hard work and patience are required, but in nearly every case the labor of reducing is abundantly remunerative.

Martin, a group of passerine birds, of the swallow tribe. Two species quite closely allied to the common or chimney swallow are always called martins: and several species, less closely allied to the common swallow, and assigned by some naturalists to another subgenus, are frequently called martins.

The common martin, or house martin (Hirundo urbica), is a well known bird. Its upper part is black and its rump and under part are white. Its total length is somewhat upwards of five and one-fourth inches. It builds its nest with mud-earth at the angles of windows, under the eaves of houses, and in other similar situations; and it has been known, when disturbed, to build four times in one year. The female lays four or five smooth, white eggs of nine and one half lines in length and six lines in breadth, and incubates during 13 days, and in many instances deserts her young.

Martingale, the strap connecting the bridle-rein with the belly band and passing between the fore-legs, to prevent the horse from throwing his head too high, or rearing.

Martynia, or **Unicorn Plant**. The young pods, when sufficiently tender to be easily punctured by the finger-nail, are sometimes used for pickles. The plant produces large, showy flowers, and is so hardy as to run at large in central Illinois. Plant one in a place, two by three feet apart.

Mash, medicated diet for horses and cattle. It is commonly made of bran or malt. A bran mash is made by pouring enough of boiling water on fresh sweet bran to give it the consistency of a soft poultice, and by thoroughly stirring the mixture, and covering it over, and allowing it to stand until it becomes sufficiently cool for use. No bran mash, even in the heat of summer, ought ever to be made with cold water. A little oats may be sprinkled on the surface of the mash to provoke a squeamish horse to eat; but when oats are used in any considerable proportion, or as a constituent of the mash itself, they ought to be scalded along with the bran. A steaming bran mash, designed to steam the horse's head for strangles, colds, and sore throats, or to make him inhale its vapor while he eats its substance, may be put hot into the manger, but ought never to be put into a nose-bag secured to the animal's head, for in that position it impedes respiration.

Masonry. To measure masonry see page 146.

Mastiff, the largest of watch-dogs: see page 337.

Mats. Good door mats of many kinds are to be had at dry-goods and furniture stores; but often some member of the family—an invalid or a cripple, perhaps—takes great pleasure in conjuring up little conveniences and pieces of ornamental work for the house. To prepare sheep-skins for mats, make a strong lather with hot water, and let it stand till cold; wash the fresh skin in it, carefully squeezing out all the dirt from the wool; wash it in cold water until all the soap is taken out. Dissolve a pound each of salt and alum in two gallons of hot water, and put the skin into a tub sufficient to cover it; let it soak for 12 hours and hang it over a pole to drain; when well drained, stretch it carefully on a board to dry, and stretch several times while drying; but before it is quite dry, sprinkle on the flesh side one ounce each of fine pulverized alum and saltpeter, rubbing it in well. See whether the wool be firm on the skin, and if it is not, let it remain a day or two, then rub again with alum; fold the flesh sides together and hang in the shade for two or three days, turning them over each day till quite dry. Scrape the flesh side with a blunt knife, and rub it with pumice or rotten stone. In order to dye it any color, its face or woolly part is dipped into a bath of the required tint, prepared in the ordinary manner for dyeing wool. The washing must again be repeated, to get rid of the excess of coloring matter which adheres to it. The skin is then dried and trimmed to the proper shape.

Husk matting is easily made by simply tying the husks together, turning the ends all to one side, and then clipping them all off to a uniform length.

Sheepskin rugs, or mats, are cleaned by washing with strong soap-suds two or three times, rinsing well in cold water after each washing; the last rinsing should be in water in which a little bluing is dissolved. In drying, the rugs should be shaken and turned occasionally.

To clean straw matting, wash it with weak brine and dry it well, or boil a small bag of bran in two gallons of water and wash the matting in that water.

Matting, mat-work; material for mats; an ornamental border of thin-rolled brass placed between the plate and glass of a daguerreotype picture, to prevent abrasion.

Maturant (mat'u-rant), a medicine or application which promotes suppuration,—expulsion of pus or "matter."

Maxilla, the cheek or jaw of an animal of any of the higher orders, and the under jaw of an insect.

May-Apple, or **Mandrake**. This is a familiar herb, growing in woods throughout the United States. Its flower is large, rose-shaped, white and fragrant, appearing in May, and the fruit, about the shape and size of small hen's eggs, and edible, ripens the first portion of August, about the close of blackberry time. The root is poisonous, and hence used in medicine,

where it is known as a cathartic. In small doses, continued for some time, it is an alterative. The celebrated "podophyllin" is the peculiar principle of May-apple root, and is employed as a cathartic and a laxative, according to quantity taken The leaves of this plant are said also to be poisonous.

May Beetle, an insect especially injurious to meadows and pastures: see page 850.

Mead, Metheglin, Hydromel, or **Bragget.** This is a beverage essentially consisting of fermented sweetened water. When made of honey it is called metheglin, or hydromel. The fermentation is held in the alcoholic stage as long as possible, by bottling or tight bunging in the cask. In the course of time the fermentation proceeds to the acetic stage, when vinegar is formed. To get metheglin in perfection, it must remain a year in the wood untouched. It is then to be bottled, and kept for at least six months before being used, when a very agreeable and potent liquor will be obtained.

These drinks have more alcohol and acid in them than has any kind of beer or ale.

We give the following recipes for making this drink:

Sarsaparilla Mead. 3 pounds of sugar, 3 ounces of tartaric acid, 1 ounce of cream tartar, 1 of flour, 1 of essence of sarsaparilla and 3 quarts of water. Strain and bottle it; then let it stand ten days before using it.

To Make Bragget. To 28 pounds of honey add 8½ gallons of boiling water; mix thoroughly. Boil in half a gallon of water the peel of 3 lemons, 1 ounce of ginger, 2 drachms of mace, 1 drachm of cloves and a small bundle of rosemary; strain, and add immediately to the hot mixture; stir the whole together, and set aside in a cask till quite cold. Mix two large spoonfuls of fresh yeast with a quart of the liquor; pour into the cask, and allow it to remain till the fermentation has taken place, when the cask is to be bunged up.

Meadow, land seeded down to grass suitable for either regular or occasional mowing. It is distinguished from pasture by its adaption to soiling and haymaking, and the latter being used exclusively for grazing. The chief point to be observed in meadows is to select such grasses as will afford the largest amount of nutritious and palatable hay and which will ripen simultaneously. See Grass. The chief hay grasses in the United States are: Kentucky blue grass, orchard grass, fowl meadow grass, smooth-stalked meadow grass, tall fescue, timothy and red-top. When Kentucky blue grass ripens in June, the other grasses will ripen as follows: orchard grass, June; fowl meadow grass, July and August; smooth-stalked meadow grass, July; tall fescue, June; timothy, July; red-top, July and August. In seeding meadows more are less clover is generally sown. If with timothy and red-top as the basis, the clover must be allowed to get pretty ripe in order that the timothy may be cut when the seeds are half formed. Then the red-top will be in its prime, and the clover will have thickened at the bottom. Blue grass, orchard grass, tall fescue and clover ripen so that they may form the meadow; fowl meadow grass and red-top ripen nearly enough together so that they may be fit for hay at the same time. Clover, timothy, blue grass and orchard grass like a strong, rather dry soil; red-top will grow in moist soil: so will fowl meadow grass. Timothy should not be cut close, since the bulb at the top of the ground will be injured. Clover, red-top, fowl meadow, smooth-stalked meadow grass and blue grass make excellent hay for cattle and sheep. For horses timothy, orchard grass and blue grass make superior hay, since the hay is clean and generally free from dust. In the South, clover, lucern blue grass, orchard grass, timothy and red-top do fairly, but in the Gulf States the main dependence seems to be on crab, crowfoot, Bermuda and gama grass, which are extensively sown.

Permanent meadow lands, if constantly cropped without manures, may be exhausted with much greater rapidity than pastures, though this depreciation is much more gradual than with tillage land. There is no greater mistake than to suppose they will keep in condition by taking off one annual crop only, and either pasturing the aftermath or leaving it to decay on the ground. No soils but such as are periodically flooded with enriching waters, can long suffer such a drain with impunity. They must be renewed with the proper manures, or barrenness will ensue. Ashes, lime, bones and gypsum (the latter especially to be applied to clovers, its good effects not being so marked on the grasses), are essential to maintain fertility, and to insure the greatest product: animal or vegetable manures must also be added. The proper manner of applying these fertilizers is by scattering them over the surface when the grass is just commencing a vigorous growth in spring, or simultaneously with the first rains after mowing. The growing vegetation soon buries them under its thick foliage, and the refreshing showers wash the soluble matters into the roots; and even the gases that would otherwise escape are immediately absorbed by the dense leaves and stalks which everywhere surround it. The loss of any kind of manure is trifling, even in a state of active decomposition, when scattered broadcast under such circumstances.

Pasturing Meadows. There is no objection to feeding off meadows in early autumn, while the ground is dry and the sod firm. The roots of the grass are rather benefited than injured by the browsing and the land is improved by the droppings from the cattle, and more particularly by sheep. But they should never be pastured in spring. It is economy to purchase hay at any price rather than to spring-pasture meadows.

Meal. The ground or pulverized edible portion of the grains of wheat, corn, oats, peas or other cereal grasses and certain legumes. Flour differs from meal in being freed from the coarser parts by being bolted. Meal is denominated according to the kind of grain which afford it, as oat-meal, corn-meal, rye-meal, barley meal, etc.

Measles. For several days before the appearance of the peculiar eruption of measles, there are certain symptoms which often excite a suspicion of the impending disorder. The child labors under a severe cold; there are watery discharges from the eyes and nose; accompanying these are irregular chills and shiverings, with general languor and appearance of illness. In the course of a day or two there is frequent sneezing, and a cough is generally heard of a hard, metallic, somewhat croupy character. It will be easily observed that these symptoms differ considerably from those attending the early stages of scarlatina and small-pox: in the former, there is fever, with sore throat; in the latter, there are the peculiar and severe pains in the back, stomach, and head; but in neither is there the hoarse cough, the sneezing, and the discharges from eyes and nose which prevail in measles. On the fourth day the rash appears. It is first visible around the head, behind the ears, and about the temples; it then appears on the rest of the face, then on the throat and neck; on the rest of the body a few spots, like flea bites, may often at this time be noticed; but the eruption does not reach the hands and feet until two days after its appearance on the face. On the day after this the rash on the face begins to fade away.

Treatment. When measles are mild and regular, which they usually are, and when the child has had careful attention, this complaint requires only the mildest treatment and simplest remedies. The danger is in the consequence of the disease, rather than in the disease itself. They may be rendered severe, and even dangerous by neglect or improper remedies, as the giving of hot and stimulating drinks to hasten the eruptions, or confining the child in a hot room, covered with flannel and blankets during the fever and eruptions, and at the same time they are drenched with saffron tea, or hot toddy, for the purpose of driving out and keeping out eruptions. These improper means may cause inflammation of the lungs, which frequently prove fatal.

Very little medical treatment is necessary in ordinary cases. Cold drinks should be given, both during the period of fever and while the eruption lasts. Occasionally some cooling purgative may be given if necessary, but in mild cases no other treatment is necessary. In the latter stages of measles the occurrence of free purging often occurs. This is usually regarded as favorable, and astringents and anodynes should not be given to stop it. A knowledge of this fact is often important, as many children have lost their lives by such treatment.

Exclude light from the eyes and protect the child from exposure to cold air, a current of which might drive in the eruption. Never deny the patient cold water in abundance. Give light food, and sponge the face, chest and hands occasionally with warm water to which a little vinegar has been added. This will greatly relieve the heat, dryness and itching of the skin, which is often distressing at night.

Measure, in a legal and commercial sense, the dimensions of anything bought, sold, or valued. There are three kinds of measures: 1st, Linear measure, or that which is used for lines, which have only the dimension of length, such as roads or distances, either on the surface of the earth, or in absolute space. 2d, Square measure, or that which is used for surfaces which have the dimensions of length and breadth, as in land measuring, etc.; and 3d, Solid measure, or that which is used for solid bodies, which have the three dimensions of length, breadth and thickness, as in the measurement of timber, the gauging of vessels, etc.

All measures, whether linear, square or solid, are deducted from some standard measure of a lineal kind, either arbitrarily assumed, or related to some invariable distance in nature. Arbitrary standards have till lately been adopted by all nations, and their measures have been reduced from the length of some part of the human body, as the foot, the cubit, the span, the nail, the ulna or arm, the fathom, the pace, and the inch or thumb. The modern yard is said to have been adjusted by the arm of Henry I of England, in 1101; and it has been conjectured that the old French foot had a similar origin.

We have given the rules for measuring all the different articles that are usually measured under their respective heads. The rules for measuring brick work may be found on page 146; for measuring corn, on page 294; grindstones, page 607; measuring live cattle to estimate the weight, 215; hay, 649; boards, logs, sawed and hewn timber, 948; measuring land, 890. For the measuring of doses of Medicine, see that article. To measure the height of a tree, see Tree, and so on: to find the rules for measuring any article, see that article in its alphabetical place.

Meat, the flesh of animals, prepared for human food. But the name, in the popular use of it, seldom comprises the flesh of fishes, of fowls, or even of wild quadrupeds, and is principally confined to beef, veal, mutton, lamb and pork.

In this article we will treat the relative values of the different kinds of all the domesticated animals used for food, giving the joints or parts into which they are divided, the uses to which each part is generally appropriated. Directions are also given in selecting the different kinds of fish and poultry and the general principles of cooking and handling meat are laid down.

BEEF. Good beef has a fine, smooth, open grain, is red in color, and tender to the touch. The fat is white rather than yellow, and is moderate in quantity. The grain of cow-beef is closer and the fat whiter, but the lean is not so brightly red. Ox-beef is preferable to bull-beef, the flesh of the latter having a coarser and closer grain, the fat being hard and skinny, the lean of a deeper red, and the scent stronger. Bull-beef, being dry, tough, and difficult of digestion, is not often eaten. Heifer-beef, if well fed, is sometimes preferred to that of the ox. In old meat there is a horny streak running between the fat and lean of the sirloin and ribs.

In relation to the best cattle for beef, an experienced butcher speaks thus: "I shall present the experience which has brought me in contact with all sorts and sizes, shades and colors of cattle, and not only by hundreds, but by thousands, from the poorest,

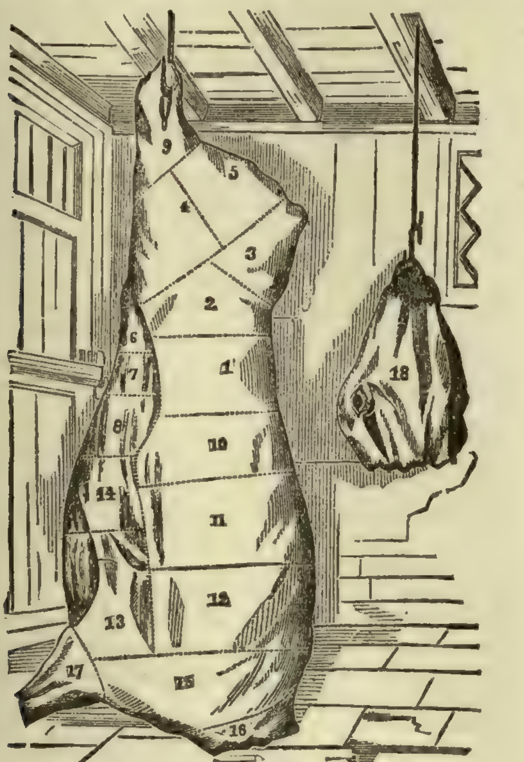


FIG. 1.—*Joints of the Ox.*

1 Sirloin.	8 Thin flank.	14 Brisket.
2 Top, or aitch-bone.	9 Leg.	15 Neck cut or neck piece.
3 Rump.	10 Fore rib (5 ribs).	16 Neck.
4 Buttock, or round.	11 Middle rib (4 ribs).	17 Shin or shank.
5 Mouse buttock.	12 Chuck rib (3 ribs).	18 Cheeks or head.
6 Verny piece.	13 Shoulder or Leg-of-mutton piece.	
7 Thick flank.		

toughest 'old bull,' used for jerked beef, to feed the slaves of the West Indies, to that of the choicest—the winners of many first prizes—which have been so elaborately prepared, both to please the palates of rich epicures and lovers of good beef, and also to gain the admiration of thousands. I place them in their order, as follows:

" 1. Spayed heifer, from four to seven years old.
" 2. Steer, or bullock, from four to six years old.
" 3. Free martin (or barren heifer), not over eight years old.
" 4. Ox, from five to eight years old.
" 5. Heifer, from three to four years old.
" 6. Cow, from three to eight years old.
" 6. Stag, from three to eight years old.
" 8. Bull, from two to six years old."

The best pieces for roasting are the sirloin, tenderloin and second and third rib cuts. The latter may have the bones removed by the butcher and be rolled and skewered before roasting, which is much the most economical and convenient way of serving. The bones may do duty to the soup kettle. Many persons think that the sweetness and goodness of the meat is impaired by removing the bones before cooking, and prefer that they should be taken only from the thin end, when that can be folded under.

The best steaks are near the ribs, five to eight inches on the side of the beef, and called "Porter-house steak." The next best comes from the sirloin.

The whole ham is used for dried beef. The best boiling pieces of corned beef comes from the brisket. Good steaks can be cut from the fore-shoulder. The best soup bone is the hind leg. The piece called the sticking place is usually boiled for mince pies.

VEAL. The calf, after it is slaughtered and dressed, is called veal; but, unlike the ox in its dressing, the butchers seldom take off the skin until the day it is to be placed in the shop for sale. It is retained on the carcass for the purpose of keeping the flesh moist, bright and clean. The age of the calf not being less than four nor more than six weeks, produces the best veal if properly fed and in good condition. At a less age the flesh is not fit for food, as it is flaccid, gelatinous and watery. When calves are wholly fed from the cow and range between

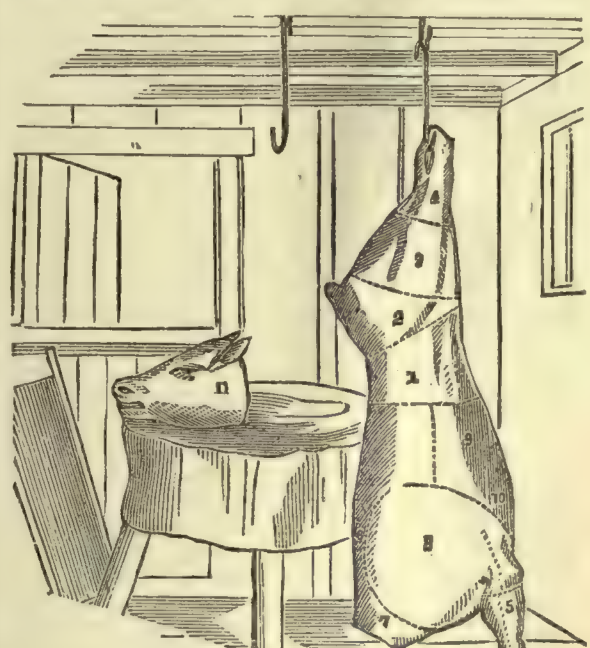


FIG. 2.—*Joints of a Calf.*

1 Loin, best end.	5 Fore knuckle.	9 Breast, best end.
2 Loin, thin end.	6 Neck, best end.	10 Breast, brisket end.
3 Fillet.	7 Neck, scrag end.	11 Head.
4 Hind knuckle.	8 Shoulder.	

the age of four to six weeks, they produce what may be called *milk veal*, being the most white, tender and delicate, and the choicest eating of all other veal.

In spite of the prejudice existing against this

animal, it furnishes materials for many dainty dishes. From its head to its feet it can be utilized. The loin of veal is best for roasting; the leg furnishes the fillet and cutlets; the knuckle makes a good soup, while from any portion of the fore-quarter may be made stews, fricandeaus and soups.

The sweetbreads are especially delicate, that nearest the heart being the best. The head, if nicely cleaned, makes a delicious mock turtle soup. It should be dressed and cleansed the same as pig's feet, that is, with the skin left on. The feet may be cooked with the head, or be made into jelly. The tongue is excellent pickled and the brains will make the most delicious of sauces. The liver is the best of all animal livers, as are the kidneys.

Pork. The young pig, termed the "sucking pig" or "roasting pig," is not changed in name, like the full-grown animal, by the fact of slaughtering. Living or dead it is named pig, a roaster or a roasting-pig. When dressed for choice eating it should not be less than three nor more than six weeks old. The skin of the roaster should be white (unless it has been a spotted or black-haired pig), plump, hard and well cleaned. The flanks, when it is opened, should be thick and fat, and it ought to weigh from eight to fourteen pounds. Its season is best in the autumn and winter months. The name of the half or full-grown hog and its varieties when prepared by the butcher is changed to pork. When living and of different ages and sexes they are known by several distinct names; those under one year are either called pigs, shoats or porkers. If the female within one year have pigs she is known as a "young sow," and no longer by the name of shoat, etc. When spayed the animal is known as a "spayed sow." Above one year the male is named a "young boar," when aged an "old boar;" and when altered a "barrow," or "barrow hog," or "hog," and when altered late or aged it is called a "stag-hog." The female is familarly named "sow," "sow hog," or "hog." These terms are applied to live animals. Experience and information in relation to the varieties which will produce the best kind of pork may be placed in the following order; 1, Barrow pigs or shoats, from three months to one year old; 2, hog, pigs or shoats, from three months to six months old; 3, barrow pigs (milk and grass fed), three months to one year; 4, sow pigs, from three to four months old; 5, barrow hogs and spayed sows, when one year, corn-fed, selected usually for bacon hogs; 6, sow hogs, ditto, selected usually for bacon hogs; 7, stag hogs; 8, boar hogs or boar, youngest best. The general appearance of the most choice pork is from an animal, the carcass of which will not weigh less than 50 and not more than 120 pounds. The skin should present a thin, transparent appearance, approaching white in color. The fat on the back should not be less than half an inch thick, white and firm, and the lean of a pale reddish color and sappy. The skin of the older animals or bacon hogs is thicker and coarser, while the lean is of a darker color, but equally sweet, juicy and tender. Hogs selected for bacon, clear pork, hams, shoulders, back fat, or for salted or barrelling pork, are usually from 150 pounds to 500 pounds.

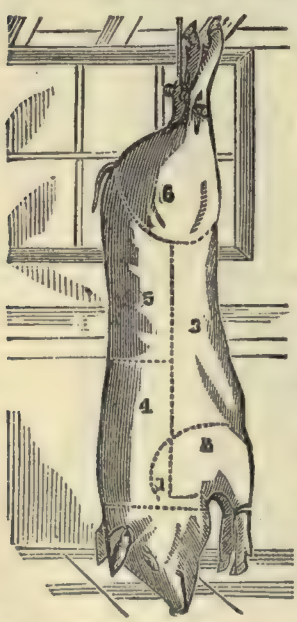


Fig. 3.—The Joints or Divisions into which Pigs are divided.

1 Spare rib. 2 Hand. 3 Belly, or brisket and flank. 4 Fore loin. 5 Hind loin. 6 Leg, or ham.

The roasting joints of pork are the spare ribs, loin and the leg; the other joints are salted. The leg may also be cured and boiled.

Mutton is divided into leg, loin (best end), hump and loin, neck (best end), scrag, shoulder and breast. The two loins together make a saddle of mutton. The leg and neck are boiled, the shoulder stewed.

It is an acknowledged fact that good mutton is one of the most nutritious as well as one of the most easily digested of meats, and therefore particularly well adapted to invalids. It is not the most economical, as there is a great deal of waste in so much fat; and lean mutton is not good, being generally dry and tough. In choosing mutton particular attention should be paid to the appearance of the fat. In the best it will look white and clear, and the lean will be firm, juicy and dark red. If the meat is indifferent the fat will be yellow and the flesh flabby and coarse-grained.

The saddle and shoulder of mutton are the best for roasting; they are improved by hanging for some days before cooking, as the "sheepy" taste is lost by exposure to a cool, clear air. The leg of mutton, unless very tender, is better for boiling, and

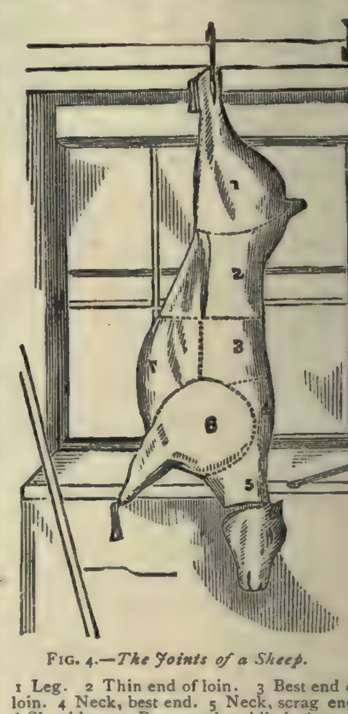


Fig. 4.—The Joints of a Sheep.

1 Leg. 2 Thin end of loin. 3 Best end of loin. 4 Neck, best end. 5 Neck, scrag end. 6 Shoulder. 7 Breast. A saddle is the two loins undivided. A chine is the two sides of the neck undivided.

may be cooked when quite fresh. The leg may also be cut for broiling, but although more economical, these cutlets are much inferior to chops from the loin or ribs. Good broth and stews may be made from the breast, scrag or flank, always being careful to remove the fat before serving.

LAMB. Lamb is generally recognized by butchers until it reaches the age of about twelve months, when it is termed yearling, although at this period the yearlings are often dressed "lamb fashion." The size, fatness, condition, age and sex are considered best in the following order: 1. Spring lamb (ewe), from six weeks to three months old. 2. Spring lamb (buck). 3. Wether lamb, three months to eight months old. 4. Ewe lamb. 5. Wether lamb or yearling, eight months to twelve months old. 6. Buck lamb. The spring lamb is commonly called house lamb, it is presumed, from the circumstance of its being born during the winter months, when its tender life, if not carefully housed, fed and kept warm, would perish, or remain dwarfish or become sickly. Its flesh is not prized for its unseasonable character, and, although delicate and tender, is quite insipid and is not nourishishing. Lamb is sometimes sold as early as March, after which it slowly increases in size and quantity; and in the months of June, July and August it is in full season and of fine quality. When first brought into market lamb is not sold in less quantity than a quarter its weight, being seldom above five or six pounds.

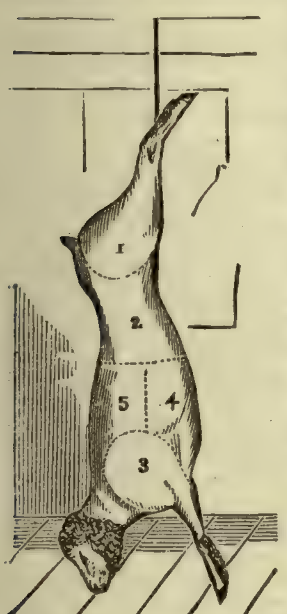


FIG. 5.—*The Lamb is divided as follows:*
1 Leg. 2 Loin. 3 Shoulder. 4 Breast. 5 Ribs.
3, 4 5, together, Fore-quarter.

To choose lamb, first examine the fat on the back, and then that of the kidneys, both of which should be white, hard and of the same color. Lambs are tender creatures. Rough handling, cold, stormy weather, insufficient food, and being long driven, produce a feverish state, which causes the fat and flesh to be veiny, and of a dark red color, and also renders it dry, tough and tasteless. The kidney fat of a fine (or inferior) lamb should not be raised, stuffed, or blowed, but merely its own caul or fat laid on its legs and flanks, to prevent them from drying or burning whilst roasting. The carcass of the lamb is first split down the center of the back and neck into two sides, which are quartered by leaving two or three ribs on the hind quarter of lamb. When large enough, and it is desired by the purchaser to be cut or divided, the leg is first cut off and prepared for roasting, boiling, or cut into chops, etc. Separated from the shoulder the neck and breast make a choice dish. Lambs' frys and sweetbreads are generally found in our markets in the spring and summer months on dishes, nicely cleaned and prepared ready for use. Some sprinkle a little parsley to decorate them. They are considered, and certainly are, delicate eating, and are therefore much sought after.

HOW TO SELECT MEATS. Besides the instructions above in reference to the qualities of the different kinds of meat, the following points in selecting should be observed:

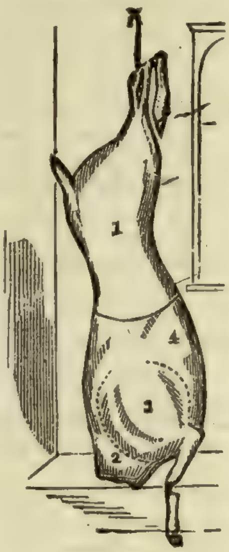


FIG. 6—*Joints of a Deer.*
1 Haunch 2 Neck. 3 Shoulder. 4 Breast.

Beef. Good ox-beef has a loose grain, red meat, and slightly yellowish fat; cow-beef has a firmer grain, whiter fat and less color. An animal old or ill-fed shows a dark red color in the lean and the fat is hard and skinny. When meat rises quickly after the pressure with the finger, it is good; when slowly, it is poor. If it bear a greenish tint and feels slippery on the surface, it is stale and unfit for food.

Veal. Good veal is usually white, though the dark is often good. If the kidney fat is fine and white, the meat is probably good.

Pork. Good pork has a thin, smooth rind, cool to the touch. If turning bad a dent with the finger remains. Kernels in the fat show that the hog was ill-fed or diseased.

Mutton. Good mutton is red and firm, the grain close and fat white.

Lamb should be small; of a pale-colored red, and fat.

Venison. You can tell as to being "high" or not, by running a skewer into the shoulder, and observing the scent on it when withdrawn. The fat should be thick and clean. If the cleft of the haunch is smooth and close, the animal is young.

Bacon. If bacon is good the rind is thin, the fat firm and pinkish, the lean tender and adhering to the bone. Rusty bacon has yellowish streaks in it.

Hams are tried by sticking a knife or skewer into them up to the knuckle; if when drawn out it has a nice smell, the ham is good. A bad scent will be perceived if it is tainted.

As to the identification of diseased and other poor meat, the residents of towns and cities are more concerned than farmers; but as farmers buy a large proportion of the fresh meat they use, it is equally important for them also to be able to distinguish good meat from bad. Sometimes meat becomes poisoned by the animal feeding upon a poisonous substance previous to being killed. There are several diseased

conditions which are not apparent in the animal while living, and some of these conditions are difficult of discernment after death, even by the microscope. Scientific physicians are cognizant of many more ailments in the human family due to diseased meats than the public are aware of. When cattle are overdriven or otherwise worried, they become feverish and their meat becomes diseased and unwholesome. Also, anger suddenly converts the secretions of the body into poisons. When a person bites another or himself accidentally and not in anger, the injury is no worse than if the wound were made by a piece of wood or bone; but if the party biting is highly excited by anger, the wound is about as dangerous as the bite of a rattlesnake or mad-dog. It is in a measure the same with lower animals. Angering them before death, even but for a moment, poisons their flesh to some extent. Slaughterers generally hasten roughly on with their business, not taking pains to be nice with their work, either in the selection and slaughter of their animals or the trimming of the meat. If they can only make it look well until they sell it, they are satisfied. They have no object in being more particular, in a general way, than are their customers, many of whom spoil good meat after they get it.

It is fashionable, especially in cities and among those who affect a French taste, to allow all unsalted meat to commence decay before it is cooked and served; but every hygienist condemns the practice; indeed, it seems that common decency alone should deter any "white man" from the use of such flesh. Perfectly sound, wholesome meat is of course not so "tender" as that which has commenced decomposition. In all sound flesh the muscles are firm and elastic, pale for the young animals and darker for the older ones. A deep purple color is good evidence that the animal died without being bled, and the meat is therefore unfit for food. Diseased meat generally has a more or less unpleasant or suspicious odor, has a wet, flabby, sodden appearance, and the fat looks like jelly or wet parchment. The marrow in the leg bones is of a light, rosy red color for 24 hours after killing. If the marrow is soft, brownish in color, or if it shows black points, the animal has been sick and putrefaction has commenced. On slaughtering an animal, an inspection of the lungs, liver and spleen will often reveal its true condition.

To Choose Poultry and Game. *Turkey*. The cock bird, when young, has a smooth, black leg with a short spur. The eyes are bright and full, and the feet supple, when fresh; the absence of these signs denotes age and staleness; the hen may be judged by the same rules.

Fowls. The young rooster has a smooth leg and a short spur; when fresh the vent is close and dark. Hens, when young, have smooth legs and combs; when old, these will be rough; a good capon has a thick belly and large rump, a poll comb and a swelling breast.

Geese. In young geese the feet and bill will be yellow and free from hair. When they are fresh the feet are pliable; but they are stiff when stale.

Ducks may be selected by the same rules.

Pigeons, when fresh, have supple feet, and the vent will be firm; if discolored they are stale.

Rabbits. When a rabbit is young and fresh, the cleft in the lip is narrow, the body stiff, and the claws are smooth and sharp; old and stale ones will be the opposite of this.

Partridges. Yellow legs and dark bills are the signs by which a young bird may be known: a rigid vent when fresh. When this part is green the bird is stale.

Moore Game. Grouse, woodcocks, snipe, quails, etc., may be chosen by the rules above given.

Choose white-legged fowls for boiling, and dark for roasting.

How to Select Fish. The only rule in selection is to get them as fresh from the water as practicable, alive if possible, and kill. A fish allowed to die slowly is not so good as when killed immediately before cooking.

The eyes of fish, if fresh, are bright, the gills of a fine, clear red, the body stiff, and the smell not unpleasant. Chloride of soda will restore fish that is not extremely fresh, but it is never so good as when it has not been kept.

The salmon and the cod should have a small head, very thick shoulders, and a small tail. The flesh of the salmon should be of a bright red color, the scales very bright.

Do not buy herrings, mackerel, unless quite fresh, and do not attempt to keep them even till the next day. Cod may be kept twenty-four hours.

Eels should be bought alive. Crabs and lobsters should be heavy and very stiff; if they feel limp they are stale. They are often bought alive. Oysters, if fresh, will close forcibly on the knife when opened. If the shell gapes in the least degree, the oyster is losing its freshness. When the fish is dead the shell remains open.

Cooking, Preserving and Handling Meats. There are some general remarks on the various modes of cooking, preserving and handling meats that are quite essential.. We have treated the cooking of each particular kind of meat under their respective names, but the following are observations or principles that apply to all meats:

Meat, to be in perfection should, when the weather will admit of it, be kept a number of days. Beef or mutton should be kept at least a week in cold weather, and poultry three or four days. It should be kept in a cool, airy place, away from the flies, and if there is any danger of its spoiling, a little salt should be rubbed over it.

Meat should be wiped with a dry, clean cloth as soon as it comes from the butcher's; fly-blows, if found in it, cut out, and in loins the long pipe that runs by the bone should be taken out, as it soon taints; the kernels also should be removed from beef. Never receive bruised joints.

Meat will keep good for a long time in cold weather,

and, if frozen through, may be kept for months. Frozen meat must be thawed before it is cooked by plunging it into cold water or placing it before the fire before setting it down to roast. It will never be dressed through if this precaution is not taken, not even when twice cooked.

Pepper is a preventive of decay, in a degree; it is well, therefore, to pepper hung joints.

Powdered charcoal is still more remarkable in its effect. It will not only keep the meat over which it is sprinkled good, but will remove the taint from already decayed flesh.

A piece of charcoal boiled in the water with "high" meat or fowls will render it or them quite sweet. A piece of charcoal or powdered charcoal should be kept in every larder. Hams, after being smoked, may be kept for any length of time packed in powdered charcoal.

To destroy taint in cooking meat. Put your meat between layers of charcoal both before basting and while basting. You may purify your coals by heating them red-hot, so as to use the same coals in the two operations.

To sweeten tainted meat. To those that wish to sweeten tainted meat, dig a hole eight or ten inches deep, and large enough to lay the meat in single layers; place a thickness of cloth between it and the ground, laying the pieces so they will not touch; then spread cloth over, tucking it down so the dirt will not touch the meat; then cover with dirt quite deep, and leave for two or three days; it will then be sweet.

To tender meat. Soak it in vinegar and water; if a very large piece, for about twelve hours. For ten pounds of beef use three quarts of water to three-quarters of a pint of vinegar, and soak it for six or seven hours.

Boiling. The best way to boil meat is to put it in cold water, and boil it gently, with just water enough to cover it, as it hardens by furious boiling. The scum should be taken off as soon as it rises. Do not let the meat remain long in the water after it is done, as it injures it. The liquor in which all kinds of fresh meat is boiled makes a good soup when thickened and seasoned.

Broiling. Cleanliness in this mode of cooking is very essential. Keep the gridiron clean between the bars, and bright on the top; when it is hot wipe it well with a cloth just before you use it. It is best to oil the gridiron with suet, and also heat it before putting the meat on. Chalk is sometimes rubbed on the gridiron, when fish is to be broiled. It is better to have a gridiron expressly for fish, otherwise meat is often made to taste fishy. Be diligently attentive to watch the moment anything is done. Never hasten the broiling of anything, lest you spoil it. Broils must be brought to the table as hot as possible.

Roasting. The first preparation for roasting is to have the spit properly cleansed. It is well, if possible, to wash it before it gets cold.

Have a fire so large as to extend six inches beyond the roaster each side. When your meat is thin and tender, have a small, brisk fire. When you have a large joint to roast, make up a sound, strong fire, equally good in all parts. Set the meat, at first, some distance from the place where it is to roast, so as to have it heat through gradually, and then move it up to roast. Allow about fifteen minutes to every pound of most kinds of meat in warm weather, but in winter twenty minutes. When the meat is nearly done stir up the fire to brown it. The meat should be basted a good deal, especially the first part of the time. A pale brown is the proper color for a roast. When the meat is nearly done, the steam from it will be drawn towards the fire. Flour thickening in gravies must be wet up in very little water till the lumps are out, and then made thin. Strain all gravies.

Baking is a very cheap and convenient way of dressing a dinner for a small family. Legs and loins of pork, legs of mutton, fillets of veal, and many other joints will bake to great advantage, if the meat be good or rather fat; but if poor, no baking will give satisfaction. The time of baking depends much upon the state of the oven, of which the cook must be the judge. The preparation of the articles to be baked is much the same as for roasting.

Frying is a very convenient mode of cookery. To make sure that the pan is quite clean, rub a little fat over it, and then make it warm, and wipe it out with a clean cloth. It is best to fry in lard not salted, and this is better than butter. Mutton and beef suet are good for frying. The secret in frying is to know when the fat is of a proper heat—according to what you wish to fry. When the lard seems hot, try it by throwing in a bit of bread. To fry fish, potatoes, or anything that is watery, your fire must be very clear, and the fat very hot. When taking up fried articles, drain off the fat on a wire sieve.

To Cook Poultry. All kinds of poultry and meat can be cooked quicker by adding to the water in which they are boiled a little vinegar or a piece of lemon. By the use of a little acid there will be a considerable saving of fuel, as well as shortening of time. Its action is beneficial on old tough meats, rendering them quite tender and easy of digestion. Tainted meats and fowls will lose their bad taste and odor if cooked in this way, and if not used too freely no taste of it will be acquired.

For particulars in cooking the different meats, see Bacon, Beef, Fowl, Ham, Mince Meat, Mutton, Pork, Rabbit, Turkey, Veal, Venison, Pies and the following miscellaneous preparations:

To Cure Meat. To one gallon of water add 1½ pounds of salt, ½ pound of sugar, ½ ounce of saltpeter, half an ounce of potash. In this ratio the pickle may be increased to any quantity desired. Let these be boiled together until all the dirt from the sugar rises to the top and is skimmed off. Then throw it into a tub to cool, and when cold, pour it over your beef or pork, to remain the usual time, say four or five weeks. The meat must be well covered with pickle, and should not be put down for at least two days after killing, during which time it should be slightly

sprinkled with powdered saltpeter, which removes all the surface blood, etc., leaving the meat fresh and clean. Some omit boiling the pickle, and find it to answer well; though the operation of boiling purifies the pickle by throwing off the dirt always to be found in salt and sugar. If this recipe is properly tried it will never be abandoned. There is none that surpasses it, if so good.

To Preserve Meat. A process for preserving meat in cans is this: Pack the meat, in its raw state, into tin cans of any desired size. Solder down the lids, the top of each having a small tin tube inserted in it, which communicates with the interior of the tin. These tubes must next be inserted in the exhauster, which is a receptacle connected with a machine designated a Torricellian vacuum, an apparatus in which the air is exhausted by the action of water. The tins are then placed in the cooking-bath, and at the proper juncture the vacuum is created, at a temperature varying from 180° to 228°. At this stage another feature of the invention comes into play. The vacuum having been created, a supply of gravy is turned on from a receptacle, and the tins filled with the fluid. The feed-pipes of the tins are nipped and the cases hermetically sealed. By thus filling the tins with the gravy the difficulty of collapse, which once prevented large tins from being used, is obviated, while the whole space of the package is utilized.

To Pickle Meat. Moist sugar, 2 pounds; bay or common salt, 4 pounds; saltpeter, ½ pound; fresh-ground allspice, 2 ounces; water, 6 to 8 quarts. Dissolve. Used to pickle meat, to which it imparts a fine red color and a superior flavor.

Medic (med'ic), one name of lucern or alfalfa.

Medicine, literally, that which heals or cures; in common usage, a drug taken into the stomach or veins for the purpose of curing one of disease. Medicines are weighed by what is called "apothecaries' weight" in the arithmetics.

The following table will be found a very accurate way of measuring quantities and is convenient for the household where there are no scales or measures.

A pint	usually contains about	16 ounces.
A tumbler		10 ounces.
A tea-cup		6 ounces.
A wine-glass		2 ounces.
A table-spoon		4 drams, or ½ ounce.
A dessert-spoon		2 drams.
A tea-spoon		1 dram, or 60 drops.

These quantities refer to ordinary-sized spoons and vessels. Some cups hold half as much more, and some tablespoons contain 6 drams. Many persons keep a medicine-glass, which is graduated so as to show the number of spoons it contains.

Whenever a tea or tablespoon is mentioned, it means the same as it should say spoonful; the same of cup, in fluid measures; but in dry measures, where a spoon or spoonful is mentioned, the design is that the spoon should be taken up moderately rounding, unless otherwise mentioned.

A tablespoonful is often mentioned as a measure or quantity in a recipe or prescription. By this is generally meant a measure or a bulk equal to half an ounce of water. By a dessert-spoonful is meant half a tablespoonful, and a teaspoonful is equal to a dram of water. Drop is a vague measure, because the quantity depends upon the consistency of the liquid and the size and shape of the mouth of the bottle. One drop is considered by the medical profession to mean one grain, 60 drops being a fluid drachm.

TABLE OF DOSES OF MEDICINES.

Aconite, tincture of, 15 to 20 drops.
Aloes, powdered, 10 to 15 grains.
Antimonial wine, 1 teaspoonful.
Balsam copaiba, ½ teaspoonful.
Blue mass, 5 to 10 grains.
Camphor, 5 to 10 grains.
Calomel, 5 to 20 grains.
Castor oil, 1 to 3 tablespoonfuls.
Chalk, prepared, 10 to 20 grains.
Chalk, mercurial, 5 to 20 grains.
Chloroform, 30 to 60 drops (in syrup).
Chlorate potash, 15 to 30 grains (in sweetened water or lemonade).
Croton oil, 1 drop (in pill or liquid).
Cream tartar, ½ to 1 teaspoonful.
Dover's powder, 5 to 10 grains.
Elixir vitriol, 5 to 10 drops.
Ether, sulphuric, ½ a teaspoonful.
Epsom salts, 1 to 2 tablespoonfuls.
Ergot, powder, 10 to 20 grains.
Essence peppermint, ½ to 1 teaspoonful.
Hive syrup, ½ to 1 teaspoonful.
Hoffman's anodyne, ½ teaspoonful.
Iodide potassa, 1 to 5 grains.
Ipecac, powder (emetic), 30 to 50 grains.
Jalap, powder, 10 to 30 grains.
Laudanum, 10 to 30 drops.
Magnesia, calcined, ½ to 1 teaspoonful.
Morphine, ⅛ to ¼ grain.
Number Six, 1 teaspoonful.
Oil peppermint, 1 to 2 drops.
Opium, powder, 1 grain.
Paregoric, 1 to 3 teaspoonfuls.
Piperine, 1 to 3 grains.
Quinine, 1 to 4 grains.
Rhubarb, powder, 10 to 30 grains.
Soda, carbonate, 10 to 30 grains.
Sulphur, powder, 1 teaspoonful.
Sugar of lead, 1 to 2 grains.
Syrup squills, 1 teaspoonful.
Syrup ipecac, 1 teaspoonful (for children).
Syrup rhubarb, 1 to 4 teaspoonfuls.
Spirits nitre, 1 teaspoonful.
Spirits camphor, ½ a teaspoonful.
Spirits hartshorn, 10 to 15 drops.
Spirits lavender (compound), ½ a teaspoonful.
Spirits turpentine, 5 to 20 drops.

Tartar emetic (emetic), 1 to 2 grains.
Tannin, 1 to 2 grains.
Tincture arnica, 30 drops to 1 teaspoonful.
Tincture assafœtida, ½ a teaspoonful.
Tincture Cayenne, ½ to 1 teaspoonful.
Tincture iodine, 10 to 20 drops.
Tincture iron (muriate), 10 to 30 drops.
Tincture lobelia, 1 teaspoonful.
Tincture rhubarb, 2 to 4 teaspoonfuls.
Tincture valerian, 1 teaspoonful.
Tincture bark, 2 to 4 teaspoonfuls.
Tincture ginger, 1 teaspoonful.
Tincture kino, ½ to 1 teaspoonful.
Wine, colchicum, 10 to 20 drops.
Wine, ipecac, ½ to 1 teaspoonful.
White vitriol (emetic), 40 grains.

The above doses are for adults; children of 12 years may take half the quantity; five years, one-fourth; and younger in proportion.

Note. The dose of medicine, as a general rule, may be repeated once in three hours. Liquids should be given in a little sweetened water. Powders may be mixed in syrup or molasses.

Rules for Proportioning Doses, Having Reference to Age and Sex. When for adults (30 to 50 years old) the dose is 1 dram, or 60 grains, 20 years old, it is 40 grains; 13 years, 30 grains; 7 years, 20 grains; 4 years, 15 grains; 3 years, 10 grains; 2 years, 7 to 8 grains; 1 year, 5 grains.

For babes under 1 year, the dose should go down by months, at about the same rate as by years for those over 1 year.

Again, for persons in advanced life, say from 60 years, the dose must begin to lessen about five grains, and from that on, 5 grains for each additional 10 years. Females, however, need a little less generally than males.

Sex, temperament, constitutional strength and habits of individuals must be taken into account. Nor does the same rule apply to all medicines. Calomel, for instance, is generally borne better by children than by adults, while opium affects them more powerfully and requires the dose to be diminished. The rule must also vary in castor oil, the proportion of which cannot be reduced so much.

Megrims (me'grimz): see page 791.

Melilot (mel'i-lot), sweet clover; a good honey plant, but spreading as a persistent weed. A specimen of it drying in a room yields a sweet, fragrant odor. See page 273.

Melon. See Muskmelon and Watermelon.

Melocotoon (mel o-co-toon'), a quince or large kind of peach.

Meningitis (men-in-ji'tis), inflammation of the membranes of the brain or spinal cord.

Mercury, a liquid metal called quicksilver, which differs from all other metals in being fluid in the temperature of this climate. It has, however been frozen both by the natural cold of high northern latitudes, as in Minnesota, and by artificial cold produced by mixture of snow and aqua fortis. It is found to congeal at 40 degrees below zero of Fahrenheit's scale. Mercury unites with other metals, forming a soft mass termed an amalgam. On this property depends the art of gilding, and the art of coating looking-glasses. There are but few mines of quicksilver; the greatest quantity is procured in Spain. In its metallic state it is used as a medicine. There is, however, a prevalent idea in the minds of ignorant people that doctors and veterinary surgeons give this substance to force a passage through the bowels, and that if it fails the bowels and stomach will be ruptured or torn. If the patient should die, the blame is not unfrequently laid on the use of quicksilver by the doctor, when this substance was never thought of for any such purpose. Quicksilver has no action whatever on the animal system, either in health or sickness.

Mercury with Chalk, Gray Powder, is used in diarrhœa in calves, in doses from ten to fifteen grains, given with a little ginger and mixed with wheat-flour gruel.

Bi-chloride of Mercury. See Corrosive Sublimate.

Nitrate of Mercury Ointment. This is the citron or golden ointment, and is a good remedy in ringworm. Unfortunately, however, it spoils with long keeping, and not being made extemporaneously, it is often rancid and of little value.

Oxide of Mercury, Red Precipitate, is used in the treatment of unhealthy sores, in the form of powder and ointment.

Sulphate of Mercury, Turpeth Mineral. A medicine of no use and should be expunged from the books on horse and cattle diseases.

Sub-chloride of Mercury, Calomel. A medicine many practitioners never use and will not recommend for internal administration. In the form of the black-wash, and sprinkled upon sores, it is a good remedy. Calomel is recommended for thrush in the feet, and is inserted in the cleft of the frog.

Mercurial Ointment. This is sold in the drug stores. The ointment of mercury is chiefly used in skin diseases, as mange in horses and dogs. Equally as good a remedy, however, will be found in sulphur and its preparations, which are not only more safe, but more certain of curing the case.

Mercurial Poisons. The symptoms when a person is poisoned by corrosive sublimate, calomel, red precipitate, vermilion, turpeth mineral, prussiate of mercury, are acid metallic taste; tightness and burning in the throat; pain in the back part of the mouth, stomach, and bowels; anxiety of countenance; nausea; and vomiting of bloody and bilious fluids; profuse purging, and difficulty of making water; pulse small, hard and quick; skin clammy; icy coldness of the hands and feet; and death in 24 or 36 hours.

Antidote: White of eggs mixed with water; milk; flour and water, mixed pretty thick; linseed tea; and barley water. *Treatment:* Give large draughts of

warm water, if you cannot get anything else: strong emetic of ipecacuanha, the stomach-pump, a dose of castor oil and laudanum. Foment the bowels with poppy-head fomentations, and apply leeches if the belly is very tender.

Mesentery, a great folded membrane, within the abdomen of a vertebrated animal, including the intestines in its folds, retaining them in their places, and enclosing within its laminæ the nerves and vessels which connect the nutrimental evolutions of the intestines with the circulation. This membrane is simply a prolongation of the peritoneum; and, though eventually possessing many duplicatures, is single in its upper part. An inflammation in it is called mesenteritis, and requires to be treated in the same manner as kindred abdominal inflammations.

Mesmerism, the art of introducing an extraordinary or abnormal state of the nervous system, in which the actor claims to control the actions, and communicate directly with the mind, of the recipient. The actor, however, makes such claim to the recipient rather than to the public, in order to obtain and keep control of him. Mesmerism is often of great medical service; and when it avails, it is of course preferable to dosing the system with medical nostrums.

Mesquite (mes-ke′tay or mes-keet′), a rich, native grass in Western Texas.

Meteorology, the science which treats of the phenomena which occur in the atmosphere,—of their causes and effects. See Weather.

Metheglin: see Mead.

Metric System. As this is fully explained in all our modern school arithmetics, we will give only a condensed view here, with a few practical suggestions. For all the (dozen) irregular tables of weights and measures now in use, the "metric" system substitutes only one, small, symmetrical table, where the multiples are all tens or tenths.

VALUES OF THE ROOT WORDS.

NAME.	AB'N.	SYM.	VALUE.
meter	em	m	39.3685 inches.
liter	el	l	61.533 cu. in., or dm cubed.
gram	eg	g	15.433 grains, or cm of water.
are	ar	a	119.589 sq. yds, or Dm squared.
stere	es	s	36.609 cu. ft., or m cubed.
tonneau	ton	t	2,203 pounds, nearly.

VALUES OF THE PREFIXES.

milli-	m	.001
centi-	c	.01
deci-	d	.1
....		1.
deca-	D	10.
hect-	H	100.
kil-	K	1,000.
myria-	M	10,000.

Each prefix is attached to each root-word, forming self-explanatory derivatives. A millimeter is therefore 1,000th of a meter; a centimeter, 100th of a meter, a decimeter, one-tenth of a meter; a decameter, 10 meters; a hectometer, 100 meters, etc.; and so on with the other terms. A milliliter is 100th of a liter; a kiloliter, 1,000 liters, etc. The meter is for linear measure, the liter is for liquid measure, the gram (or gramme) for weight, the are for surface measure, and the stere for cubic measure. The "tonneau" is an unnecessary compromise term which some persons use.

By the adoption of this system the worst half of all commercial arithmetic would be done away with, and all the irregular and vexatious tables of weights and measures, covering several pages of our present arithmetics, with the many accompanying pages required to explain and apply them, would be superseded by the following:

milli-	
centi-	meter
deci-	liter
....	gram
deca-	are
hecto-	stere
kilo-	
myria-	

Not all of the above will be needed in practice in this country, the following terms probably being all that will ever come into use here:

NAME.	SYMBOL.	PROX. VAL.
em	m	1.09 yard
centem	cm	.4 inch
dekem	Dm	2 rods
kilem	Km	⅔ mile
millar	ma	1 square foot
deciar	da	⅓ square rod
hectar	Ha	2½ acres
myriar	Ma	⅓ square mile
es	s	1⅓ cubic yards
centes	cs	⅓ cubic foot
deceg	dg	1½ grains
hecteg	Hg	3½ ounces
kileg	Kg	2.4 pounds
ton	T	2,203 pounds, nearly
el	l	1 quart
decel	dl	.8 gill
dekel	Dl	2½ gallons
hectel	Hl	3.1 bushels

It is suggested that the most convenient method of reading metric quantities may be as thus illustrated:

7.02 dl=seven decels, nought, two.
45.817 Dm=forty-five dekems, eight, one, seven.
.036 Hg=nought, three, six hectegs.

For the convenience of some we will add—

1 foot=304.8 mm
1 sq. ft.= .93 ma
1 quart= .937 l, or 937 ml
1 pound= 453 g

Mexican Falcon. One of the most beautiful birds met with on our western plains is the Mexican or Prairie falcon, known also as the Lanier falcon. They have brown feathers on the back, while the breast has many long dark spots, shaped like arrow heads, on a yellowish-white ground. Its beak is short, broad and stout, head wide, and its talons large and strong. Its legs are feathered, but its toes are bare. Its length is about 17 inches, with a stretch of wings 41 inches. Its motions are quick, though exceedingly graceful, and in its flight it cuts the air like an arrow. Like all the Falconidæ, or diurnal birds of prey, it is always stern and unrelenting in appearance, and is ever on the look-out to capture and eat some bird more feeble than itself. They are noted for their ferocity and bravery and are never loth to attack an enemy much larger and stronger than itself.

Miasm, or Miasma, infection floating in the air.

Mica, a mineral capable of being cleaved into elastic plates of extreme thinness. It is sometimes colored, but it is always more or less transparent, and is very useful in lanterns, doors of stoves, etc.

Mice. To destroy, see Rats. For field-mice, see Moles.

Middleman. As the term implies, this means the man between the producer and the consumer. He is a non-producer and non-consumer, yet realizes profits on goods others produce and consume, because he carries from one to the other.

Midge, a minute insect infesting wheat and gooseberries. The wheat midge is treated under the head of Wheat. The gooseberry midge injures gooseberries by depositing its egg in the fruit, and the larva, or grub, having hatched, feeds inside, and causes the gooseberry to present a prematurely ripe appearance, to turn red and then drop from the bush. It is recommended to pick all fallen fruit from the ground and burn immediately, as, although this may not be the means of freeing the bushes the same season, the berries being already destroyed or infected, the following year there will be scarcely any midges to attack the crop.

Midriff (mid'riff), the Diaphragm. See page 680.

Migratory, migrating or moving to the North or South with the seasons, as is done by numerous birds and fishes.

Milch, furnishing milk: applied only to beasts, as milch cows.

Mildew, a thin, whitish, powdery or cobweb-like coating, consisting of minute fungi and found on various diseased and decaying substances. Almost any organic substance kept in confined moist air at a summer temperature, will become covered with mildew.

Often people are greatly troubled and perplexed by mildew from damp closets, and we therefore give the following receipts for removing it from goods of various kinds:

For Removing Mildew. Dissolve chlorate of lime in sufficient water to cover the goods; put in the goods, let stand a few minutes, ring out and spread in the sun; repeat two or three times and the mildew will entirely disappear; then take up, wash and boil, and you will not only find the mildew removed, but your clothes nicely bleached.

To take Mildew out of Muslin. Soak several days in sour milk, then wash, and dry in hot sun. Repeat if necessary. During the summer washing is made much easier by soaking clothes in sour milk, taking care to wring out of milk and soak in water over night.

Mildew can be taken out with bar-soap and powdered chalk. Wet the cloth, rub on the mixture, and lay it in the sun.

Preventive. By putting an earthen bowl or deep plate full of quicklime into the closet, the lime will absorb the dampness and also sweeten and disinfect the place. Rats, mice and many bugs that are apt to congregate in damp places have a dislike to lime. As often as the lime becomes slacked throw it on the compost heap if in the country, or into the ash-barrel if in the city.

Mile. The statute mile is 5,280 feet, or 1,760 yards. The geographical or nautical mile is 2,029 yards, or 6,087 feet. Some authorities give it as a little less.

Milfoil, yarrow; a tansy-like weed common in old pastures, meadows and waste places.

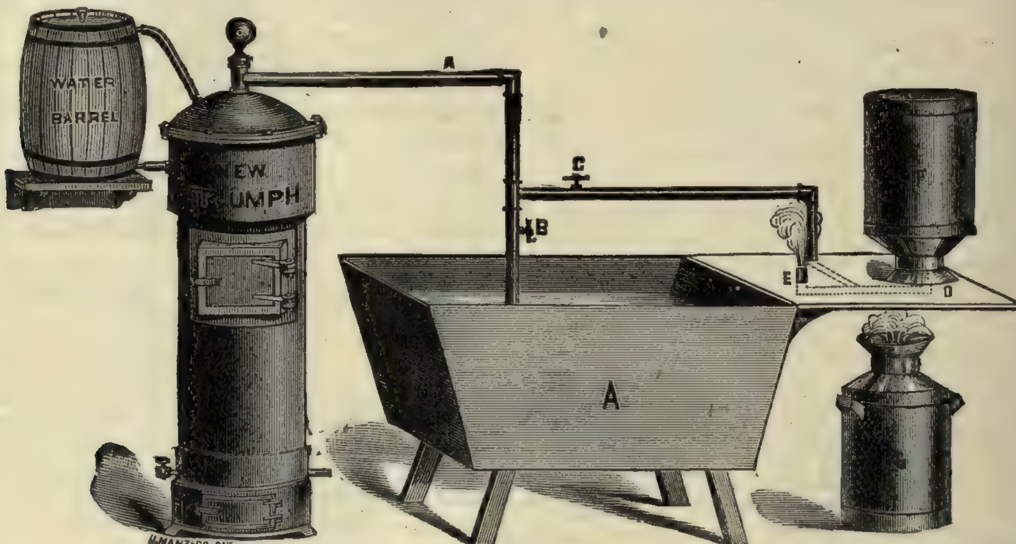
Milk, a whitish, opaque fluid, composed of a fatty substance, which forms butter, a caseous substance, which forms cheese, and a watery element, known as serum or whey, in cheese-making. Milk is obtained only from the class of animals called mammalia, and is intended by nature for the nourishment of their young. The milk of each animal is distinguished by some peculiarities, but that of the cow is of vastly more importance to us in this part of the world, and of course will receive our greatest attention. To this animal we are indebted for three of the most useful articles of food,—milk, butter and cheese.

The butter matter in pure milk varies in amount from about two and a half to six and a half per cent., the cheesy element from three to ten per cent., and the serous matter, or whey, from 80 to 90 per cent. To the unassisted eye milk looks of a perfectly uniform nature and consistence throughout. It contains, however, myriads of minute globules of very unequal size which under a microscope will be seen floating in the watery matter. These are enveloped in a delicate film of cheesy matter and are so minute that they will pass through the finest filter-paper. (See Flecks in Milk, page 486.) Milk readily mixes with water although of less specific gravity or weight. Its average specific gravity is 1,025, that of water being one. The various elements of milk being of different specific gravities, changes begin to take place in it as soon as it is at rest. The butter material being oily

and lighter than the remainder of the fluid, rises to the top and forms cream, while the heavier serous matter or whey sinks to the bottom. At a high temperature acidity soon sets in and hastens this separation of the whey from the other constituents. It is consequently easy to distinguish the three principal elements of milk. The strength of milk is imparted to it by the caseous or cheesy element; its richness by the buttery or oily substance, and its sweetness by the sugar of milk which it contains.

The proportions of these elements vary considerably according to the breed of the animal, the food, the length of time after calving, etc. The first of these questions will be found fully treated under the head of Cows. The udder of the cow is divided into what may be termed sections or compartments, of which there are four. The two teats of the hind sections give, as a rule, more milk than the teats of the front sections. Milk is one of the most sensitive of all fluids to external influences. The action of many of these is not well understood. Even in the cow herself it is probable that the milk of the various divisions of the udder differs to some extent in quality. It is quite certain that marked differences both in composition and quality are noticeable in the milk of different cows, even when fed on the same food. It is conceded by all conversant with the subject that the effect of food upon the quality and quantity of the milk is more direct and powerful than anything else. This is natural, inasmuch as the food is the source from which all the secretions of the body are derived. The great importance of this portion of our subject is at once manifest. As usual in such cases, there is some difference of opinion among authorities as to the best and most profitable method of feeding milch-cows. But there are certain leading points upon which there is tolerable unanimity of view and practice. In order to render the flow of milk richer and more uniform, cows are sometimes spayed, or castrated, as described on page 304. A moist climate is held to be much more favorable to the production of milk than a dry one; consequently in very dry seasons the quantity of milk yielded by the cow will be smaller than in moist, mild seasons, though the milk will be richer in quality. In summer, milk is richer in cheesy matter and less buttery than in winter. Even when feeding is precisely the same, milk is whiter in winter than in summer. The milk of the same cow is at certain seasons bluer than at others. This is often noticed in exceedingly hot weather. The first milk drawn from the cow is the poorest; the quality progressively improves until the last drop.

Milk which is carried to a considerable distance, so as to be much agitated, and cooled before it is put into pans to settle for cream, never throws up so much, nor so rich cream, as if the same milk had been put into pans directly after it was milked.



Arrangement for Steaming Milk Cans.

When exposed to heat milk boils at 199°, water boiling at 212°; and in the boiling a curd of caseous matter is partly coagulated, rising to the surface in form of a pellicle or thin skin; if this be removed it is soon succeeded by another, and the effect would go on till the residuum would have a watery appearance and be incapable of furnishing any more such pellicle.

The accompanying illustration represents a very convenient arrangement for washing, steaming and drying milk cans, covers, pans, etc. A is a tank containing water which is heated by steam and conveyed from the boiler through the pipe A B. After being washed in this, the cans are inverted and placed on the table over the pipes E and D. Steam is then turned into them until they become heated, when they are removed and placed right side up. Then being hot, all moisture on the inside evaporates and

passes off with the steam, leaving them perfectly dry and sweet. Covers, small cans, pans, etc., may be steamed by piling them on the table and placing a blanket or box over them.

We very fully treat of the selection, feeding, care and management of milk cows in the article on Cow, and the proper mode of milking and training the calf in the same article and in the article Milking. Cream, Butter, Dairy and Cheese are treated under their respective heads.

Milk of Various Animals. There is considerable difference in the milk of various animals.

The milk of the human subject is much thinner than cow's milk and contains more saccharine matter. It yields much cream, but no butter can be procured from it by agitation.

Asses' milk comes the nearest to human milk of any other; it has, likewise, more saccharine matter than milk from the cow, and is thinner, with a larger proportion of curd. It is considered as the lightest and easiest to digest of any; hence it is a popular remedy in consumption, but is apt to cause diarrhœa in very delicate persons, if taken in too great a quantity. Artificial asses' milk may be prepared by dissolving two ounces of sugar of milk in a pint of cow's milk. Or the following preparations are used freely as substitutes for asses' milk, and may be administered in cases of consumption and general debility, a teacupful three or four times a day, either plain or with a spoonful of rum. Mix the whites of two eggs with three-fourths pint new cow's milk, and one ounce sugar; add three-fourths ounce syrup of tolu.

Goat's milk is something thicker and richer than cow's milk. It has a peculiar aroma, contains a great deal of curd, and makes excellent cheese; also affording butter, which is whiter than that from the cow, and is said to keep longer. The milk of the goat is much used in Spain, Italy, and the south of France.

Ewe's milk has the appearance of cow's milk. It affords a larger quantity of cream, forming a soft and very fusible butter. Its curd is very soft and unctuous, and when mixed with that of the cow, it gives it a rich appearance. It makes excellent cheese, and in greater quantity than any other milk, but contains the least sugar of any.

Mare's milk contains more sugar than that of the ewe, and hence it is much used in Tartary for making a fermented liquor. It contains scarcely any butter.

Camel's milk is used only in Africa.

Buffalo's milk is employed in India; it is nearly the same with that of the cow, but rather thinner.

To Keep Milk Sweet. A teaspoonful of fine salt or horse-radish in a pan of milk will keep it sweet for several days. Milk can be kept a year or more as sweet as when taken from the cow by the following method: Procure bottles, which must be perfectly clean, sweet, and dry; draw the milk from the cow into the bottles, and as they are filled, immediately cork them well, with pack-thread or wire. Then spread a little straw in the bottom of a boiler, on which place the bottles, with straw between them, until the boiler contains a sufficient quantity. Fill it up with cold water, and as soon as it begins to boil draw the fire and let the whole cool gradually. When quite cold, take out the bottles and pack them in sawdust in hampers, and stow them away in the coolest place in the house.

To Deodorize Milk. It frequently occurs in the spring, when the farmers are feeding the cows on ruta-bagas, or turnips, that the milk becomes so strongly impregnated by their disagreeable taste and odors as to be unfit for butter-making. To obviate this, put a pinch of finely pulverized saltpeter into every gallon of cream; a little saltpeter worked into butter that has become sour, or rancid, will render it sweet and palatable.

Milk for Infants. When it becomes necessary to feed infants on milk other than that of the mother, the greatest care should be taken to always have it pure and fresh. Goat's milk being much more like human milk than that of the cow, is preferable; but when this cannot be had some directions for the preparation of cow's milk become necessary. First, assure yourself of the perfect health of the cows, as far as practicable, and then get the milk from different ones, night and morning. Add to it a little loaf-sugar and about one-third or one-fourth of water. The water should be hot and the sugar dissolved in it; then pour it slowly into the milk, and allow it to simmer a little over the fire. Throw it away if scorched in the least. This should be done morning and evening. The cup and spoon used to feed the infant should never be used for any other purpose whatever, and should be immediately scalded after using.

For milk for infants six months old, take one pint of milk and one pint of water, boil it and add one tablespoonful of flour. Dissolve the flour first in half a teacupful of water; it must be strained in gradually, and boiled hard twenty minutes. As the child grows older, one-third water. If properly made, it is the most nutritious, at the same time the most delicate food that can be given to young children.

Milk, Condensed. This is milk from which the water has been driven off by evaporation and to which sugar has been added. It is, therefore, really preserved milk. The following is a process: The milk is strained into a receiving vat from which it passes through a second strainer and into the heating cans. These are set in water, the milk in them heated to 90° and passed through another strainer into a large wooden vat, at the bottom of which there is a copper steam coil. Here the milk is heated to nearly the boiling point. A pound and a quarter of the best white sugar is added for every gallon of milk, after which the milk is drawn off into a cylindrical copper vacuum pan provided with a coil of copper pipe and a jacket underneath for steam. Here the milk is subjected to steam heat for three hours, and is then drawn off into cans, and stirred until the temperature is reduced a little below 70°. It is then emptied into

drawing cans provided with faucets, and drawn off into smaller cans as required.

Milk Fever. In the human subject this usually occurs about the third day after delivery. No medical treatment is required except to keep the bowls free and to draw the breasts when they are full. For milk fever in cows, see page 231.

Milking. Few things exert a greater or more lasting influence on the productiveness of the cow than the method of milking. A slow, careless milker will soon dry up the best cow in the world, as is well-known to every observant farmer. The construction of the udder, which will be found described in the proper place, will readily account for this. Cleanliness of the most scrupulous kind is absolutely essential in a good milker. Without this, the milk is in constant danger of spoiling. The udder, the hands of the milker and every utensil employed should be carefully washed before the milking begins. As elsewhere frequently stated, the pails should be well scalded with *boiling* water. The form of pail represented by Fig. 1, is one of the best inventions of the age in the dairy line. It is a pail, milk-stool, and strainer, all combined into one apparatus. The milker sits on the pail and milks into the funnel, which is supported by a rubber tube, and so cannot be broken by a kick from the cow, or by other accident. Such a milk pail, also, cannot be kicked over by the cow while it is in proper use by the milker. The funnel can be fixed higher or lower, to suit different cows. The milk is thoroughly protected from dirt, and even from the foul odors common to the barn-yard.

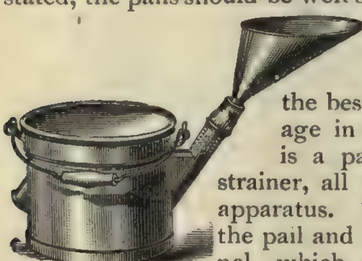


Fig. 1.—*Milk Pail, Stool and Strainer, combined.*

More's pyramidal milk-strainer (Fig. 2) is probably the most perfect for the purpose of straining milk. The bowl is seamless, and the bottom is easily detached, by a turn or two, for cleaning, as shown in the cut. The whole apparatus is neatly finished and easily kept from rusting.

Fig. 2.—*More's Pyramidal Milk Strainer.*

The milker should begin gently and gradually, but should increase the speed of his movements steadily until the udder is emptied. The vessel used to receive the milk should be large enough to hold it all, so that there be no need of changing the pail. If the milking be in any way interrupted, cows not infrequently hold back their milk. Extreme care should be taken to strip the udder to the last drop, and to do it quickly. Any slowness or carelessness has a direct effect on the yield of the cow.

Fig. 3.—*Graduated Milk Testing Tubes.*

Milk left in the udder either becomes caked, or is re-absorbed into the system, and tends to diminish the milk-giving quality of the cow. Especially is thoroughly dry milking necessary in the case of young cows with their first calf. The mode of milking, and the length of time they can be made to hold out, will influence their milking qualities ever after. The greatest development of their milk-glands will largely depend upon the manner in which they are milked after their first calf. At this period they should have the most milk-producing food. Gentleness is especially to be exercised in their regard; by coaxing and caressing they may be brought up gentle and quiet. On the other hand, nothing tends to dry up a young cow more than harshness or cruelty. The same is true of older cows. The longer the young cow, with her first and second calf, can be made to hold out, the greater the prospect of confirming her in this habit. She should be induced, if possible, by the use of juicy, sweet food, to hold out even up to the time of calving, if it be deemed desirable to milk her so long, and she may acquire this habit for life. Some of the best cows develop their finest qualities slowly, so that the full yield of a cow must not be expected the first year after calving. No cow is fully developed until her fifth or sixth year. Attention to the above points cannot be too strongly insisted upon. There is in milch cows a constant tendency to dry up which must be guarded against with the greatest care until the habit of yielding a large and constant quantity has become fixed in them.

It is unnecessary to dwell here in detail upon the

best method of carrying milk to market. Practice in this regard varies according to locality, climate, and the distance which the milk has to be carried. It is to the dairyman's interest to watch the improvements made and to adopt them.

The specific gravity of milk, as before stated, is somewhat greater than that of water, but it varies considerably in different cows and in different yields of the same cow. The richer the milk is in cream, the less will be its specific gravity. Salt fed to the cow will, within a few hours, make the specific gravity vary from one to three per cent. Thick milk throws up much less of the cream it actually contains than thinner milk. The addition of water will largely increase the yield of cream, but at the expense of the milk left behind.

Cows are usually milked twice a day, in the early morning and in the evening. Milking but once a day of course lessens the quantity of the yield, but increases its richness. For some weeks after calving, and in the height of the flow, cows ought, undoubtedly, to be milked, if possible, three times a day. In young cows, this practice, after calving, develops the udder and the milk veins. Frequent milking increases the secretion of the fluid, and should never be neglected, either in the case of young cows, or of very large milkers, at the height of the flow, which will last for two or three months after calving. The greater gentleness of women renders them better adapted than men for milking. If possible, the same person should always milk the same cow, and should not be changed unless there are urgent reasons for it. The milk of every cow added to the dairyman's stock should be tested, so as to determine the milk-giving qualities of each, which will be found to vary very considerably. It is needless to say that the poorest milk-producers should be weeded out of the stock and replaced by better ones.

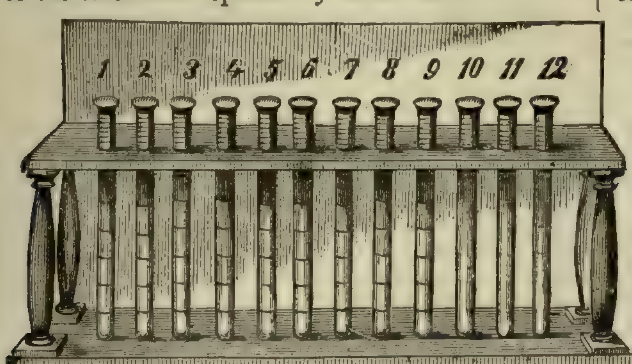


Fig. 4.—*Milk-Testing Tubes.*

By the testing tubes represented by Fig. 4 the milk furnished by each patron is sampled, and the tube reserved for his particular use. The graduated tubes represented by Fig. 3 on preceding page, are for more general use.

Milk-pans, or Coolers. The material of which milk-pans for dairy use are generally made, is either tin or earthenware. The main objection to the former is the trouble of keeping them clean; to the latter their liability to break, and their weight. The lead contained in the glaze of many kinds of earthenware, upon which the acid of milk acts, is a serious objection. When glazed with salt, they undoubtedly form the best, although not the handiest, coolers. Much diversity of opinion exists with regard to the best form of tin milk-pan or cooler. Some prefer a very shallow form, others the forms introduced by Cooley and Hardin, which are deep, for which see article on Butter.

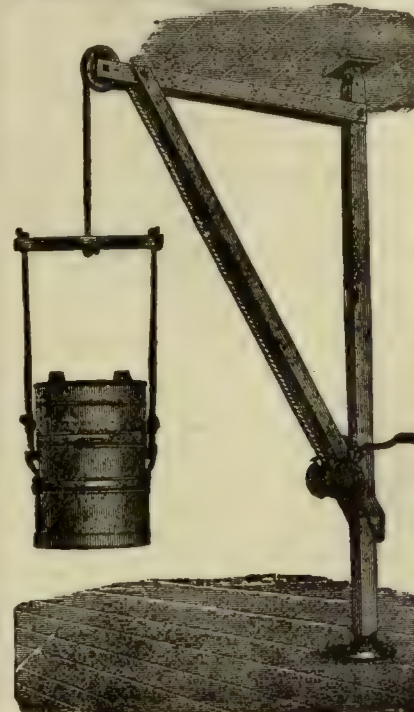


Fig. 5.—*Crane for Hoisting Milk.*

Milk-teeth, the fore teeth of a foal, which come at the age of about three months, and are cast within two or three years. Also, the first set of teeth in a child, 20 in number, consisting of the four front teeth in each jaw, the two pairs of canines (or "eye-teeth") and two pairs of grinders ("double teeth").

Milkweed. A well-known weed, of several species, the milky juice of which is supposed to be semi-poisonous.

Millet. In its growth and manner of bearing its seeds, the millet strongly resembles a miniature broom-corn. It reaches a height of two and a half to four feet, with a profusion of stalks and leaves, which constitute excellent forage for cattle. From 80 to 100 bushels of seed per acre have been raised, and with straw equivalent to one and a half or two tons of hay; but an average crop may be estimated at about one-third this quantity. Owing to the great waste during the ripening of the seed, from the shelling of the earliest of it before the last is matured, and the frequent depredations of birds which are fond of it, millet is more profitably cut when the first seeds have be-

gun to ripen, and harvested for fodder. It is cured like hay, and on good land yields from two to four tons per acre. All cattle relish it, and it is fully equal to good hay.

Millet requires a dry, rich and well pulverized soil. It will grow on thin soil, but best repays on the fertile. It should be sown broadcast or in drills, from May first to July first, according to latitude, climate, soil, etc. If for hay, and sown broadcast, 40 quarts per acre will be required; if sown in drills for the grain, eight quarts of seed will suffice. It will ripen in 60 to 75 days, with favorable weather. When designed for fodder, the nearer it can approach to ripening, without waste in harvesting, the more valuable will be the crop. See page 599.

Milt, the spleen; also the "soft roe" of fishes, or the spermatic part of the males.

Mince Meat. Three pounds of raisins, stoned; 3 pounds of currants; 3 pounds of beef suet, chopped fine; 1 pound of bread crumbs; ¾ pound of mixed candied peel; 1½ pounds of fillet of beef, previously cooked. Salt, sugar, spices and ginger to taste. Each ingredient to be chopped up separately and very fine. Mix all well together, and take especial care that the beef is well mixed with the other ingredients. Moisten with a bottle of brandy and stir occasionally.

Excellent mince meat is made as follows: Two pounds currants; 5 pounds peeled and cored apples; 2 pounds lean boiled beef; 1 pound beef suet; ¾ pounds citron; 2½ pounds coffee sugar; 3 pounds of raisins; 2 tablespoonfuls cinnamon; 1 nutmeg, and 1 tablespoonful each of mace, cloves and allspice, 1 pint wine, cider and brandy. Wash the currants, dry and pick them, stone the raisins, remove the skin and sinews from the beef and chop each ingredient up separately and very fine; place as soon as done in a large pan, set on the stove, let it just come to a boil, mix thoroughly, pack in jars, keep in a cool place.

LEMON MINCE MEAT. Take 1 large lemon; 3 large apples; 4 ounces of beef suet; ½ pound of currants; 4 ounces of white sugar; 1 ounce of candied orange and citron. Chop up the apples and beef suet; mix them with the currants and sugar; then squeeze the juice from a large lemon into a cup; boil the lemon thus squeezed till tender enough to beat to a mash; add to it the mince meat; pour over it the juice of the lemon and add the citron chopped fine.

Minim, in apothecaries' measure, is about one drop.

Minnow, a small and well known fresh-water fish of the carp family. It seldom exceeds three inches in length and is usually seen much smaller. It equals many of the most famous fish in the delicate flavor of its flesh. It is extensively used by anglers as bait.

Mint-julep, a drink consisting of brandy, sugar and pounded ice, flavored with sprigs of mint.

Mirrors, TO CLEAN. Take a newspaper, fold it small, dip it in a basin of clear, cold water. When thoroughly wet, squeeze it out as you do a sponge, then rub it pretty hard all over the surface of the glass, taking care that it is not so wet as to run down in streams; in fact, the paper must only be completely moistened or dampened all through. Let it rest a few minutes, then go over the glass with a piece of fresh, dry newspaper, till it looks clear and bright. The insides of windows may be cleaned in the same way; also spectacle glasses, lamp glasses, etc.

Mite. The mite family comprises very small, often microscopic, spider-like insects, some of which are found almost everywhere, both on animals and plants as well as decaying substances, as parasites. Thus we have the itch mite, flour mite, etc.

Moire Antique (mwor an-teek′), a silken cloth with a clouded, mottled or watered appearance, made for ladies' dresses.

Molar, one of the grinding or "double" teeth. In man there are 12 of these, counting the "wisdom" teeth, which are generally developed when the individual is 18 to 21 years of age.

Molasses, the uncrystallizable part of the saccharine juice, either naturally so or rendered uncrystallizable through the process of heating. When fermented it yields rum by distillation. See Cane.

Mold: see Mildew.

Mole. 1. A well-known species of burrowing animal with a very soft fur. 2. A spot, mark or small, permanent protuberance on the human body, from which one or more hairs sometimes grow. 3. A plow of peculiar construction, for forming underground drains. This word has several other meanings, but they are of no practical interest to the non-professional man.

TO REMOVE FLESH MOLES. Apply muriatic acid; use the end of a broom straw, and apply to the mole until it sinks perfectly flat; only one application, well applied, being necessary; it will be sore for over a week, and will come off in a small scab, and soon heal over.

MEADOW MOLE. The common ground mole or "meadow mole," as this little animal is often called, is of interest from a zoological point of view, but in this article we will deal only with the practical side of the subject in its relations to agriculture and horticulture. The mole is both useful and hurtful. When his services more than counterbalance the injury he commits, he should be left unmolested. On the other hand, when he becomes, as he often does, an intolerable nuisance, he may be more or less successfully dealt with in the manner we will proceed to describe.

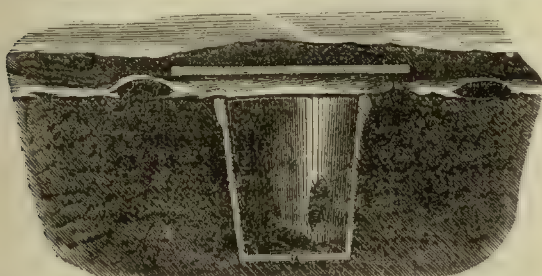
It is very annoying to see a handsome lawn covered with unsightly ridges plowed by the noses and paws of these little depredators; but the knowledge that they are the natural enemies of the numerous worms and grubs that sometimes make fearful war upon the roots of growing young crops, renders it often difficult to decide whether the moles are to be wel-

comed as allies or combated with such means as are available.

The mole is a purely carnivorous animal and never does any damage to plant life except in pursuit of his prey. He may break and disturb the tender roots of young plants, but he does not devour them, and he is often wrongly blamed for injury which has been committed by the insect depredators he has caught and devoured.

The field mouse, on the contrary, does devour tender, succulent roots, and the mole is too often charged with the damage thus sustained by farmers, in addition to that really due to his burrowings.

The simplest form of trap, and one that will prove effectual in catching these little animals if skillfully employed, is the jar mole trap shown in the accompanying illustration. A glass or stoneware jar is sunk



Mole Trap.

into the ground under the runs as indicated in the engraving. The moles, while running along, fall into the jar, and the vertical slippery sides of the jar prevent their getting out again. Field mice are also frequently caught in these traps, which leads to the suspicion that they are the authors of much of the mischief attributed to moles, whose burrows form convenient avenues for the intruders.

Moline (mo'lin), the crossed iron that supports the upper mill-stone.

Mollebart (mol'ly-bart), an agricultural implement used in Flanders, consisting of a large shovel, drawn by a horse and guided by a man.

Molting, the periodical shedding of the plumage of birds and the hair of quadrupeds.

The molting of birds occurs twice a year, and is either total or partial. A total molt generally takes place once a year, and a partial molt accompanies the change of tints in the plumage which certain species undergo at the season of breeding. A new plumage is developed at every molt; and, according to the species and the season, it either may or may not have the same tints as the old plumage. The winter plumage of some species is always different in color from the summer plumage.

The horse retains the hair of his mane and tail in a perennial way, but sheds all his other hair twice a year. His fine, short coat of summer would be of insufficient service to him in winter, and his heavy long coat of winter would be oppressive to him in summer; and therefore, like all other animals which need a similar change, he receives from the beneficence of his Creator a regular change of clothing in beautiful adaptation to his wants and comfort. But as he lives in a somewhat artificial state, he experiences some suffering and requires some special attention from his keeper during the progress of the change. He experiences excited action in the vessels of the skin, and is in consequence slightly feverish, and becomes chilled, thirsty, irritable and weak. He suffers more at the autumnal than at the vernal molting, for the production of the long, heavy coat of winter makes greater demands upon his system than the production of the short, light one of summer. The curry-comb ought to be sparingly applied during molting, lest it should too rapidly force off the old coat before the new one be duly produced.

Momentum, or **Impetus**, the force of a moving body.

Monger, a trader or dealer.

Monkey, in mechanics, an apparatus for disengaging and securing again the ram of a pile engine.

Monkey-wrench, one which has an adjustable jaw, worked by a screw.

Moon Blindness, a disease in the eyes of horses. It is treated on page 762 under the head of Specific Ophthalmia.

Moose, the largest of the deer genus. They inhabit the northern portion of the United States and live in swampy places.

Moose Elm, the red elm.

Moose-wood, the striped maple: see Maple.

Morass, a peaty marsh, so soft and spongy and saturated with water as not to be able to bear animals on its surface.

Mordant, any substance, as alum or copperas, that gives fixity to dyes, rendering them indelible or fast. It is requisite in the case of every dye which of itself merely stains cloth and can be washed out with water. It possesses an affinity for both the dye and the cloth.

Morel (mor'el), an edible mushroom, brown, egg-shaped, and growing in the shade of trees in June.

Morello, a variety of cherry which is hardy in the Northern States, the fruit being large, juicy and purple, or almost black when ripe: see Cherry.

Morgan Horse: see page 690.

Morphine, an alkaloid obtained from opium and possessing the narcotic and sedative powers of that substance: see Opium.

Mortgage, a conveyance or transfer of real or personal property to secure the grantee or assignee the payment of some debt, or the performance of some agreement, with a condition or understanding that, in case the debt is paid or the undertaking is per-

formed, within a certain time, and in the specified manner, the conveyance or assignment shall be void and the land or personal property revert to, or rather still belongs to, the mortgagor. Although the title to the property named appears to pass to the mortgagee by such a deed, the law of this country holds that it does not; that the mortgage is merely a security and not a sale and the mortgagor retains the title and control of the land, subject to the mortgagee, until a decree of court "forecloses" or shuts out his "equity of redemption" or right to redeem the land by paying the mortgage after it becomes due.

Blank forms of mortgages are so easily obtained, being on sale in every hamlet throughout the Union, we deem it quite unnecessary to give them here. We wish to make a few practical observations upon the principle of mortgaging property. In general it is very hazardous to place a mortgage over a farm, and the circumstances should, indeed, be most extraordinarily pressing that would induce a farmer to cover his only piece of property with a mortgage. Golden visions of wealth gained in a certain speculation may induce him to mortgage his farm to secure the necessary funds in order to carry out his scheme. Profits in speculative business are so uncertain that nineteen times out of twenty he will be disappointed and cripple himself financially and perhaps lose his farm.

It has been said of a mortgage on the farm that it is in many respects worse than a cancer on the body. Everything then which should go to nourish and strengthen the one goes to the other, and both body and farm grow haggard and are lost if the affliction be not removed. No wonder it is termed "mortgage" or "dead pledge." It usually kills the land while the mortgagor holds possession by eating its profits in interest.

Could we present in tabular form, so that a single view would cover all, the statistics of financial ruin caused by mortgages and other process of securing debts instead of paying them, or better still, never making them, it would cause many a farmer to stop before he rushes into the mire from which so many never get out.

Mortification: see Gangrene.

Mosaic (mo-za'ik), inlaid work, in which the effect of painting is produced by the use of pieces of colored stone or other hard substance, natural or artificial. The figures are generally geometrical and symmetrical, and the blocks containing them constitute expensive ornamentation in walks, walls and other structures.

Mosquitoes, To Clear a Room of, take of gum camphor a piece about ⅓ the size of an egg, and evaporate it by placing it in a tin vessel, and holding it over a lamp or candle, taking care that it does not ignite. The smoke will soon fill the room and expel the mosquitoes.

To Keep Away Mosquitoes. Dip a piece of sponge or flannel in camphorated spirits, and make it fast to the top of the bed-stead. A decoction of penny-royal, or some of the bruised leaves, rubbed on the exposed parts, will effectually keep off these troublesome insects.

For remedy for mosquito bites, see Insect Bites, page 872.

Moth. These numerous and beautiful insects, which are seldom seen except at night, were included by Linnæus in the genus *Phalæna*. Since his time, however, naturalists have divided them into an immense number of different groups. Of the moth family the genus *Tinea* are those most destructive, in their larva state they devouring almost every kind of substances. The winged moth enter through the cracks into the closets, drawers, chests, or get under the edges of carpets, or into the folds of curtains and garments and deposit their eggs, which hatch into caterpillars in about 15 days, and immediately begin to gnaw the substances within reach and cover themselves with the fragments, shaping them into hollow rolls and lining them with silk. They generally live in these rolls through the summer, enlarging them as they grow, and carrying on their work of destruction, but in the autumn become torpid, change to pupas in the spring, and in 20 days come forth winged moths, which in turn lay their eggs for a new brood. The various species are all noxious, and however brilliant the perfect insects may be they should be destroyed wherever found.

To Secure Goods from Moths. The destruction caused by these little pests can be counted only by millions yearly, and they are the plague of every housekeeper. Unless you can hermetically seal a cask or box, you can scarcely keep the miller out, as she will crawl through a good sized pin-hole. Therefore something offensive must be used, and perhaps there is nothing so effective and cheap as petroleum paper; or even the common tar roofing paper will answer. Buy your paper in rolls, cut in sections long enough to cover the inside, the bottom and the sides, and lap over on the top of the box. All of the inside of the box must be covered, and on the inside of this again place wrapping paper to prevent the contact of nice clothing with the petroleum paper. Use a large box—no matter about being very tight, as the paper will cover the holes—and pack in all your woolens and furs, filling it full. Bring the paper up which has been hanging over the sides of the box, and let it cover the whole so that the miller cannot enter without crawling over the petroleum paper, which she will never do. Nail on the cover of your box and your clothing is safe for three years, if you want to leave it that long. It is much cheaper and does not evaporate like camphor, and the carbolic acid in it seems to act like an antiseptic on the animal fiber of the wool, to preserve and make it healthful.

To Keep Moths from Carpets. Moths will work in carpets in rooms that are kept warm in the winter as well as the summer. A sure method of removing the pests is to pour strong alum water on the floor to the distance of half a yard around the edges before

laying the carpets. Then once or twice during the season sprinkle dry salt over the carpet before sweeping. Insects do not like salt, and sufficient adheres to the carpet to prevent them alighting upon it.

To Secure Woolens from Moths. Carefully shake and brush woolens early in the spring, so as to be certain that no eggs are in them; then sew them up in cotton or linen wrappers, putting a piece of camphor gum, tied up in a bit of muslin, into each bundle, or into the chests and closets where the articles are to lie. No moth will approach while the smell of the camphor continues. When the gum is evaporated it must be renewed.

To preserve furs from moth see page 551.

Mother, of vinegar and other liquors, a thick slimy substance of a fungoid nature, different from either the scum or the dregs.

Motorpathy (mo-tor′-pa-thy), movement cure. See Hygiene.

Moult. See Molting.

Mouse-piece, the piece of beef cut from the part next below the round, or from the lower part of the latter: called also "mouse buttock."

Mouse. See Rat.

Mousselin (moos-leen), muslin.

Mouth. For scald mouth and inflammation of the mouth of the horse, see page 791.

An excellent wash for common sore mouth is a solution of chlorate of potash. Make a strong solution, wash the sore and swallow a little occasionally. A few of the crystals of chlorate of potash put in the mouth and left to dissolve will prove very effective and is a very mild remedy. Yellow root (golden seal) is very effective in cases of sore mouth. Take some of the root in the mouth and chew, or put some of the powder on the sores. A mild cathartic should be taken.

Mow (mou), a pile of hay or sheaves of grain deposited in a barn; also, the place in a barn where hay or grain in the sheaf is stowed. To "mow-burn" is to heat and ferment in the mow, as hay when housed too green or wet.

Mower, a machine for cutting grass and clover. This is one of the most useful machines upon the farm. It is also at present one of the most common. They are so widely and universally distributed throughout the country, and their use and care so thoroughly understood that we need give but a reference to them. The competition in the manufacture and sale of the various patterns is so brisk that a farmer need not be at a loss in his selection. As to the general care of the machine we refer the reader to page 842, under the head of Implements.

Mowing, the cutting down of grain, grass or weeds, either with a scythe or mower. Before the days of mowing machines the art of mowing with the scythe was difficult to attain to a high degree. This implement is seldom used at present, except in corners of fences, or on very rocky or stumpy land.

Mucilage: see Glue.

Muck. A mass of decomposing matter, consisting largely of dead vegetable substances, and very suitable for manuring purposes.

Swamp muck is formed by the imperfect decomposition of vegetable matter. It consists of the more or less completely decomposed remains of countless generations of marshy plants, mosses, grasses and sedges, together with the materials which have been washed in, or blown in from the surrounding land. It is the product of cool and moist situations. In moist and cool climates the decomposition of vegetable materials is slow, while the growth of the plants furnishing this material is rapid. In tropical countries, in consequence of the rapidity of decomposition of vegetable matter, no deposit of peat occurs except in cool mountainous elevations.

In consequence of the varying conditions under which this vegetable decomposition may proceed, there may be found in the same bed three well-marked varieties of muck: First, we find mossy materials which have undergone little change, having the original plant structure very perfectly preserved, of a brown color, and when dry very light and spongy, like compressed hay. This substance is of no value as a manure, not having reached such a stage of decomposition as to develop any valuable qualities. Second, we have material which has decomposed so completely that only traces of the original vegetable structure can be detected. The material is a solid, unctuous mass, which cuts like soft clay or old cheese, and may be termed cheesy muck. It is of a dark brown or black color, and usually the darker the color the better the quality, because this darker color shows that it has combined with some alkaline substance by which its quality is improved. This cheesy muck is usually formed by decomposition of vegetable matter under water. When this cheesy muck is dried it shrinks in volume, forming a hard, coaly mass, and may remain exposed to the weather for years without much change. Third, when this cheesy muck has been exposed to the air so as to be thoroughly acted on by the frost, we find a dark brown or black powdery mass, which is not to be distinguished from the vegetable matter or mould of soils. It is this which is of so much value to the farmer, and is the only kind of muck which is fit for immediate application to the soil, or for any use except to form composts with fermentable manures or with alkaline substances. It must be borne in mind, however, that the cheesy muck, thrown on the land under such circumstances that it will be thoroughly frozen before it dries out, will thereby be changed to this powdery muck. The action of the frost and weather on muck must be considered as almost indispensable for the successful use of it as a manure.

How to Use Muck. If the bog is near the barnyard, draw the muck immediately to it; otherwise deposit it with wheelbarrows in ridges not more than

two feet deep on the most convenient bank; let it drain and dry until after the fall harvest, and then gradually draw it into the yards to be worked over by domestic animals; dump it upon the drier portions of the yard, around a basin which should let nothing escape. The following May it will be in the best condition to apply to the crops. All the manure made during the winter should be spread over that which lies in the yard, and afterward new muck drawn in, to be worked over by the animals, and so on. Or, apply ashes, salt and lime to the muck-heaps, letting them stand a full year, and it will be good for use.

Muck may be used to deodorize and preserve in an inoffensive form the manural matter derived from dead animals. When a dead animal is properly covered with muck, no offensive gases escape and all the manural matters are preserved.

Mucus, the viscid, ropy secretions of the mucous membrane. This is the membrane which lines the mouth, nostrils, exterior of the eyes, lungs, stomach, intestines, bladder and urinary apparatus. Mucus is a substance generally liquid, and appears to be employed by nature for the purpose of lubricating movable parts, or protecting them from the action of other substances.

Muffin, a light, spongy cake, circular and flat; also, an earthen table plate of moderate size.

CORN MUFFINS. Two cups yellow Indian meal, one cup flour, three eggs, four tablespoonfuls of sugar, and a little salt, a piece of lard or butter the size of an egg, one teaspoonful saleratus and two of cream tartar. The cream tartar must be put in dry with the flour, and the saleratus mixed with a little warm water and put in last of all; mix all together with milk as thick as pound-cake batter. Pour in corn-muffin pans and bake in a hot oven.

BROWN FLOUR MUFFINS. One quart tepid water, half cup yeast, one tablespoonful of Indian meal, two of molasses, two pints Graham flour, one pint wheat, one teaspoonful of soda about half an hour before baking—as thick as soft gingerbread; bake half an hour, or in greased rings on a griddle.

FLOUR MUFFINS. One-half cup of butter, one-half cup of sugar, two cups of milk, three teaspoonfuls of yeast powder rubbed thoroughly into a scant quart of flour, and a little salt; bake in muffin rings.

RICE MUFFINS. Take one cup of cold boiled rice, one pint of flour, two eggs, one quart of milk, one tablespoonful of butter, and one teaspoonful of salt; beat very hard and bake quickly.

HOMINY MUFFINS. Take two cups of fine hominy, boiled and cold; beat it smooth; stir in three cups of sour milk, half a cup of melted butter, two teaspoonfuls of salt, two tablespoonfuls of white sugar; then add three eggs well beaten, one teaspoonful of soda dissolved in hot water, and one large cup of flour; bake quickly.

OATMEAL MUFFINS. Put a cup and a half of oatmeal and half a cup of corn meal to soak in two cups of sour milk for an hour or more. Add two eggs, a tablespoonful of sugar, a teaspoonful of salt and a half teaspoon of soda dissolved in a tablespoonful of hot water. Heat the muffin tins and grease them well. Bake in a quick oven.

Mulberry. The red mulberry, the only native species of mulberry in the United States, is a tree native in our western forests, having a leaf like that of an elm, and ripening in July, bearing a fruit like a long blackberry, which is very delicious to the taste, though it is very subject to worms. It is rarely picked from the tree, as it falls as soon as ripe; and it is therefore the custom, with cultivated trees, to keep the surface of the ground underneath in a short turf, so that the fruit may be gathered from clean grass.

Several varieties are cultivated in the older countries, but none in the northwestern portion of the United States. In Europe the Black is the leading variety, and in the eastern portion of America the Ever-bearing and the Johnson are the principal kinds in cultivation. Several varieties of the white mulberry are cultivated for silk.

The Russian mulberry was first brought to this country by the Russian Mennonites, a few years ago. In Russia the fruit is used as we use raspberries and blackberries. The tree is, as near as we can learn, a cross between the black mulberry and the native Russian variety. It grows very large, frequently reaching a height of 50 feet. The timber is hard and durable and the fence posts made from it have the lasting qualities of catalpa or red cedar. A part of the trees have beautiful cut leaves, and some of them have as many as twelve lobes. The bark is grayish white, branches drooping. The Russians also use it as a hedge plant, and it stands shearing as well as any tree on the list. It also grows as readily from cuttings as cottonwood or willow. The tree is perfectly hardy. Mercury 30° below zero and not even the twigs injured.

The best soil for the mulberry is a deep, rich, sandy loam. The tree requires little or no pruning, and is of very easy culture. It is usually propagated by cuttings three feet long, planted half their depth in the ground in the spring. Cuttings made of pieces of the roots will also send up shoots, which will grow well.

Mulch, the placing of straw, leaves, or other litter around the roots of trees. Covering the soil with a mulch is valuable in many ways, besides the decay of the material placed upon the ground, of the added fertility of the manure or straw. A certain amount of moisture must be retained in the soil to allow the fibrous roots to feed to the best advantage. If there is more than the required amount of water, the soil is too cold for the best results, and the air is excluded by the water to an extent that prevents or retards chemical action. When ammonia escapes from decaying vegetation or from the soil and passes into the atmosphere, it does not chemically unite with other substances, but simply remains suspended, to be

brought to the earth by the first rain. If the soil be covered by a heavy mulch this atmospheric ammonia is retained and hoarded for plant food.

A heavy mulch breaks the force of the rains, and prevents them from compacting the soil. It also protects the surface from freezing as readily as when exposed, and thus keeps it longer open to the action of the air and moisture.

The throwing out of winter grain is often prevented, because this is generally due to the frequent freezing and thawing of the surface soil. When wet surface soil freezes, it is raised up, and the young plants growing in are raised with it; when the frost is thawed out, the soil falls back to its original position, while parts of the crown or root of the crop remain elevated. The next freeze takes hold lower down and lifts them again, and the next thaw leaves them higher up, until frequently in the spring a crown of clover or wheat stands three inches out of the ground.

Mulching prevents the rapid freezing or thawing, so the changes are not so frequent. It also prevents the baking of the soil.

Mule, the offspring of the male ass and the female horse. The offspring of the male horse and the female ass is the hinny. We refer the reader to the article on Hinny, where the difference between the mule and hinny and their respective peculiarities are discussed. Mules are incapable of reproduction, as with few exceptions all hybrids are. They are more highly esteemed and generally used in the South than in the North. They are more hardy in constitution, more muscular in proportion to their weight and more patient than horses. They are also less subject to disease, longer-lived, require less care and attention, and can subsist on less food. They are especially adapted to hard and rough roads, being very surefooted. Indeed there is no more useful or willing animal than the mule, and perhaps no other domestic animal has received so little attention and been so greatly abused. Popular opinion of his nature has not been favorable, and he has therefore had to labor and plod through life against the prejudices of the people. Still, both in peace and in war, he has been the great friend of man, serving him well and faithfully. Could he tell man what he most needed it would be kind treatment.

The mule is not naturally vicious, as is supposed, and wholly incapable of appreciating kindly treatment. His heels are his means of defense, and are dangerous to those who wantonly provoke him and place themselves in his way. His long ears are sensitive and by roughly handling them his combativeness is easily aroused, and distrust is awakened to that degree that renders him almost unmanageable. Yet he may be so raised and trained as to make him gentle, obedient, even affectionate. One thing should always be observed, however, in dealing with him, and that is to keep out of the way of his heels, which he throws out as instinctively when startled, irritated or approached by a stranger as a cat thrusts out her paws.

The mule was known and much used by the ancients, but what prompted his production must forever remain a mystery. He was found useful in making long journeys, climbing mountains and crossing deserts, and when food and water were scarce and horses would have perished. He was used by men of rank, and even rulers, in ancient times, as beasts of burthen. They were employed to draw the carriages of Roman ladies, and within the present century the coaches of the Spanish nobility have been drawn by them.

Breeding. The mule is a hybrid and cannot breed either with its own or other classes of animals; consequently it is necessary to breed asses, or import them, to keep up the stock of mules. It has been a prevailing custom to use anything in the shape of an ass, no matter how inferior, for breeding purposes. The mares generally recommended for mule breeding are big, homely ones. This is all wrong. To raise good mules it is just as important to have good parents as it is in breeding any kind of animals To produce a good, well-proportioned mule, a good, compact and serviceable mare must be bred to a well-marked, well-built and excellent jack. It is of greater importance, however, to have a good jack than an excellent mare. A blooded mare should be used for breeding horses if anything. Her offspring, coupled with a jack, would not be nearly so valuable as if put to a good stallion. Besides, the connection with the jack will likely prevent her from ever giving birth to a pure colt. If bred to a stallion after having produced a mule, the mare will be almost sure to have a colt marked, to quite a degree, like the ass. A bad temper in a mare, or any tendency toward a vicious disposition, should wholly disqualify her for breeding mules. The Norman blood is perhaps the best to be sought in the mare.

Care of the Colt. When fully matured the mule is a remarkably healthy and hardy animal, but in his earliest years is quite tender and timid. While young he requires as good care and as much attention as does the horse colt. He does not require as much corn and oats as the common colt, but he should have abundance of good hay, plenty of fresh water and ample shelter. If castration is to be performed it should be done before the mule is six months old, and it will generally be better to do it as early as the fourth month. The operation requires as much care and skill as it does for the horse colt. This is described on page 700.

Breaking. The mule does not require as complete a course of training as the horse, because its range of work is more limited; but so far as it does go it should be thorough. In breaking the mule most persons are apt to get out of patience with him; but patience is the most essential thing in breaking the mule. He is an unnatural animal, and hence more timid than the horse and more difficult to be made to understand what you want; but when he does and has confidence

in you, you will have but little difficulty in making him perform his duties. Begin early to handle him and do so often. Teach him to lead, to be tied up and to have things put upon his back and to feed from the hand. Never spring at him, nor yell at him, never jerk him, never strike him with a club. Show him that you are friendly and have no desire to hurt him. In this way the young mule may be taught almost as readily as the horse.

Mules seem generally to be born kickers. It makes no difference how they are bred, the moment they are able to stand up, and you touch them, they will kick. In beginning to break them, therefore, kicking is the first thing to guard against and overcome. This is most easily remedied by kind treatment. Harsh treatment will invariably make him worse. Observing these and the statements made on breaking horses in the article on the Horse, the mule may be subdued and made useful.

General Observations. It has been said that the mule never scares or runs away. This is not true. He is not so apt to get frightened and run away as the horse is, but any one who has had long experience with them knows that they will both get frightened and run away. They do not, however, lose all their sense when they get frightened, and run away as the horse does. Bring a mule back after he has run away, and in most cases he will not want to do it again. A horse that has once run away, however, is never safe afterward.

Avoid spotted or dapple mules; they are the very poorest animals you can get. They cannot stand hard work; and once they get diseased and begin to lose strength, there is no saving them. Many of the snow-white mules are of the same description, and about as useless. Mules with the white muzzle, or, as some term it, white-nose white, and with white rays around the eyes, are also of but little account as work mules. They can stand no hardship of any kind. In purchasing mules, you must look well to the age, form, height, eyes, size of bone and muscle and disposition; for these are of more importance than his color. Get these right and you will have a good animal.

If any gentleman wants to purchase a mule for the saddle, let him get one bred closer after the mare than the jack. They are more docile, handle easier, and are more tractable, and will do what you want with less trouble than the other. If possible, also, get mare mules; they are much more safe and trusty under the saddle, and less liable to get stubborn. They are also better than a horse mule for team purposes.

Diseases. The mule is not so susceptible to disease as the horse; but in those he is afflicted with he does not materially differ from the nobler animal. He, however, suffers less from them, owing to lack of sensibility. For diagnosing diseases and treatment, see Diseases in the article on Horse.

Muley, hornless; applied to cattle—as the polled cattle; also a stiff, long saw, not stretched in a gate, and moved much more rapidly than an ordinary gate saw.

Mull, to soften or bring down in spirit; or to heat, sweeten and spice, as to mull ale, wine, etc.

Mullet, a genus or family of fishes.

Mumps, an enlargement of the glands of the neck; an affection confined almost exclusively to children, and contagious in its nature. The swelling generally takes place near the angle of the lower jaw, and where it is articulated with the upper jaw, and sometimes causes such an enlargement that the distended gland hangs down like a bag. In general, however, the glands are only partially distended, though by their pressure on the tonsils they cause both difficulty of swallowing and partial deafness. Mumps is generally attended with a degree of inflammatory fever, and when severe, is accompanied with shortness of breathing, hot skin and other febrile symptoms. The attack generally reaches its height in four days and then declines. Sometimes the swelling suddenly disappears, as in gout, and makes its appearance upon some other part of the body; this is regarded as an unfavorable symptom.

Treatment. This is very simple and consists of a mild diet and gentle laxatives, occasional hot fomentations and wearing a piece of flannel around the throat.

Murrain, an infectious and fatal disease among cattle, much prevalent in ancient times. It was one of the plagues of Egypt before the exodus of the Israelites. Visitations of plagues or murrain upon cattle are mentioned and described by Homer, Hippocrates, Plutarch, Livy and Virgil. Even in modern times epidemics have spread through Europe destroying almost all the cattle. The term murrain has largely gone out of use, new names being substituted, according to the precise form of the disease. See page 233.

Mush, "Indian meal boiled in water."—*Webster*. But the terms "oatmeal mush," "Graham mush," "rye mush," etc., are so common among educated people that we presume Webster's definition a little deficient. Again, he gives no idea as to the proportions of meal and water, distinguishing the article from gruel or porridge. In this article we will regard mush as a "dish made of meal or flour and water, not as solid as bread on the one hand, and thicker than porridge on the other."

General recipe: Bring the water to boiling and then gradually stir in the meal or flour, avoiding the formation of lumps.

Corn-Meal Mush. In addition to the general direction just given, boil for an hour or more,—either over a hot fire and by constant stirring, to prevent burning, or over a slow fire, without stirring. The former method is probably the best, as the slightly scorched portion is stirred from the bottom of the vessel through the mass, giving it the parched or spicy flavor of well-baked corn bread.

One of the most popular articles of food is fried or browned mush. With a smooth, sharp case-knife, kept wet with cold water, cut cold mush into slices

one-fourth of an inch thick, and brown on a buttered griddle. Eat while hot.

OATMEAL MUSH. Mix a cup of medium oatmeal with a teaspoon of salt and a cup of cold water. Put three cups of water in a double boiler; if you have none use a tin pail set in a kettle of boiling water. When the pint of water boils briskly stir in the moistened oatmeal; let it cook for five minutes, then stir again, after which take out the spoon, put on the cover and cook for an hour; two hours will make it all the better. The double boiler, or a substitute for one, is a necessity in making oatmeal porridge; to be good it must be cooked a long time, and should never be stirred after beginning to boil until it is done, for stirring while cooking makes oatmeal gummy. The steamed oats which come put up in packages require only a few minutes cooking, but cost double as much as the oatmeal which is sold by the pound. When wanted for an early breakfast it is a good plan to cook the porridge at supper time in a small stone jar set in a kettle of water. Put a cover or plate on top and leave the jar in the hot water all night. If left on the back of the stove it will be just right for breakfast. Serve with rich milk or cream and sugar if desired. It is of special importance that oatmeal be fresh. After its manufacture it becomes bitter very rapidly.

GRAHAM MUSH. After stirring the flour into the boiling water, let it stand over a moderate heat without stirring for a few minutes, and it is done. Perhaps the most palatable form of this dish is to eat it when about lukewarm, or nearly cold, with sweet cream or rich milk. This "pudding" also can be sliced and fried (or browned) like corn-meal mush.

RYE MUSH, is similarly made.

Other mushes generally go by other names, as, blanc mange, Iceland moss pudding, manioc and tapioca puddings, etc.

Mushroom, a well-known esculent species of fungus. Mushrooms are eaten by every civilized nation, when fresh. The difficulty in obtaining non-poisonous kinds, and the distressing and sometimes fatal effects of eating poisonous fungi, deter many persons from using them at all.

When a fungus is pleasant in flavor and odor, consider it wholesome; if, on the contrary, it have an offensive smell, a bitter, astringent, or styptic taste, or even if it leave an unpleasant flavor in the mouth, it should not be considered fit for food. The color, figure and texture of these fungi do not afford any characters on which we can safely rely; yet it may be remarked, that in color, the pure yellow, gold color, bluish-pale, dark or luster brown, wine-red, or the violet, belong to many that are esculent; whilst the pale or sulphur-yellow, bright or blood-red, and the greenish belong to the few but poisonous. The safe kinds have most frequently a compact, brittle texture; the flesh is white; they grow more readily in open places, such as dry pastures and waste lands, than in places humid or shaded by wood. In general, those should be suspected which grow in caverns and subterraneous passages, or on animal matter undergoing putrefaction, as well as those whose flesh is soft or watery.

TO STEW MUSHROOMS. Peel and put them in milk and water, and let them soak for half an hour; then put them in a saucepan covered very close; shake them every now and then. Let them stew on a trivet for half an hour; then add a small crust of well-toasted bread, a small blade of mace, and a quarter of a pint of cream. Next, take out the mace, and put the crust into the middle of the dish. If the cream does not thicken it sufficiently, add the yolk of an egg and half a teaspoonful of vinegar before it is used.

MUSHROOM PUDDING. Rub into half a pound of bread-crumbs two ounces of butter, adding pepper and salt, with sufficient water to render the bread moist; cut up and add to these one pint of small mushrooms; line the basin with your paste, put in the above, cover with a paste, tie it up in a cloth, and boil for an hour and a half.

CANNED MUSHROOMS IN SAUCE. About half a can with two beefsteaks. Drain the mushrooms from their liquor and fry (saute) in a small frying-pan with a little butter. Add pepper and salt. When they have acquired a slight color draw them to one side of the pan, put in a heaping teaspoonful of flour and rub it smooth in the hot butter, still keeping the pan over the fire, and when the flour has become slightly browned pour in the mushroom liquor gradually and a few spoonfuls of water. Shake in the mushrooms, let all boil up, squeeze in the juice of a quarter of a lemon and pour over the beefsteak in the dish.

Muskmelon. This very valuable member of the Cucumber family was originally introduced into Europe from Asia by the Romans, and very early found its way to our own shores. It is grown to its greatest perfection in Persia and Arabia, where it is used as common food. The flesh of this fruit is very delicious, being succulent, cool and highly flavored.

CULTIVATION. Select a warm, light soil, which is indeed better than cold, rich soil; but a rich, warm soil is best; thoroughly work the soil, manure with a rich compost, and have the hills six feet apart; do not excavate hills, but work the manure just under the surface, as the roots of all vines naturally seek warmth; pinch the terminals of the more vigorous vines occasionally. In planting put a dozen or more seeds to the hill, allowing for freezing or bugs, but do not leave more than two to the hill. Sprinkling the young plants occasionally with air-slaked lime or plaster will guard them against insects. Hoe often

FIG. 1.—*Extra Early Cantaloupe.*

until the vines touch. In regions so cool as to render the crop doubtful, the seeds should be planted in pots

FIG. 2.—*Pineapple Cantaloupe.*

in hot-beds about a month ahead, and the plants set out in hills about the first corn-hoeing time. Very often, covering with hand-glasses or wire-gauze boxes will be necessary to guard them against insects or frosts. The striped bugs must be chased away by throwing dust at them.

VARIETIES. *Christiana.* Remarkable for early maturity.

Sill's Hybrid. Salmon color, flesh rich, sweet and delicious.

Torrey's. Green-fleshed, large, earlier than Cassaba.

Shaw's Golden Superb. Small, but superb in quality.

Skillman's Fine-Netted. Early and of delicious flavor.

Early Nutmeg. Green-fleshed; highly scented.

Long Yellow. Large, sweet, productive; a well-known sort.

Green Citron. Green-fleshed; sweet, melting and rich-flavored.

Ward's Nectar. Early, exceedingly prolific, sweet, rich and green-fleshed.

Early Jenny Lind. An early sort; a favorite with gardeners.

New White Japan. Flesh greenish white; early and prolific; sweet, delicious.

Pineapple. Oval, rough-netted, thick-fleshed, juicy and sweet.

Prolific Nutmeg. Hardy, medium size, flesh thick, green, and of fine flavor.

Cassaba, or *Persian.* Large, oblong, flesh yellowish green, rich and sweet.

Munroe's Little Heath. Very prolific and hardy; large ribs, pale-netted, scarlet flesh, fine flavor.

Long Valparaiso. Large and of fine quality.

Colorado. Extra fine, large and sweet.

Promising new varieties are the Persian, Bay View, Chicago Nutmeg, Surprise, Log-of-Wood, Algiers Cantaloupe, Silver-Netted, Hardy Ridge, Improved Cantaloupe.

The cantaloupe is a class of favorite kinds. It derived its name from a place near Rome where it was first cultivated in Europe. It is a native of Armenia. The nutmeg melon is also a popular variety. In many markets the names cantaloupe and nutmeg are used more generally than that of muskmelon, and even sometimes to designate other than their respective varieties of muskmelon.

MUSKMELON BUTTER. Take very ripe melons, so ripe as to be soft; cut them in two once and take out the seeds; then scrape the melon from the rind with a knife, and to every 4 gallons of melon take 5 pounds of light-brown sugar; put into a kettle and boil the same as apple butter; when cooked enough, season, while hot, with lemon to suit the taste.

Muslin, thin, cotton cloth. To wash Muslins, see page 908.

Must, the expressed juice of the grape before fermentation; also, sour moldiness; fustiness.

Mustang Ponies: see page 693.

Mustard. This is a hardy and easily cultivated salad plant. The chief varieties are the black, the white or yellow and the Chinese.

TABLE MUSTARD. Mix 3 spoonfuls of ground mustard with 2 of salt and 9 of water. Mix to a smooth paste, add 6 spoonfuls more of water, and mix.

French Mustard. Take ¼ pound of best yellow mustard, pour over it ½ pint each of water and vinegar; add a pinch of salt and a piece of calamus root the size of a pea; put it on the fire and when it boils add 1 tablespoonful of flour; let it boil twenty minutes, stirring it constantly. Just before taking it off stir in a teaspoonful of sugar or honey. When cool, put it into bottles and cork tightly.

MUSTARD PLASTER. Mustard seed is a very powerful stimulant and rubefacient. When moistened and applied to the surface it occasions great irritation. It is, however, not necessary to produce blistering to prove its good effects in this way. The following is an excellent mode of making a mustard plaster for chronic inflammation, colds, sore throats, inflammations of the lungs, liver and bowels, sprains, etc.: Take 1 part, by measure, of mustard; 5 parts flour and 5 of Indian meal. Mix the mustard in a little hot water, and when smooth, add about 2 parts boiling water, and when all is dissolved stir in the flour and then the meal, thoroughly, adding more boiling water if necessary. Spread on a thick cloth double folded to retain heat and moisture. Cover with mosquito netting or lace, and nothing closer, sew around the edges; apply to the painful spot; fasten with bandages and wear till dry, or for 24 hours, and then put on a fresh one. Continue to renew these for 1 or 2 weeks. When the skin becomes too tender add 1 more spoonful of flour and meal each. When these plasters can no longer be borne, use powdered ginger instead of mustard, and then finish with plain Indian meal poultice alone.

Another: In making a mustard plaster use only the white of an egg (no water); a mixture is thus formed which will draw perfectly, but which will not blister or break the skin. It is especially suited for young and tender skin.

Veterinary Uses. In veterinary practice mustard is used as an irritant on the body where the Spanish fly would be improper and dangerous. On the belly and over the loins are the usual places where mustard is applied. In lumbago and sprains of the back and loins and in pain in the bowels mustard is useful. The mode of application of mustard is as follows: If the hair of the part be long cut it off, then foment the part with warm water and immediately rub into the the parts a handful of the best flour of mustard. This is more effectual than laying a paste or poultice without rubbing.

Mutton, the flesh of sheep when slaughtered and dressed.

The recent increasing demand for good mutton in the United States has led to the extensive importation of sheep particularly adapted for food. Flocks of these breeds are now found nearly all over the country. The wool of the mutton sheep is also eagerly sought for, being more abundant on the heavy classes, though of coarser quality. For superior mutton qualities, the South Down stands pre-eminent everywhere, though this supremacy is vigorously disputed by the breeders of the Black-face of Scotland, the Cheviot of the border and the Exmoor of the Somerset hills. But in their desire to grow fine mutton sheep, the farmers and breeders of this country have not lost sight of the valuable wool qualities, and those breeds which combine the best qualities as the producers of both mutton and wool are receiving the most attention. Hence, in the West, the Cotswold is the general favorite, for its large size, the length and quality of its fleece, hardihood, tendency to fatten and its rich though somewhat coarse meat. In the blue-grass regions the Lincoln is receiving preference for his long, lustrous wool and great size. In the hilly countries devoted to sheep husbandry, the Merino and South Down with their crosses are used, though the mutton of the Merino is of a very inferior quality and quantity. One of the features of this breed of sheep, which compensates in a measure for their lack of mutton qualities, is the possibility of keeping them in large droves, without injury, while none of the long-wool classes can be profitably kept in flocks of 100, and even smaller, are better. The quality and flavor of mutton depends not only on the breed of sheep but on the pasturage and feed. High, dry pasture lands of a limestone nature, will make much better mutton than the rich, damp soil of the Western prairie, or the production of a lengthened stall feeding on roots. Sheep stall fed will make fine and heavy meat if ground meal is partially substituted for roots and a dry, well-ventilated shed is used. Mutton as food is considered as highly nutritious, light and easy of digestion, but the meat of the male has a strong, sheepy, disagreeable flavor and is usually tough. The meat of the ewe is good if under two years old, but after that, especially if not well fatted, it is inclined to become coarse and tough. The mutton of the wether is most esteemed, next to that of lambs. See page 964. The flesh of the lamb is mild, tender and juicy, and at its best when the animal is well fatted on its mother's milk, and is from six to ten months old. Between the "lamb" and "mutton" period in its growth it is not so fine-flavored, and as mutton it does not reach its fullest color and flavor till five years old. Good mutton is dark colored and marble-like. See pages 964–5. The quality of mutton is improved for cooking by hanging up in the air as long as it can be kept without taint, and it will keep longer than the flesh of any domestic animal. Of the long-wools, the Leicester is considered by English breeders to possess the finest fattening qualities, maturing early and easily and affording meat of great weight and prime quality. The Lincoln is one of the largest breeds and posesses good mutton qualities; the Cotswold are of a hardy constitution, mature well and make excellent mutton, though rather fat. They are probably the best adapted of any long-wool breeds to the West. The carcass of a good Cotswold lamb should weigh, at eight or ten months, 100 pounds or more, and a full-grown, well fatted animal may be made to weigh 200 pounds of dressed meat. Under heavy feeding the mutton sheep takes flesh easily, and like the hog, develops heavy layers of fat on the ribs.

The middle-wools do not become so grossly fat as the mutton breeds but are of a finer flavor, good weights of carcass being from 70 to 100 pounds. Of these the South Downs, Hampshire Downs, Shropshire Downs and Oxfordshire Downs have been imported into this country to a considerable extent. The Hampshire Downs incline to the greatest weight and the South Downs to the finest quality.

The terms "long-wools," and "mutton sheep," as applied to the different breeds, are synonymous, and in quality of mutton, rank second to the middle-wools, while the fine-wools—Merinoes, etc.,—are inferior in quality of mutton, probably owing to their thick, greasy, strong smelling coat, and their want of a tendency to fatten. However good the natural qualities of the sheep for mutton, the flavor of the meat depends to a great extent on external circumstances, those which are fattened exclusively on good sheep pastures, yielding the choicest meat, and those fed on grain, or grain with a light supply of roots, being better than those fattened exclusively on roots. Fattening in a close and crowded pen also has a tendency to give the meat a rank taste. Much also depends on the manner of killing and dressing; the sheep should be kept from food for some hours before it is slaughtered, and it should be hung up to dress, and pains taken to prevent the wool or outside of the skin from touching the meat, and the hand which is used to crowd the pelt off should be first carefully washed. To kill a sheep, lay it on its side on a bench and pass a common, sharp butcher knife through the neck, close to the lower jaw, holding the edge of the knife against the neck bone, so as to sever both jugular veins. Hold him still until dead, to prevent him mopping the blood with his wool. Split the skin along the windpipe, to the breast but not over it;

now skin the brisket by splitting the skin on both sides in a triangular form, taking hold of the apex and pounding lightly with the handle of the knife. The next step is to skin the hocks, insert the gambrel and hang up the body, and run the knife up into the chest, resting its back on the windpipe and cutting outward to the center of the breast-bone, to let any blood that may have accumulated in the chest pass off without staining the neck which is not yet skinned. Skin a fore leg, and then pass up the side, splitting the skin on the belly only as fast as required, and separating it from the flesh, by holding it firmly in the one hand, while the flesh is crowded away from it by the closed fingers of the other. The knife will be necessary at the flank, but the hind leg and ham are best skinned by crowding the fist upwards and backwards. When one side is completed and the pelt fastened back so it cannot fall on and stain the meat, go over the other side in the same manner. Remove the bowels without breaking, and then cut out the brisket and take out the heart and lungs, and rinse out with clean cold water, without the use of a cloth, and you have a clean carcass. See Sheep; also Mutton and Lamb, on pages 964–5.

MUTTON, TO COOK. We very fully treated of the distinguishing features of the different cuts of mutton, and the best way of selecting, on pages 964–5. Here we give only the methods of serving in various palatable and popular dishes.

Roast Shoulder of Mutton. Take out the bone and fill the space with a stuffing made of bread crumbs, salt pork chopped fine, pepper, salt and sage, or sweet marjoram. Time, a quarter of an hour to each pound.

Stewed Leg of Mutton. Make a stuffing of finely chopped beef suet, bread crumbs, an onion chopped finely, pepper, salt, and a little ground clove. Make incisions in the leg, and stuff it well; tie a little bundle of basil and parsley together; lay in the bottom of the pot, and on it place the mutton; just cover with water, and stew slowly for two hours; when tender, take out the mutton and add to the liquor a large spoonful of flour, made smooth with a little water; stir it well, and in five minutes take it off and strain it; pour it back into the pot, and add a wineglassful of catsup and lay the mutton in till it is served.

Mutton Chops can be either broiled or fried plain, or with eggs and crumbs.

Stuffed Leg of Mutton. Boil two large white onions until tender, then chop fine; add bread crumbs and sage to taste, a little salt and pepper; then slit the sinewy part of the leg and insert the stuffing and roast.

Mutton Cutlets. Take a piece of the best end of a neck of mutton, saw off the bones short, remove the gristle and fat, cut the cutlets about one-third of an inch in thickness, shape and trim them neatly; beat them with a cutlet bat dipped in water; pepper, salt and broil them over a brisk fire.

Irish Stew. Put two pounds of mutton cutlets or chops, and four pounds good potatoes, peeled and sliced, in alternate layers in a large saucepan or stew-pan, season to taste with pepper and salt, and a finely shred onion; add a pint of cold water, and simmer gently for two hours. Serve very hot.

Cold Mutton Broiled. Cut in thick slices cold boiled leg of mutton; it should not be cooked too much or it will fall into pieces; salt and pepper it and then broil. Serve very hot, and add a thick sauce flavored with fresh tomatoes, or tomato sauce.

To Fry Lamb Steaks. Dip each piece into well-beaten egg, cover with bread crumbs or corn meal, and fry in butter or new lard. Serve with mashed potatoes and boiled rice. Thicken the gravy with flour and butter, adding a little lemon juice, and pour it hot upon the steaks, and place the rice in spoonfuls around the dish to garnish it.

Leg of Lamb. Boil it in water to cover it; when half done add two cups of milk to the water, with a large spoonful of salt. It should be served with spinach and caper sauce. Time, about one hour and a quarter.

To Roast Lamb. The hind quarter of a lamb usually weighs from seven to ten pounds; this will take about two hours to roast. Wash it well, put it into the pan, salt it and dredge with flour; put some water in the pan; have a brisk fire and baste it frequently while roasting. Serve with mint sauce.

To Roast the Fore Quarter of Lamb. An hour and a half to roast this piece; it is considered by some the best roasting piece; it should be frequently basted. To make the gravy take all the drippings, add a very little water, salt and flour, and give it one boil.

Mint Sauce, to serve with roast lamb. Take a bunch of green mint and chop it very fine with a knife; add a teacup of sugar, and a teacup of sharp vinegar. Stir this up, and send it to the table in a gravy tureen or sauce-boat.

N

NAG, a small horse, suitable for the saddle, or for a variety of kinds of light labor.

Nail, the flattened claw on the toe or finger of an animal. It is similar in chemical composition to horn.

In-growing Toe Nails. We give the following two excellent remedies for this painful affliction:

Cut a notch about the shape of a V in the end of the nail, about one quarter the width of the nail distant from the in-growing side. Cut down as nearly to the quick as possible, and one-third the length of the nail. The pressure of the boot or shoe will tend to close the opening you have made in the nail, and this soon affords relief. Allow the in-growing portion of the nail to grow without cutting it, until it gets beyond the flesh.

Another: Lift up the corner of the nail; put underneath a bit of cotton wool; keep it under for a time, wearing shoes tight on the instep and loose at the toes, with low heels. Short, wide shoes, or high-heeled shoes or boots cause this trouble, as well as corns and bunions. Laced shoes are the best, as buttoned shoes stretch, and let the foot down into the toe when walking. Keep the corners of the nails well cut down, and a cure will soon be effected, but never if the toes press against the shoe in walking.

To Whiten the Finger Nails. Take 2 drams of dilute sulphuric acid, 1 dram of the tincture of myrrh, 4 ounces of spring water, and mix them in a bottle. After washing the hand, dip the fingers in a little of the mixture, and it will give a delicate appearance to the hand. Rings, with stones or pearls in them, should always be removed from the hands.

Nankeen, a species of cloth made from cotton. It was originally a Chinese manufacture only, and, it is said, derived its pale salmon-colored tint from the natural color of a kind of cotton grown in that country.

Naphtha, a highly inflammable fluid characterized by a strong, empyreumatic, peculiar odor, and generally a light yellow color, but is rendered colorless by being carefully and thoroughly rectified. It burns with a white flame, emitting much smoke; it boils in platinum vessels at 158° Fahrenheit; it continues liquid down to zero: it has, when highly rectified, a specific gravity of 0.753 at 61° Fahrenheit; it is insoluble in water, but very soluble in alcohol; and it combines, in all proportions, with petroleum and oils. It exhibits some observable varieties of composition and appearance and even undergoes some slight change by being kept in exposure to the air. Most kinds of it are believed to be quite destitute of oxygen; and almost all are devoid of power to tarnish potassium, a substance possessing most powerful affinity for oxygen. The normal composition of naphtha is supposed to be six equivalents of carbon and six of hydrogen. Natural naphtha occurs abundantly on the shores of the Caspian and in some parts of Italy; and artificial naphtha, as obtained by distilling coal tar, has, of late years, become so general an article of commerce as to be almost everywhere well known.

Narcotic, a medicine which induces stupefaction or deadens the power of sensation. Narcotics are supposed to act directly on the nerves and the brain, and indirectly on the vascular system; and they at first excite or stimulate, but afterwards, and very rapidly and for a very long time, produce a sedative effect. They are useful medicines in certain conditions and stages of disease, but they cannot be safely administered to a horse, far less to a human being, without the guidance of such high skill and science as few but professional men possess; and in all cases they act upon the healthy system, or in frequently repeated doses, as downright poisons, depressing the vital forces, wasting the nervous energy, and producing some of the worst forms of both chronic and mental disease; and need only to be given in sufficiently large doses to cause almost immediate death. Two of the most common kind of them are tobacco and opium; and the myriads of infatuated men who daily use the former are just as suicidal and not by any means so cleanly as the thousands who use the latter in Turkey and China. Two other chief narcotics and at the same time virulent poisons, are digitalis and hellebore. See Opium.

Poison by Narcotics. The effects of poisoning by narcotic substances as opium, thornapple, hemlock, etc., are faintness, nausea, vomiting, stupor, delirium, and death. *Treatment:* G ve emetics, large draughts of fluids, tickle the throat, apply smelling-salts to the nose, dash cold water over the face and chest, apply mustard poultices, and above all, endeavor to rouse the patient by walking between two persons; and if possible by electricity; and give 40 drops of sal-volatile in strong coffee every half hour.

Nasal Gleet: see page 774.

Nasal Polypus: see page 793.

Nasturtium or **Indian Cress**, a highly ornamental

plant, whose leaves are used for salad and seed-pods for pickles. Sow in May in drills an inch deep and three feet apart, or in hills four feet apart each way, and either brush them like peas, or plant them near a fence or hedge upon which they can run. The dwarf kind, however, does not need this latter treatment. The principal varieties are: the tall dark, which has crimson flowers; the tall yellow, which has rich yellow flowers; and the dwarf.

Native Cattle: see page 204.

Natural, according to nature; normal, according to rule, or the requirements of perfection; artificial, made by man or animal. Hence, disease is natural, in the philosophical sense, but not normal; and bird's nests and human habitations are both natural and artificial; but to products of art neither the term normal nor abnormal applies. The term "natural" is often used in the sense of normal.

Navicular Bone. This bone, in the lower part of the horse's limb, is situated behind and beneath the pastern bone, and above the heel of the coffin-bone, and forms a joint with these bones, and acts as a most important part in sustaining the junction between the pastern and the foot.

Navicular Joint Lameness: see page 793

Near. The "near" side of a team is the left side, and the near horse or ox is the left one of the team. The term originated in the fashion of guiding a team at the right of the driver when the latter is walking, in which case the left animal is *near* the driver, and the other one "off" from him.

Neat Cattle, all cattle of the ox species. See Cattle.

Neat's-foot Oil, the oil obtained by boiling feet of cattle.

Nectarine. This is what some scientists would call a sub-species of peach, a nectarine tree sometimes bearing peaches as well as nectarines. Indeed, it is impossible to distinguish a nectarine tree from a peach tree; but the fruit is smaller, perfectly smooth without down, and it is one of the most wax-like and exquisite of all productions for dessert. In flavor it is perhaps scarcely so rich as the finest peach, but it has more piquancy, partaking of the peach-leaf flavor. The nectarine is a shy bearer in this country and its fruit is generally destroyed by the curculio. For the production of the largest fruit the branches should be shortened in annually. The culture is in all respects similar to that of the peach, which see.

The four best varieties of the nectarine for cultivation in the North are the following:

Boston. Large and handsome; ripens in September; bright yellow, with a very deep red cheek, shaded off by a slight mottling of red; flesh yellow to the stone, sweet but not rich, with a pleasant and peculiar flavor; separates from the stone, which is small and pointed.

Elruge. Medium size, greenish yellow, with a dark red cheek; flesh pale green to the stone, or slightly stained there with pale red; juicy and high flavored, melting; stone oval, rough, and of a pale color; separates from the stone. Ripens in September.

Hunt's Tawny. Medium size, a prominent swollen point at the top and one side of the suture enlarged; pale orange with a dark red cheek, mottled with numerous russety specks; flesh deep orange, juicy, melting, rich and good, separates from the stone; ripens Aug. 5 to 15. Tree an abundant bearer.

Red Roman. Large, roundish, a little flattened at the top, greenish yellow, with a brownish, muddy red cheek; flesh firm, greenish yellow, deep red at the stone, juicy, with a rich, high vinous flavor; clings to the stone; ripens in September; tree healthy and productive; leaves with kidney-shaped glands; flowers large.

Nerves, tubular cords of the same substance as that which composes the brain and spinal marrow. They extend from one or other of the nerve centers to every part of the body. They convey impressions from and to the brain, preside over the functions of the different organs and regulate motion and the senses. When the nerves become affected it requires longer time, and is far more difficult to restore than any other portion of the animal. Those persons with nervous constitutions, which are characterized by great excitability of the nervous system and extreme sensibility to external impressions, should adopt a nutritious and not too stimulating diet. Easily digested food should be taken. We cannot even attempt to treat the long train of afflictions to which the nerves are subject, directly and indirectly, more than is done under the heads of respective diseases. As a nerve stimulant nux vomica is the most powerful and exhilarating. This is the great nerve stimulant of most physicians. Put from 3 to 5 drops in a tumbler of water and take of this a teaspoonful every two or three hours. Owing to the slowness with which the nerves are built up this must be continued for a considerable length of time. American valerian is a most excellent agency for quieting nervous irritability. It can be given in a powdered root, teaspoonful doses, or from 3 to 5 grains of the extract.

Nervines, medicines relieving pain without producing narcotism.

Nervousness: see Nerves.

Net, a textile fabric of netted meshes, for catching fish, ensnaring rabbits, ensnaring birds, protecting fruit trees from the depredations of birds, and several other purposes. Nets for fishing are exceedingly various in form and size, and require to be minutely adapted to the several methods of fishing, and in some instances to the capture of particular species of fish.

Neuralgia, simply pain in the nerves, attended with neither swelling nor inflammation. The most general seat of neuralgic affliction is in the face and

head. The pain then shoots from the mouth to the eyes, often to the ears and over the cheek, palate, teeth and jaws. The pain follows the course of some particular nerve, and at times is of the most excruciating character.

Treatment. Constipation is often the cause; first give a gentle aperient; then make a bean poultice of common white beans; boil and mash, spread on thin cotton; this will retain the heat a long time. Hot oatmeal gruel heats the system quickly and thoroughly, and is very beneficial in cases of colds, neuralgia or rheumatism. *Another:* Prepare horse-radish, by grating and mixing in vinegar, the same as for table purposes, and apply to the temple where the head or face is affected, or on the wrist, when the pain is in the arm or shoulder.

Neurotomy (nu-rot'o-my), the dividing of the nerves in any extreme part of an animal, in order to destroy the pain of severe or laming disease in the region with which they communicate. It is usually performed in navicular diseases, when other treatment has failed.

Nicking, a barbarous operation on horses' tails, intended to make them maintain a cocked or elevated position. It was formerly much more fashionable, and accompanied with far more cruelties, and performed in a far more sweeping and unrelenting manner than at present; but still it is too common and too savage, and reflects disgrace both on the taste and the morality of multitudes of persons who have to do with horses. The depressing muscles of the horse's tail, in a natural state, are stronger than the erecting ones, and the fitful purpose of reversing this order, so as to give the erecting muscles the ascendancy of power and make the tail be more or less curved outward or elevated is all the apology which the jockeys and farriers and horse-breeders have to offer for inflicting this great torture upon the most useful of the domesticated animals.

The horse about to be nicked is either cast or held fast with the side-line; several deep cross-cuts are made in the under side of the tail after it has been docked. A cord is usually fastened to the hair of the tail and carried over a pulley attached to the ceiling, and thus kept drawn up over the back by a weight until the wounds heal. This they will do by granulation filling up the spaces, thus making the nicking complete. Thus keeping the wounds open for so long is a much worse horror than the nicking itself.

So violent and prolonged is the pain inflicted, that, in rare cases lock-jaw and death have been the consequence. A woman who dies from trying to make an "insect" of herself by tight-lacing, and a horse which dies from being made a monster by means of docking and nicking, are both victims to savagely perverted taste, but the former kills herself and the latter is killed by his master. See Dock.

Nightmare. This distressing complaint comes on with a sense of great weight on the chest, and a dreaming of something very frightful and horrible,—bad persons, specters of various shapes, wild beasts, infuriated animals in pursuit, and which the patient cannot escape, though apparently he makes, or tries to make the greatest efforts to escape; he attempts to cry out, but generally in vain. The sensation is very distressing and painful. Sometimes the uneasiness continues after he awakes, so as to prevent his turning or moving in bed for some time.

Nightmare arises from distension of the stomach; from indigestible matter in the stomach of heavy supper-eaters, which, pressing up the diaphragm, impedes respiration, and renders it short or convulsed; hence people are most subject to it after a heavy supper, and when they lie on the back. It rarely occurs in any other position. Those subject to it should therefore avoid sleeping in a bed which is hollow in the center, as this induces the sleeper to lie on his back. The pillow should be moderate in thickness, so that the head should not be raised too high.

Nightshade, an order of plants, many of which are familiar and some useful, as common or black nightshade, deadly nightshade, Irish potato, tomato, egg plant, jimson weed, tobacco, red or Cayenne pepper, apple of Peru, bittersweet, henbane, belladonna, ground cherry, horse nettle, matrimony vine, etc. Although some of these plants are remarkably different from others in the list, some being articles of food and some being poisonous, they all do have a nature in common. They are placed together in one family by botanists on account of similarity in the structure of their seed vessels. The plan and internal appearance of their flowers are also remarkably alike. The common nightshade, bearing black berries the size of small currants, is not poisonous. The true, medicinal bittersweet of this order is not the climbing "bittersweet," well known as a wild vine throughout the country. The horse nettle is also called ball nettle, or bull nettle, and is a pestilent weed.

Night Soil, human excrement. A most valuable manure.

Night Sweats. These sweats come on during sleep and are the result of general debility or weakness, and occur mostly with consumptives. To relieve night sweats, dissolve 15 grains sulphate of quinine in ½ ounce essence of tansy, ¼ ounce alcohol, ¼ ounce water, and 30 drops muriatic acid. A teaspoonful to be taken two or three times during the day and at bedtime. In connection with this remedy, cold sage tea is recommended to be used freely as a drink.

Nippers, the four teeth in the front part of a horse's mouth, two in the upper jaw and two in the under. See page 678. The name nippers is also given to some kind of pincers.

Niter, or Saltpeter, is both a natural and an artificial product. It is found in this country and in India in abundance, and is manufactured largely in Europe, especially Germany. Medicinally, niter is considered refrigerant, diuretic and diaphoretic, and is

known to be a powerful antiseptic. It has long been used by veterinarians as a diuretic, and as a febrifuge in low fevers. Cheaper and better medicines are daily in use for this purpose. Niter is not a cheap medicine, nor yet is it an indispensable one. The days are long since past when emetic tartar, niter and digitalis were the remedies used in all cases of inflammation, irritation and fever. This formula has in its day deceived many a man, and has been the means whereby many thousands of valuable animals have been lost. Wherever niter is indicated, sulphite of soda will answer. A bundle of fresh cut grass given to a horse will have a better and more soothing effect than niter.

Poison by Niter. This sometimes occurs. In such cases the symptoms are, heartburn, nausea, violent vomiting, purging, convulsions, difficult breathing, violent pain in the bowels, kidney and bladder, with bloody urine. The treatment consists in the speedy removal of the poison from the stomach, and the administration of gum arabic, slippery elm, etc., in drinks. Laudanum to allay the pain and irritation and cordials to sustain the system. No antidote is known.

Nitrates, the salts of nitric acid. Some of them have an important connection with the soil, and play an important part with the chemistry of vegetation; and both these and others, as well as nitric acid itself, possess considerable value in medicine and arts.

Nitrogen, or **Azote**, an elementary gaseous body. When pure it is colorless, odorless, tasteless gas, neither combustible nor capable of supporting combustion or respiration. It is fatal to life when inhaled in an unmixed state. It forms about 79 per cent. of air.

Nocturnal, relating to the night. Many birds and insects are termed nocturnal because they prey only at night.

Norman Horses: see page 691.

Nose, the organ of smell and one of the pieces of the complicated and wonderful mechanism of respiration. It combines the two offices of smelling and inhaling in order that the properties of the air and effluvia of bodies may at all times be even involuntarily brought under cognizance; and like the eye, the ear, the mouth and every other complex part of the animal organization, it affords countless and glorious indications of the wisdom and goodness of the Creator.

Carnivorous animals have but a dull sense of the smell of vegetable bodies, and exhibit a lamellar structure in the gauzily osteous cells over which the substance of the olfactory nerves is spread; while herbivorous animals, which require to exercise a nice and searching discrimination between the parts of herbage which are wholesome and the parts which are unwholesome, have a very keen sense of the smell of vegetables, and exhibit a spiral and convoluted structure, and therefore a vastly extended aggregate surface in the cells or supporting framework of the outspread olfactory nerves.

Bleeding of the Nose. This is often a troublesome complaint with many persons. Males are more subject to it than females. It generally occurs in persons predisposed or who are subject to it, and is brought on by violent exertion, bending the body with the head downward, or picking the nose. It often occurs without warning, but is often preceded by giddiness, flushed face and itching in the nostrils. It is often the result of habitual costiveness.

Treatment. Usually cold water applied to the back of the neck and face, and taken up the nostrils, will stop the flow. By pressing the artery that passes over the middle of the lower jaw-bone, or a little back, upon the side on which the bleeding occurs, and which is indicated by a slight depression in the bone, relief will be afforded. This stops the supply of blood. Strong salt water inhaled through the nostrils is often beneficial. If the bleeding is caused by costiveness, the bowels should be moved.

Nose-bag, a bag containing grain attached to the head of a horse in such manner as to permit him to eat its contents. It also means a bag used for steaming horses with a cold, as illustrated by Fig. 48, page 754.

Notary, or **Notary Public,** a person appointed by the governor of a State to certify oaths, depositions, deeds, notes, marriages, etc. His certificate (or attestation and seal), affixed to a document renders it authentic as evidence in the courts, but does not affect the correctness or incorrectness of the document itself.

Note, of hand, or promissory note, is a written or printed promise to pay a specified sum at a specified time for value received, and may be with or without interest. The "face of a note" is the amount specified. If it is drawn to the payee or order, or bearer, it is negotiable. In those States where the rate of interest is not fixed by law, the rate should be specified, but elsewhere it is unnecessary to specify the rate. If the interest is to be paid semi-annually it should be so stated. The words "value received" should not be omitted. If a note is made payable to your order, and you wish to retain it, withhold the endorsement on the back, so that if the note be lost or stolen you will not suffer harm, for it has no value except to yourself until you endorse it. If any one else endorses your name upon it it is a forgery. But if a note is endorsed and is lost or stolen, and comes into the hands of a third person for a valuable consideration, who holds it innocently (that is, believes the person from whom he received it was the rightful owner), it is no longer yours, in law, but his. If you part with a note payable to your order, and do not wish to guarantee it, endorse it and write over your name the words, "Without recourse to me." Without those words over your name, you would be holden for a time, and by a timely protest your responsibility would be perpetuated.

Nursery, a field or farm where trees or plants are propagated and cultivated until they are of sufficient size for transplanting where they are to permanently remain. We very fully treat of the manner of propagating all kinds of trees and plants under their respective heads; and as the nursery business is generally carried on by experts or professional nurserymen and not by farmers, we need say but little on the subject of propagating in the nursery. We treat of the care and management of trees in general in the article Orchard. It will scarcely justify the farmer to raise his own nursery stock, since he can purchase his trees and plants much cheaper than he can grow the seedlings and graft or bud them. The same may also be said of ornamental trees. When, however, large numbers of forest trees, or where groves or wind-breaks are to be planted, it is certainly better that the trees be bought when quite young and planted in nursery rows to remain there until of sufficient size to permanently transplant.

Thus, seedling conifers from four to twelve inches high, and deciduous trees one or two years old, and nursery stock either recent grafts or of one year's growth, may be ordered and planted out, the evergreens in rows two feet apart and pretty thick in the rows. As they begin to crowd each other in the row, take out every other one until they stand two by two feet. Then take out every other row, and again every other plant in the remaining rows. Those left will make specimen plants for various ornamental purposes. Deciduous seedlings should be planted four feet apart, as to the rows, by twelve inches in the row, thinning out as may be necessary, as heretofore directed. Eventually they may stand sixteen by sixteen feet, and these may be allowed to grow up into a grove, or the wind-break may be planted thickly and thinned out as necessary, leaving enough to stand for permanent growth. The idea in all this is that trees and plants while young can be cultivated and taken care of more economically in compact bodies than when planted out at the distances at which they are finally to stand. One plant will also support and act as a nurse to another if not too much crowded. The pruning, pinching, and training is more easily performed, and they may stand in the home nursery much longer and be transplanted far more safely than direct from the commercial nursery rooms, and for the reason that they will not have to be carried long distances. Thus, by buying quite young stock (maiden trees) they may stand until quite of large size, four or five years for apples and pears, three to four years for plums and cherries, and be safely transplanted with an abundance of fibrous roots, especially if they have been root-pruned the June previous to being finally transplanted. This is done by thrusting a sharp spade deeply down to cut the leading roots at a distance of eighteen inches to two feet from the stem of the tree, according to size. Thus, they will be found the succeeding spring to be furnished with an abundance of fibrous roots. It would be better that this root-pruning be done two years before the final transplanting, when the roots may be cut from fifteen to eighteen inches from the stems of the trees. Thus, a five or six year old tree may be transplanted and with ordinary care will scarcely be checked in growth.

The object in pruning nursery trees should be to develop them in every part, to produce a stout, stocky, sturdy little tree, one that may be turned out upon the bleak prairie and be able to withstand the blasts. To produce this result, the leaves should never be stripped from the shoots to make them extend their growth, for the sake of making more leaves; the nurseryman should know the value of leaves, as constituting the great evaporating surface that plays the most important part in causing the ascent of the crude sap, and also in its elaboration after it has been taken up into the organization of the plant. Leaves should be carefully preserved, and in the trimming, which is necessary, this should be borne in mind. To make vigorous, stocky trees, the side branches should be encouraged rather than pruned off. The tops may sometimes need to be pinched, to force out the laterals, and to encourage their growth; if two shoots start together as rivals, one of them should be topped or cut back, or twisted and broken, but not cut off at its origin, unless there be plenty of lateral branches or twigs to furnish the tree. When these become too long, they may be spurred-in, either in the fall and winter when cutting grafts, or in the summer, during the growing season. Whenever it becomes necessary to trim off any of these laterals, it is best to do it at mid-summer, as the healing of the wounds made at this period is very rapid. Heading off the nursery trees is to force them to branch uniformly the second year, to form their heads at the right place; this is to be done toward spring, and is applicable especially to those varieties that are prone to make a single shoot the first year without branching, and which have not been pinched in or headed during the previous summer to force out side branches. Cherries, plums, and pears, and some apples, are very apt to make this kind of growth. The age of trees for planting depends so much upon the views of planters that the nurseryman can not always control the period at which he shall clear a block of trees. Peaches should always be removed at one year from the bud. Plums and dwarf pears will be ready to go off at two years from the bud or graft; so with apples and cherries. But many persons, purchasers and sellers, prefer larger trees, and they recommend that the trees should remain one, two, or even three years longer in the nursery.

Nursery Agents deserve a notice in this connection. In pioneer districts this class of vampires drive a lucrative business, as every settler is anxious to get an orchard and has been too busy to post himself on the nursery business, and he is too easily wrought upon by wily and unprincipled traveling peddlers; but in course of time these farmers have some experience with these swindlers, become more wealthy and more informed about the wicked ways of the world

generally, and therefore proof against the old-time frauds. They have orchards, too, from the stock of reliable nurserymen and from various friends, and therefore are not in haste to order trees by or through strangers. They can afford to deliberate and adopt a safe course in the renewal of their stock. Many also become independent, being able to do their own planting, grafting, etc.

In view of the shameless abuses of the itinerant agency system, many nurserymen employ no traveling canvassers at all, and so advertise; while a few—as honest men, too, as the other class—proceed on the principle of making special efforts to find trade, and send out men "on the road." And, of course, there are some nurserymen who are not as reliable as they should be.

The question of suppressing the irresponsible fruit-tree agency business has often come up in the horticultural conventions, but up to the latest no scheme has been settled upon except popular education in these matters. No education, however, can supersede the necessity of carrying out business principles in business matters,—the necessity of writing down with ink every detail as to the conditions of the contract. It is best to deal with the nearest nurseryman of good reputation, and if he is too distant for personal visits to your orchard, contract with him for partial payments.

On the other hand, many if not most farmers are careless or incompetent in the proper cultivation of trees, and inculpate the faithful nurseryman for failures he should charge to himself. It is really best, therefore, for nurserymen to undertake to stock only that amount of territory around them which they can inspect and for which they can become personally responsible: then both parties can be satisfied. Nurserymen, therefore, will be such only on a comparatively small scale.

Nursery agents generally resort to one or more of the following expediencies: Exhibition of highly colored or exaggerated pictures of the fruit they pretend to introduce; canned fruit of picked specimens of a superior kind, represented to be the average of the variety he pretends to introduce; charging double price, and asking only half cash in hand, pretending to have the endorsement of well known nurserymen and horticulturists, etc., etc. If every farmer and farmer's wife would only follow the simple business rule, not to take a stranger's word for anything, but have every condition of the bargain plainly written down and signed, risking nothing, no fraud could be practiced by traveling agents. It is not within the constitutional bounds of legislation to prohibit business men from traveling to sell their stock: and so long as there are people to be "gulled" there will be unprincipled persons to "gull" them.

Nutmeg. The nutmeg is the seed of the Myristica moschata. There are two kinds of nutmeg, distinguished as the male and female, the former large and oblong, the latter soft and round. The females have the most aroma and fragrancy, the males are spongy. The nutmeg itself is enclosed in a hard shell. Mace is the soft fleshy coat which envelopes it. It is inferior to and cheaper than the nutmeg, in the place of which it is often used. By pressure nutmegs yield a fatty oil used in medicine. Nutmegs yield by distillation a very fine essential oil, which is very grateful, and possesses the flavor of the spice in perfection, two drops being nearly equal to a pound of the powder.

Nutmeg Melon: see Muskmelon.

Nuts, botanically, the fruit of a tree or shrub, consisting of a hard shell enclosing the germ and its envelopes called the kernel. Thus, hickories, walnuts and oaks bear nuts. The seeds of the cherry, peach, etc., are termed pits or stones, and those of the apple, orange, etc., are pips. Thus, nuts are kernels contained directly in a more or less hard shell; pits (or drupes) are nuts enveloped in a pulpy pericarp or fleshy covering; pip fruits are those fleshy fruits containing the seeds directly in the pulp, or else in scaly compartments in the middle of the fruit.

Nux Vomica, STRYCHNIA, an alkaline principle from the seeds of an East India tree; solid, crystallized, inodorous, bitter and excessively poisonous. It is a very popular remedy among many physicians as a nerve stimulant and tonic, generally being given in from a fraction of a drop to five drops of a tincture. A few drops (from three to six) are put in a tumbler of water, and a teaspoonful of the solution given every hour or so.

Nux vomica is a valuable agent in the cure of diseases in all animals. The powdered nut is uncertain in its effects; therefore only the tincture and alkaloid should be used. It is used when the nerves are weak, just as aconite is used when the nerves are strong and excited. The one medicine is used in depression and the other in diseases of exalted symptoms. Paralysis or palsy is the loss of power in the motive nerves of the part affected. Therefore, nux vomica is used in twitching of the muscles of all animals, and in glass-eye in the horse, depending upon the want of nervous energy in the optic, or nerve of vision. For horses and cattle, the dose is from 10 to 20 drops of the tincture, repeated three or four times a day.

STRYCHNINE, DOSE. To horses and cattle, give one grain, once a day, gradually increasing the dose until three grains are given in the day. To get the full benefit from it it will have to be given for a week or two, if the animal has not got well by that time.

In the use of strychnine, care and good judgment must be exercised, for it must be remembered that however useful a drug or medicine may be, its abuse is readily accomplished. Strychnine should be administered in feed, if the animal will eat it; if not, give it in gruel in the form of a drench. Twelve grains is the dose required to kill a full-grown horse.

POISON BY NUX VOMICA. Evacuate the stomach with stomach pumps or emetics and give bromine chlorine, iodine, prussic acid, prussiate of potassa or chloroform. See Poisons.

O.

OAK. There are 22 species, with an indefinite number of varieties by hybridizing of this magnificent tree, such as Black oak, White oak, Chestnut oak, Pin oak, Willow oak, Red oak, Scarlet oak, Spanish oak, Post oak, etc., etc. These all differ, not only in the formation of their leaves and fruit, but there is a marked difference in their manner of growth, and the wood of each possesses its own peculiar properties. Some of the varieties are quite small, growing only to the height of two or three feet, but by far the largest number are lofty trees with wide-spread branches.

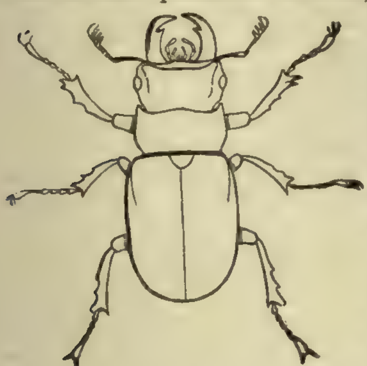


Fig. 1.—*Stag Beetle.* (Lucanus Dama.)

Some species of oak retain their foliage during the winter, as the Live oak. This tree inhabits the Southern States, where it occasionally grows to a considerable size. It is probably the most valuable wood known for ship-building, on account of its great durability. In South Carolina the Live oaks are often hung with the graceful festoons of a beautiful moss, which dangles from their branches in pendant masses of several yards in length. Of all the varieties of the oak, the black and white are with us the most abundant and most useful. These oaks often attain a great size, and live to a very advanced age. A timber or piece of black oak will rot upon the inside first while the exterior may be hard and sound. On the other hand, the white oak always commences decay first upon the outside, remaining sound upon the inside. It will last ten to twenty times as long as the black oak in places of exposure, and is used for a greater variety of purposes than any other wood.

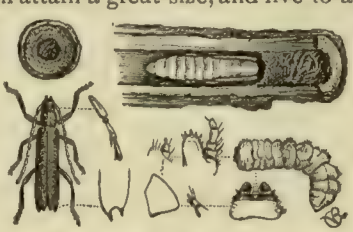


Fig. 2.—*Parellel Longhorn.* (Elaphidion parallelum.)

Oak Insects. The oaks are subject to the attacks of various insects, including the leaves, the inner bark and young wood; and they also bore into the solid wood. They are described in the insect article on pages 850, 854 and 863.

Fig. 3.—*Oak Tree Curculio.*

Oak Bark. This is a good astringent in veterinary practice for outward use or for sores which discharge or run matter. The bark is boiled: half an ounce to a pint of water. This decoction is an excellent remedy for drying up the moisture of greasy heels, so troublesome in horses. In diarrhœa in calves, given in four-drachm doses, much good will result.

Oak Apple, spongy excrescences found on oak trees; when hard they are called gall-nuts. These are fully treated under head of Gall-fly.

Oatmeal at the present day seems to comprise every grade of prepared oats, from coarse-cut grains to the finest flour, both cooked and uncooked. The uncooked groats require slow boiling for several hours, while the steam-cooked and crushed require scarcely anything more than hot water poured upon them to prepare them for eating. See Bread, Mush and Pudding. Oatmeal in all its forms is popular in some countries as an ingredient of a beverage. Either raw or cooked, a spoonful of it is put into a glass of cold water, which may be drank almost immediately. This is both a demulcent (mucilaginous) and a nutritious drink, and is a favorite among the laboring classes of England and Scotland.

The so-called "oatmeal" crackers of the groceries in this country may be made of almost any kind of flour. A few groats are mixed in with the dough, apparently with the foolish purpose of making the uninitiated believe the crackers are made out of genuine oatmeal. These crackers are probably as good as common crackers, but the consumer soon cloys upon them.

The use of oatmeal in the United States has become popular within a few years. Fifteen years ago nearly all that we used came from Canada, where they raise a superior grade of oats for the purpose of

manufacture into table food; then Mr. Schumacher, at Akron, O., began to make it popular, and lately there have been established factories in nearly every State in the Union, which, as before intimated, manufacture every grade of "oatmeal," both cooked and uncooked, from groats to fine flour.

Oatmeal should always be used as fresh as possible, as by standing it soon becomes bitter.

Oats, a member of the order of grasses, probably ranking next to Indian corn in importance as a cereal product in the United States. It is extensively used as feed for horses and cattle, and is rapidly becoming a favorite food for man. It is much easier of culture than wheat, and can be grown on soil that would scarcely produce a good crop of any other grain. Exactly where the oat came from is not known, probably, however, from central Asia. It was known to the ancient Greeks and Romans, who perhaps derived their knowledge of it from the Celts, Germans and other natives of Northern Europe.

CULTIVATION. Oats are cultivated through a wide range of latitude, and on a greater variety of soil than any other grain. The average yield on good soils is 30 to 40 bushels per acre, and on the richest, when well cultivated, it has exceeded 70 bushels. It is exposed to fewer injuries than other grain, being seldom affected by rust, smut or insects. The wire-worm is most destructive to it, especially when sown on fresh sod. The most effectual mode of extirpating these and other troublesome insects, is to turn the sod over late in the fall, so that they may be frozen to death. Deep plowing in the spring may cover them up so thoroughly that not many of them will find their way to the surface in time to do much injury.

Oats will thrive on almost any kind of soil that is not very wet. Standing water is death to the plant. They follow corn or potatoes very well. No green barnyard manure should be applied to the land, but fertilizers will not injure the crop. Well-rotted compost may be harrowed in with profit. On many soils two or three bushels of salt per acre may be used. When sown on sod it should never be omitted.

Sow early, and at the rate of two to four bushels per acre. They may occupy a turf, or follow any of the well-manured hoed crops. It is not necessary to steep for smut as for wheat, unless the grain were hulled. Harrow and roll well and the work of cultivation is done.

Oats frequently ripen unevenly, and if a large proportion is backward, the proper time for cutting will be as soon as the grain in the latest may be rubbed out of the straw by hand. Oats are sufficiently ripe for harvesting after they have passed into the milk state and are easily compressed between the thumb and finger. The lower part of the stalk will then be yellowish, having ceased to draw nutriment from the soil. Oats may be stacked or stowed away in the barn like wheat.

VARIETIES. The Common White is the most cultivated in the United States, being hardy and a good bearer, weighing 32 to 35 pounds ber bushel. In some places the Black oats are preferable. The Somerset, the Bohemian, the Houghton, the White Schonen, the Early Yellow and the Canada and other kinds have local success, and many have been tried in this country with very little success. The popular kinds in the Old World are, besides the White and the Black, the Red, the Poland, the Black Poland, the Friesland or Dutch, the Potato, the Georgian, the Siberian, Tartarian or Horse-mane, the Winter. the Hopetown, the Dyock and the Skinless.

Off. The "off" animal in a team is the one on the right side: see Near.

Oil. This substance in its purest state consists of carbon, hydrogen and a small proportion of oxygen, and its distinctive characteristics are, that it is greasy and insoluble in water, not uniting with it by itself. Oils are divided into two great classes, expressed or fixed oils and volatile or essential oils. The former is so-called because they do not boil or become volatilized, and do not inflame until they are heated to 600°. When nearly to this point they give out a vapor which is very inflammable; in fact, the oil does not ignite until it is brought into a state of vapor. On this account wicks are necessary to enable the oil in lamps to burn. Through them a small quantity is exposed to a high temperature, when it ignites. The volatile or essential oils are treated in the article Essential Oil.

Fluid oils are obtained both from animal and vegetable substances. When obtained from the animal in the solid state they are called fat and tallow. Fish oil is generally fluid. Fixed vegetable oil occurs in plants, associated with mucilage, sometimes in the fruits, as in nuts; occasionally in the pulp surrounding the seeds, as in the olive; but most frequently in the seed themselves, as linseed, rape-seed, etc. The degree of cold at which oils congeal or become solid varies extremely.

Oil-cakes, the remains of seeds after the oil has been expressed. Especially does this refer to the remains of linseed after the oil has been pressed out. Several of the oil cakes are remarkably rich and nutritive, and are used for fattening cattle. Hemp, rape, mustard and other cakes make excellent manure.

Oil-cloths. In buying an oil-cloth for a floor endeavor to obtain one that was manufactured several years before, as the longer it has been made previous to use, the better it will wear, the paint having become hard and durable. An oil-cloth which has been made within the year is scarcely worth the buying, as the paint will be defaced in a very little time, it requiring a long while to season. An oil-cloth should never be scrubbed with a brush, but after being first swept, it should be cleaned by washing with a large, soft cloth and lukewarm or cold water. On no account use soap, or take water that is hot, as either of these will certainly bring off the paint. When it has dried you may sponge it over with milk,

which will brighten and preserve the color, and then wipe it with a dry, soft cloth.

Ointment is a composition of animal fat or fixed oil with other substances, for external uses; it differs from liniment and salves in consistence only, being thicker than the latter and thinner than the former. When it contains a large proportion of wax, and of a consistence between that of ointment and plaster, it is called cerate. Ointments are not only used to defend wounds from the action of the cold air, but also to assuage pain and inflammation, to produce a healthy discharge from ulcers, and often as an external dressing, to retain on the part such other applications as may be necessary to destroy fungus, etc.

We give several recipes for making many of the best ointments known. In preparing ointment observe the following: Their solidity should not exceed that of good butter at ordinary temperature of the atmosphere. When the active ingredients are powdered substances, nothing can be more suitable to form the mass of the ointment than good lard, free from salt; but when they are fluid, prepared suet, or a mixture of suet and lard, will be necessary to give a proper consistency to the compound. In some few instances wax is required for this purpose.

Ointment for Old Sores. Red precipitate, ½ ounce; sugar of lead, ½ ounce; burnt alum, 1 ounce; white vitriol, ¼ ounce or a little less; all to be very finely pulverized; have mutton tallow made warm, ½ pound; stir all in, and stir until cool.

Neuralgia Ointment. Take 2 drachms each of cyanide of potassium and chloroform, and make into a salve with 1 ounce lard, for external application.

Belladonna Anodyne Ointment. Mix 3 drachms fresh and good extract of belladonna, ½ drachm powdered opium and 3 drachms lard. For neuralgia, etc., apply with friction for 6 to 8 minutes.

Ointment for Piles. Triturate 8 grains of morphia in 1 ounce melted spermaceti ointment, until the morphia is dissolved; then add 1½ drachms of galls in impalpable powder, 12 to 15 drops essential oil of almonds, and stir until the mass is cool.

Itch Ointment. Washed sulphur, 1½ ounces; chloride of lime, 2 drachms; hog's lard, 4 ounces. Mix and make into an ointment.

Foot-rot Ointment. Lard and Venice turpentine, 4 ounces of each; melt and add 1 ounce blue vitriol. Good for cows or sheep.

Cracked-Hoof Ointment. Tar and tallow, equal parts, melted together.

Egyptian Ointment. A detergent application for foul ulcers, etc. Mix by heat and agitation, 10 parts verdigris, 1 part calcined alum, 14 parts strong vinegar, and 32 parts thick purified honey.

Tar Ointment. Tar and mutton suet, equal parts; melt together and stir till cold. This is an excellent remedy for scald-head and ringworm.

Magnetic Ointment. Lard, raisins cut in pieces and fine-cut tobacco, equal weights; simmer well together, then strain and press out all from the dregs. This is an excellent ointment for salt-rheum and other skin diseases. It is also good for piles, bruises and cuts.

Okra, or **Gumbo.** A plant of the mallows family, the young pods of which are used in soups. For the extreme North sow in hot-bed, and transplant to rich mellow soil, one foot apart, thinning to two feet apart in the row, the larger kinds to three feet apart. The varieties are, Early Dwarf: white, small and round; pods smooth; most desirable; and the Long Green,— pods long and green, later and more productive.

Okra Gumbo is made by taking two quarts of ripe tomatoes and one quart of okra cut in rings; put them over the fire with about three quarts of water and let the mixture come to a boil; take one chicken; cut it up and fry brown, with plenty of gravy; put it in with the okra and tomatoes; add several small onions chopped fine; salt and pepper to taste; a little corn and Lima beans are an improvement, if you have them. Let all simmer gently for several hours. To be served with a tablespoonful of boiled rice and green garden pepper cut fine to each soup plate.

Oleomargarine (o-le-o-mar´ga-rin), a preparation made from tallow, which, with cocoanut, olive and palm oil and salt, as flavoring, and annatto as coloring, is used for butter, and for adulterating butter and cheese. This is quite extensively sold in cities for butter. In many of them, however, laws are enacted prohibiting its sale under any other than its real name. (See page 164).

To Detect Oleomargarine. Prof. Thomas Taylor, microscopist to the United States Department of Agriculture, gives the following practical tests for detecting oleomargarine:

"As a result of some recent chemical experiments I have discovered a very valuable and economical test, which may be easily employed by dealers and housekeepers in the detection of oleomargarine. The test is a very simple one, and consists in combining a small portion of the sample to be tested with the acid in the proportion of one grain of the substance to two drops of the sulphuric acid, the color which the mixture assumes determining its character.

"When pure butter is combined with the sulphuric acid in the above proportions it changes immediately to an opaque whitish yellow. Within five minutes a change in color, beginning at the edge, takes place, and it becomes a very pale shade of scarlet. In thirty minutes the color deepens perceptibly. Fresh oleomargarine, made from beef fat, when treated with sulphuric acid, becomes at first a transparent amber color. In the course of about twenty minutes the color changes to a deep crimson.

"When beef oleomargarine is stale or decomposing it turns under the acid treatment quickly to a deep transparent amber, and changes in less than twenty minutes to a dark opaque brown.

"Fresh oleomargarine with a lard basis, when first treated, changes quickly to a transparent amber, per-

haps a shade paler than in the case of the stale beef oleomargarine. The color changes in the course of half an hour to deep brown.

"Fresh oleomargarine having a vegetable basis, such as peanut or cocoa fat, on the application of the acid changes in color to a very pale, transparent amber, and in about thirty minutes changes to pale pink tinges with violet.

"In cases where butter is mixed with oleomargarine in quantity the tint will change corresponding to the proportions.

"With a little experiment any one may quickly become an expert in distinguishing butter from the oleomargarines by the process described above.

"As sulphuric acid corrodes most animal and vegetable substances, acting quickly and destructively, it is necessary to use it with care. It should be kept in a small vial with a glass stopper. When experimenting with it a small, solid glass rod should always be used for mixing purposes and other manipulation. No metallic or wooden implements should be employed."

Olive. The olive tree is interesting from historical recollections. It was the leaf of this tree, brought into the ark by the dove, that gave the first evidence of the waters of the deluge having abated, since which time it has been employed as an emblem of peace. The olive (*Olea Europœa*) is extensively cultivated in Southern Europe for the oil obtained from its fruit. It has also been successfully cultivated on the coasts of Alabama, Florida, South Carolina and Georgia, but to no great extent. It is a low branchy, evergreen tree, from 20 to 30 feet high, with stiff, narrow, bluish-green leaves. It is extremely hardy and will grow in soil scarcely fit for any other production, if only dry. The fruit is smooth and oval, about three-quarters of an inch in diameter, being about the size of a small plum. When ripe it is of a deep violet color. It is rather bitter, but has a pulp replete with a bland oil. Olives are chiefly cultivated for the oil which they produce, and which, in the countries where they grow, form a necessary article in the culinary art as butter with us. It is quite extensively used by many in this country as a salad oil. The fruit is also pickled.

Omelet, a kind of pancake or fritter, made chiefly of eggs. We add some excellent recipes for making omelet of various styles.

Simple Omelet. Take four eggs and beat as light as possible. For every egg add a tablespoonful of milk. Put a piece of butter in the omelet pan, and when hot pour in the mixture. With a fork scrape the egg very lightly toward the center of the pan as it cooks, and when done fold it together with a pancake turner.

Green-Corn Omelet. Take twelve ears of green corn; five eggs; salt and pepper to suit the taste; split the middle of each row of corn, and then scrape from the cobs.

Oyster Omelet. Cook 15 oysters rare done in a little saucepan, with a spoonful of milk, scrap of butter, and thickening to make white sauce of the liquor. Break 4 eggs in a bowl, put in a spoonful of milk and beat. Add a pinch of salt. Shake a tablespoonful of melted lard about in the large omelet frying-pan, and before it gets very hot pour in the omelet and let it cook rather slowly. Loosen the edges with a knife when it is nearly cooked enough to shake. When the omelet is nearly done in the center place the oysters with a spoon in the hollow middle and pull over the further edge to cover them in. Slide on the dish, smooth side up. Garnish with parsley and lemon.

Egg and Oyster Omelet. Beat up four eggs, and season to suit; chop up six large oysters, make a batter of half a cup of flour and half a pint of milk; mix the whole together, stir well, and fry slowly, adding by the teaspoonful.

Omnivorous, eating both animal and vegetable food. Most birds are omnivorous, are as also the swine, bear, etc.

Onion. The onion was cultivated in very remote times, having been known to the ancient Egyptians, who worshiped it under some mystic significance 2,000 years before the Christian era. Herodotus tells us that in his time there was an inscription on the great pyramid stating that a sum amounting to 1,600 talents had been expended for this vegetable consumed by the workmen during the process of its erection. The onion was a favorite vegetable with the ancient Greeks and Romans, and has been cultivated all over the world. It is very nutritive, and is much more succulent and of a milder flavor in southern countries than in northern climates. Onions are wholesome employed in any way. When young they are eaten as a salad. They are also eaten raw, being served with salt, pepper and vinegar; they are boiled, roasted and pickled, and also served in many ways in combination with other food. Indeed, the onion forms one of the essential productions of the kitchen garden, but the odor which they give the breath is a great objection to their use. By chewing a little parsley this may be removed.

Fig. 1.—*Silver Skin.*

Cultivation. More than all other garden vegetables onions have to be planted early in the spring, for very few varieties will germinate and grow in hot weather. Select ground which is mellow and enriched with old manure; old onion ground is better, be it ever so old. Plow it four or five inches deep, roll and harrow when dry, mark off in drills about 14 inches apart and sow the seed, covering them very shallow.

When up thin to three or to six inches apart, according to the size of the varieties sown; keep perfectly free from weeds by frequent hoeing. Onion sets, raised on the tops, do not have to be planted any thicker than they are allowed finally to stand, as they are very hardy and not subject to disease or insects. When mature, pull them up in dry weather, allow them to become perfectly dry, and then store them away in a cool place.

FIG. 2.—*Danvers Yellow Onion.*

VARIETIES. *Large Red Wethersfield.* An old standard; pleasant-flavored, grows very large, is hardy, very productive and keeps well.

Extra Early Red. One of the best.

Early Flat Red. A very quick grower, and one of the best for the North.

Early Red Globe. One of the earliest, most productive and handsome of all the red sorts.

Large Yellow Strasburgh. Late standard variety.

Danvers Yellow. Large, round, earlier than Large Yellow, very profitable; 1,100 bushels have been raised from one acre.

Early Cracker. A decided improvement on Large Yellow, being much earlier; the kind for a short season.

Large Flat White Italian. A mild-flavored, large onion grown from sets.

Naseby's Mammoth. Another Italian variety.

Marzajole or *New Neapolitan.* A silver-skin variety; white.

Southport White Globe and *Red Globe* are remarkably handsome and productive, but should not be raised north of latitute 41°.

New Queen. A new English white onion; earliest of all.

Potato Onion. Propagated by the bulbs.

TO COOK ONIONS. It is a good plan to boil onions in milk and water; it diminishes the strong taste of that vegetable. It is an excellent way of serving up onions, to chop them after they are boiled, and put them in a stewpan, with a little milk, butter, salt, and pepper, and let them stew about fifteen minutes. This gives them a fine flavor.

BAKED ONIONS. Boil in milk and water until just done, then drain and place the onions in a buttered baking-pan. Put a bit of butter and some pepper and salt over each one, and add a little of the water in which they were boiled. Brown them quickly on the grating of the oven and serve hot.

ESCALLOPED ONIONS. Take eight or ten onions of good size, slice them and boil till tender. Lay them in a baking-dish, putting bread crumbs, butter in small bits, pepper and salt between each layer, until the dish is full, putting bread crumbs last; add milk or cream until full. Bake 20 minutes or half an hour.

ONIONS AND GREEN TOMATOES. Slice as many green tomatoes as you like, fine, put on to cook with a little water, look out for burning, take one-third as many onions. When both are nearly done season with drippings of butter and plenty of salt till it has the right taste.

Opium is the most pleasant of narcotics. It produces, like tea and coffee, pleasant exhilaration, and in large doses, stupor and death. The use of it has become most extensive in China, where it is so prevalent that most of the Chinese-manufactured tobacco is said to contain an infusion of it. Opium is mostly procured from poppies, which are intensely impregnated with it. In the fluid state, called laudanum, it is often procured from lettuce, and this is quite as poisonous as that of the poppy. Hence the drowsiness observed after eating lettuces, especially when the full-flavored stalks are eaten. Opium is too extensively used by idle and ignorant persons in charge of children to save them the trouble of doing their duty as nurses. All the "soothing" syrups sold for giving to children are more or less impregnated with laudanum, which always injures and often proves fatal. There is no habit so utterly demoralizing or so hard to break or mitigate as that of opium-eating. A man of otherwise high moral principles will lie, cheat and steal for it when the terrible habit is once contracted. There is neither ease, life, activity nor mental power for him, unless under its influence. The victim of ordinary intoxication is less deplorable and more easily reclaimed than the opium-eater, or smoker.

There are several medical preparations of opium. Of these morphia or morphine is the most important. It is sold in the drug stores in the form of white crystals, as also in that of liquid. Each fluid ounce contains one grain of morphine or the true principle of the opium and one grain of the morphine is equal to three grains of opium or 45 drops of the tincture of opium, commonly known as laudanum. The latter is the most costly of all preparations of opium. These preparations are used in veterinary practice some. The dose for a horse, of the liquid opium, is from 20 to 40 grains. Horses will scarcely show the least effect of the administration of from two to four drachms of the powdered opium. On cattle it even has a much less effect than on horses. Cows can take one ounce and sheep one-half drachm of powdered opium without suffering. The dose of crude or powdered opium for horses is from one to two drachms and for cattle two to four drachms. Aconite has largely taken the place of opium in veterinary practice. Laudanum is used in lotions and liniments for the relief of pain.

POISON BY OPIUM. When a person has taken an overdose of opium, morphine or laudanum, instantly give an emetic, and keep it up till the danger is over. Strong coffee is an excellent stimulant. Or give mag-

nesia, chlorine, charcoal or iodine. Electrical shocks are a very efficient remedy for stupor. If respiration falls below ten a minute, artificial respiration should be tried. Prevent stupor by forced exercise.

Orange. Scientifically speaking, this delicious fruit is a berry. The pulp, the membranes which separate its various sections and the skin are only a thickening of the pericarp or seed-vessels. The natural office of the orange is, therefore, only to bear seed. It has been brought to its present condition by development.

The cultivation of this fruit possesses rare charms, and in California and Florida is receiving that attention which so delicious and profitable a fruit deserves. The orange tree is of very slow growth, requiring about 16 years for the seedling to attain its normal proportions. It then stands about 25 feet high, with a spread of branches of about the same distance, and a circumference of trunk, near the ground, of nearly three feet.

As the orange tree attains its maturity, its cylindrical trunk changes to one of eccentric longitudinal corrugations, although, if healthy, the bark still remains smooth. The wood of the orange tree is close-grained, hard and susceptible of a fine polish. It is of a clear yellow color, embodying a suggestion of the fruit itself. The leaves are ovate in form, slightly serrated and of a thick, leathery texture. When newly forming they are of a bright yellow hue, but as they mature they change to a dark green, with the upper surface presenting a decided gloss. The tree is an evergreen and it has numerous seasons of growth during the year, with slight dormant intermissions.

The orange tree blossoms early in February, and continues in flower until the last of March. The blossom is a pure white, of a most exquisite texture, and its fragrance is so great as to be almost surfeiting. The fruit sets in February or March and attains its maturity one year thereafter, when the tree blossoms again. The orange clings to its stem with great tenacity, and it is not unusual to find fruit of a former year's growth still on the tree when a second crop is attaining maturity. The quality deteriorates, however, if it is allowed to remain long after maturity. In time the juice is absorbed entirely, leaving the pulp a dry, spongy mass.

The orange tree grows to an extreme age, there being trees in Spain 600 or 700 years old. According to a writer in *El Diario de la Marina*, "there is still flourishing in the porch of the Convent of Santa Sabina, in Rome, an orange tree said to have been planted in A. D. 1200. Another, in the Monastery of Tondi, is supposed to have been planted by St. Thomas Aquinas in 1278. In the Moorish Alcazar of Seville, Spain, exists one that was planted during the reign of Pedro I, between 1350 and 1366. Others here known to be 340 years old are described as having a height of from 13 to 15 meters, with trunks from 1.24 to 1.40 meters in circumference. Age is not, however, indicated by size, as in Andalusia there are many younger trees that are considerably larger than these. In Alcala de Guadaira are two, the trunks of which at one meter above the ground are respectively 2.50 and 2.60 meters in circumference. The yield of some orange trees in Malta and Naples is simply astounding, reaching as high as 30,000 oranges to the tree, and in the estate known as the Huerta Grande, in Mairena del Alcor, there are two that are said to have borne 38,000 oranges each in a season."

Location and Soil. Having decided to grow oranges, these two questions should first be settled upon. In California there are three different kinds of orange-growing country: the lowlands, the middle lands and the mesas or table lands. The former, owing to the damp, cold condition of the ground, are not adapted to orange culture. The temperature here also goes below the limit of endurance by oranges and lemons. The middle lands constitute the greater portion of the cultivated lands of California. With reference to elevation, soil and water-supply, these lands are greatly diversified, and are therefore adapted to a wide range of products. Oranges are grown here with varying success, but close to the ocean the tree does not thrive. However, as the valley recedes the sea breezes are modified, a greater altitude is reached and more favorable is the location for citrus culture. It is now considered by the best horticulturists that the mesas are the most favorable for orange culture. These and the interior valleys, where conditions of soil, climate and water-supply are suitable, are recommended by authorities.

As to soil, the orange flourishes best in a sandy loam. It should be loose, well-drained and warm. On rolling or elevated lands a southern, southeastern or southwestern exposure is desirable. The orange luxuriates in warmth, and the more the tree and the ground in which it stands are exposed to the direct rays of the sun the better. They should also be free from exposure to severe winds. Should their natural location be exposed, make a break by planting cypress or other trees.

Selecting Trees. The work of selecting trees should be commenced early, and only the best should be taken. Such need not necessarily be the most expensive. A tree which is two years old in its budded growth, and four years old in its stock, and which is healthy and vigorous, standing from five to seven feet high, may be accounted first-class. The health of a tree is best indicated by the dark green of the matured foliage. If it have a yellowish cast, beware of the tree. But do not confound the sickly hue of the older leaves with the yellowish green of the new growth. The two are readily distinguishable.

In selecting varieties it is not necessary, in fact is unwise, to attempt to cultivate too great a number. Of the more than 100 varieties there are only a few that should be depended upon. Among these are:

LISBON LEMON. BONNIE BRAE LEMONS.

Riverside Navel, *Washington Navel*, *Umbilical*, *Bahia*, *Embigou*. Medium size, round, skin smooth and of fine texture; nearly seedless; juicy; high-flavored; pulp melting; quality the best. The peculiarity which gives this fruit its name and marks it beyond any question is a protuberance in the blossom end which closely resembles the human navel (see illustration on the accompanying colored plate). This is in reality a little kernel, enveloped in the skin, which, when examined, proves to be an aborted orange. The tree is semi-dwarf and has a few small thorns.

Mediterranean Sweet. Medium to large; oval; pulp and skin of fine texture; flavor delicate, less acid than any other variety of orange grown in California; nearly seedless; ripens late. The tree is a semi-dwarf, almost thornless and has a tendency to overbear. Fruit should be thinned vigorously to ensure a fair growth of wood and development of fruit remaining.

Thin-Skinned or Paper-Rind St. Michael. Fruit small, round, thin-skinned, high-flavored and a delicious sub-acid; one of the best budded varieties and destined to increase in popularity; keeps well and therefore a good shipper. Trees dwarfish in habit, thorny.

Maltese Blood. This variety derives its name from the peculiar marking of the pulp, which seems to be streaked and clotted with blood. This queer characteristic varies with fruit from different trees. The older the tree grows the more marked the fruit. It is a little under medium size, smooth, round and fine-textured; juicy; high-flavored, and the pulp tender and melting. The tree is a semi-dwarf; thornless, or only slightly thorny.

Konah. A California seedling from seed grown on Konah Island; most of the characteristics of a first-class seedling, the chief advantage being in the uniformity of fruit; thick rind, juicy, large. The tree grows to the full size of a seedling and is thorny.

Du Roi. Size medium, round, skin firm; fruit apt to be ribbed somewhat like a muskmelon. Trees prolific, vigorous, few thorns. Long grown in Florida and more recently in California.

Acapulco. Tree a vigorous, strong grower; rind, thick and rough; pulp, coarse; flavor, good; regular but late bearer.

Homosassa Of Florida origin; size of fruit medium, somewhat flattened, very heavy; color bright; skin very smooth, thin, tough and dense; pulp fine, sweet and juicy; flavor full and vinous; membrane covering segments of pulp very thin and small; ripens very early and keeps and carries well; quality best. Tree prolific, vigorous, very thorny.

Early Oblong, *Thornless Bell.* Grown in Florida. Fruit medium size, oblong, thick skin; lacking the sub-acid of other sorts; quality fair. Though its color does not turn much before the other sorts, its juices attain perfection one or two months earlier, when it should be marketed. Tree bears young; prolific; vigorous; not as large as some; leaves elliptical, acute and scattering; branches slender and thornless.

Peerless, *Rembert's Best.* Large; round; color, light, clear orange; skin smooth, fine and thin; juicy; juice sub-acid; flavor delicious; quality best. Tree prolific, vigorous and very thorny. Native seedling. This and the following are grown in Florida.

Magnum Bonum. Size large to very large; flattened; color light, clear orange; skin smooth and glossy; grain fine, tender and melting; fruit heavy and juicy; juice sweet, rich and vinous; quality best. Tree prolific, vigorous and very thorny. Native seedling.

PLANTING TREES. Orange trees should be set from 10 to 30 feet apart, according to the habits of the variety. Dwarfs are usually planted 10 feet apart, semi-dwarfs 18, and standards 24. In transplanting orange trees it is best to take them in their dormant stage, as they do not then feel the shock of removal as much as when they are active. These periods are as follows:

Middle of March to the middle of April; the month of June; the month of September; middle of November to the middle of December.

Many transplant in the first season with excellent results. The danger to be provided against at that time is in the cold weather which is likely to prevail. If the roots suffer a chill, the tree is irretrievably stunted, if not killed outright. June is the most popular time for transplanting.

Great care should be taken in trimming the trees before transplanting. A vigorous pruning should never be omitted.

CULTIVATION. When the rainy season has well set in, the orchard should be plowed with a single plow, throwing a furrow against the trees on each side, and leaving a dead furrow in the middle. The single plowing in the fall or early winter is ample for this kind of cultivation, if the soil is reasonably loose. Aside from the one or two plowings, the rest of the year's work is done with the cultivator, followed, in some instances, by the harrow or clod-crusher or "slicker."

IRRIGATION. From the 1st of April to the 1st of November may be accounted California's rainless season. It is during this rainless period that irrigation becomes necessary to sustain vegetable life. Orange trees, to thrive well and bring forth profitable crops, must be irrigated. It is a mistake, however, to suppose that because some water is good, a great deal more water is better.

INSECTS. The orange tree has its enemies, such as grasshoppers, rabbits, gophers, fungus growth, and a multitude of insects. These are described and treated at length in a work by Hon. Matthew Cooke, to which we refer.

PICKING, PACKING AND SHIPPING. Oranges begin to attain their best flavor in February, and that is the time the market should be opened. The fruit on the outer branches most exposed to the sun ripens first and is the best. The orange, unlike most other

fruits, does not begin to deteriorate directly after ripening and then drop from its stem. It will hold its juices in perfect preservation from March until June, after which it suffers gradual loss, but remains palatable until August or September.

It is a bad plan to leave oranges unpicked later than March and April, at which time the tree puts forth its blossoms for the next crop. The proper season for picking oranges is then from February to April. In no case should the oranges be dropped to the ground or thrown even a few feet to their receptacle. Oranges should not be gathered in wet weather or when there is dew on the trees.

When carried to the packing-house, the oranges should be spread upon shelves or racks, not more than two or three layers deep, all having glaring defects being at that time rejected. The fruit is thus left from two to five days, during which a portion of the water is evaporated from the skin, leaving it more tough and elastic and not so susceptible to damage by bruising as in the fresh state.

The fruit should be carefully sorted, cleaned and graded. It should be wrapped in paper, which, though involving some expense, is a protection to the fruit against bruising while in transit; it absorbs surplus moisture, thus preventing rot, and places the fruit in the market in a tasty manner.

From 100 to 250 oranges may be put in a box. They should be counted as packed, and the number marked on each box.

When old orange trees become sickly and practically useless by reason of exhausted vitality or insect pests, they may be restored by adopting the following course: Denude the tree of leaves altogether, cutting away all of the top except the leading branches. Wash these branches and the trunk thoroughly with an insecticide and wrap the trunk in burlap to protect it from the sun. Manure the ground about the tree and irrigate thoroughly. The tree will send out a multitude of new shoots, which should be thinned out judiciously. In one year the tree will have a fine top, and in two years will begin to bear again. In this way diseased trees may generally be entirely reclaimed.

ORANGE JELLY. Make a syrup with a pint of water and a pound of loaf sugar, boil it with the thin rind of four oranges and two lemons, skim it carefully, and add the juice of eight oranges, and let it boil about 20 minutes; skim, and add the juice of a lemon and either a pint of calf's-foot jelly or gelatine; stir well. Carefully peel a couple of sweet oranges, slice and remove the seeds. Fill the mold, disposing of pieces of oranges in it in a symmetrical fashion; when set, turn it out by dipping mold in warm water.

AMBROSIA. Take 8 fine sweet oranges, peeled and sliced; ½ cocoanut, grated, and ½ cup powdered sugar. Arrange the orange in a glass dish, spread the grated cocoanut thickly over it, sprinkle this lightly with sugar, cover with another layer of orange, and so on until the top is reached, which should be of cocoanut and sugar. Serve immediately.

Orchard, a field or enclosure devoted to the growing of the larger fruits. Under the heads of the different kinds of fruits, their propagation, culture and care is very fully treated, and in the articles Horticulture, Budding, Grafting, Forestry, Fruits, Mulching, Soil, Drainage, Manure, Fertilizers, etc., valuable aids to the care and management of the orchard and its products are detailed. Orchard grass is treated on page 599.

In selecting a site for an orchard some care should be exercised. Do not think that you can plant an orchard anywhere and meet with success in fruit-growing. In former times the general custom was to select low and sheltered places, by the side of streams in the river valleys; but this is being abandoned as a wrong theory. Locations least liable to the ravages of frost are the best. A "warm place" is a dangerous place for trees. Elevated sites for orchards are growing more in favor, for it must be remembered that low places and flats are the resting places for cool air which settle at the bottom, and are therefore subject to untimely frosts. In the Northwest, orchards should be on northern slopes, in order to prevent a too early swelling of the buds in spring.

Whoever would plant an orchard properly, should first determine to give up the land to the trees, and decide that whatever shall be done to it shall be done for the benefit of the trees alone, and not for any secondary crop whatever. The land upon which an orchard is to be planted in the spring should be prepared the preceding fall; but if this has not been done, delay planting until the land can be properly prepared. When the trees that you ordered arrive you had better let them remain heeled in for several weeks rather than to set them hurriedly in holes, as if they were posts. "Heeling in" is an abbreviation of the old gardening term of "laying in by the heels," and means a temporary covering of the roots with earth. To do this, open a ditch in a place where water will not stand, and as much sheltered from the winds as possible; if convenient let it run north and south; in this, place the trees inclined about 45 degrees or less, so that they may shade one another, and as they are put in, have fine mellow soil well worked in among the roots so that no cavities are left. Be careful of the labels; if there are many of a kind separate the varieties by a stake. See to it that the trees are put in in such a manner that there will be no doubt about the identity of the varieties when they are taken out. The soil for the orchard should be manured, plowed and harrowed as if for a crop of corn. As the amount of absorbing or root surface has been greatly reduced by the taking up of the trees, no matter how carefully, the evaporating or leaf surface should also be diminished. Recollect that every bud is an undeveloped leafy branch, and every bud removed takes off many leaves. Before the trees are planted this evaporating surface must be lessened by cutting back the branches. How much to cut away is a matter of judgment, but it is safe always to cut away one-third of the shoots; and if the roots have been badly mutil-

ated, one-half or two-thirds may be removed to the benefit of the tree.

The common method of setting out an orchard is to plant the trees in a square, but if a more uniform space is desired on all sides of each tree, what is called the quincunx is preferable.

In laying out your orchard in this form, first decide upon the distance for the trees and make an equal-sided triangle of light stuff with the sides of that distance. Place the frame at the end of the first row and the three corners will determine the position of as many trees. After laying off, and marking the places with stakes for a few trees, in this way, the rest of the orchard can be set without the use of the frame. Recording the orchard should not be omitted. Labels soon fall away and are not reliable, but a map or record of the trees by rows and numbers is easily and quickly made, and is permanent and useful. Trees that have been girdled by mice or rabbits will recover if a mound of earth be made to cover the wound, provided the inner bark is not destroyed. When the girdling is complete, the only hope of saving the tree is to insert grafts between the bark below and above the girdled place. Take small shoots from the same tree, sharpen both ends, and insert them in cuts made with a sharp chisel above and below, bridging the wound; afterwards cover with clay or grafting wax. Cut off any limbs of trees that have been broken down during the winter by ice and snow, make the wound smooth and cover it with melted grafting wax or paint. Old trees may be renovated by trimming out decaying branches, manuring the soil and scraping the trunk, to remove the loose bark and the eggs and chrysalids of various destructive insects. After scraping, the trees should receive a strong alkaline wash; there is nothing so good for this as home-made soft soap, mixed with water until thin and applied to the trunks and branches with a large paint or whitewash brush.

Nurserymen usually describe trees in their catalogues as "second class," "medium," "first class" and "extra." The difference in these classes is principally, if not wholly, in the size and height of the trees; and as most farmers desire the best, they suppose that the large "extra" trees merit that description, and hence order them. The fact is, however, that a small tree will grow faster and (if a fruit tree) come into bearing condition sooner than a large one, and in half a dozen years the tree that was planted when small will be larger and finer than the other. The larger the tree the larger the roots which it has, and the larger the roots the less fibers there will be upon them. A tree that has plenty of fibrous roots will grow readily if proper care is used in its transplantation; but no amount of skill can coax a tree to live and flourish which is destitute of these little fibers. The roots of large trees are always more or less mutilated in the process of taking up, while small trees sustain little injury from this source. Dealers in trees assert that experienced men buy small, thrifty trees, while those who are just starting are anxious for the largest to be had. Those who wish to set out trees will do well to learn from the experience of those who, at considerable loss to themselves, have demonstrated that small trees are the ones to buy.

If thrifty trees are set in a hole cut in a wet meadow and the sods put back, except for a foot or so about the tree, as is often done, such trees cannot thrive, and many will not survive the first season. Such orchard planting is a waste of money, and if no other land can be used, wait until the land can be drained and made fit for planting. Having the land in proper condition for producing a good crop of wheat or corn, and having laid out the orchard, marking the place for each tree with a small stake, open a broad, shallow hole, and with the tree in the center, spread the roots in all directions (see page 511), and work soil in among the roots, leaving no masses of roots or large hollow spaces about them. Set each tree carefully, as it is a matter of a life-time, and on it depends largely the success or failure of the orchard. While the trees are small they need special care. The ground should be well tilled and thoroughly manured. Hoed crops may be grown between the rows, but the very act of planting an orchard indicates that the land is devoted to the production of fruit. If another crop interferes in any way with the best growth of the trees, that crop is out of place.

It is sometimes said "the orchard has run out," but it is only another way for saying that the trees are crying for manure. The earlier in the season this manure is applied the better. Good, well-rotted stable manure is the best, but should there be an abundance of vegetable matter in the soil, a dressing of lime will often produce gratifying results. Wood ashes or bones will not come amiss upon an old "worn-out" orchard.

Pruning may be done in March or June, but should not be done in April or May, for these reasons: in March the sap is partially dormant and the wound will become dried before the sap reaches it, and therefore it will not bleed; in June, or in blossom time the sap has passed up through the pores of the wood, forcing out the leaf and changed its nature, and is on the return to supply the fruit with nutriment, and to form a new layer of wood under the bark and there becomes thick and glutinous and will not bleed, and the tree being in full vigor of growth the wounds will readily heal, while in April and May the sap is moving up through the pores of the wood, and is very thin and will readily bleed.

Orchards should be cultivated to low crops or kept in fallow until the trees are well in bearing, when orchard grass, timothy or white clover may be allowed to take possession of the ground.

Ornamental Currant. This member of the saxifrage family is cultivated for its spicy-scented, bright-yellow flowers in early spring. The berries are blackish and insipid. The red-flowering species is rare in cultivation, while the golden is common everywhere.

Ornamental Trees: see Landscape Gardening, Forestry and Floriculture.

Ornithology, that department of natural history which treats of birds. It should receive no little attention from the farmer. He should familiarize himself with characteristics, habits, etc., of the birds common to his section. It will not only enable him to guard against those that ravage his crops, and to know those that assist him, by keeping off the numberless insects, but will afford him rare pleasure. The study of the feathered tribe is very fascinating. We treat many birds in their alphabetical order, and many others in the article Birds.

Ossify, to form into bone.

Ounce, 480 grains, or one-twelfth of a pound of troy weight; in avoirdupois it is one-sixteenth of a pound, or 437½ troy grains.

Ovarium, in plants, a hollow case enclosing young seeds which contain one or more cells, and finally becomes the fruit. The ovarium is always situated in the center of the flower, and, in connection with the stigma and style, constitute the female system of the vegetable kingdom.

Overshot Wheel, a water wheel the circumference of which is furnished with cavities or buckets, into which the stream of water is delivered at the top, turning the wheel by its weight.

Oviparous, developing young in eggs which are afterwards separated from the parent, and which are usually hatched after exclusion from the body.

Ovoviviparous, oviparous, but hatching the young while within the body. The viper, flesh fly and some fish are ovoviviparous.

Oven Brick: see Brick Oven.

Overreach: see page 794.

Owl. There are few groups of birds so decidedly marked and so easy of recognition as the owl. The round, puffy head, the little hooked beak just appearing from the downy plumage with which it is surrounded, the large, soft, blinking eyes, and the curious disk of feathers which radiate from the eye, are such characteristic distinctions that an owl can at once be detected. They are almost without exception nocturnal in their habits. The principal varieties known here are the barn owl, the great horned owl, the red, screech, the long-eared, the short-eared, great gray, the barred owl and the little owl. All of them are carnivorous and they generally feed on young turkeys, chickens, hares, squirrels, rats, mice, small birds, beetles and other insects, etc.

Oxalic Acid. In cases of poisoning with oxalic acid or salts of sorrel, chalk and water may be administered as a chemical antidote, with the view of producing the insoluble oxalate of lime. Emetics should also be applied. The effects of such poison are vomiting and acute pain in the stomach, general debility, cramps and death. Lime water or magnesia in large draughts should be given.

Oxen, the gelded males of neat cattle. These, until they have matured, are known as steers. "Horned horses," as the New England fathers were wont to style their oxen, are not so much in use in this country as they formerly were, horses and mules being esteemed preferable and more in accordance with the speedy disposition of the times. In New England they are still much used on the rugged and uneven farms of that region, as well as in other mountainous sections. In New England, the Devons, red, shapely and sprightly, have always been most highly esteemed for draft purposes, the breed having been imported into the country at an early day. The Herefords have also been somewhat prized as oxen, and the various gradations of these breeds with the native scrubs have been used. The best time for breaking steers is when they are a few months old; in other words they should be so handled as never to need what is commonly termed "breaking." Miniature yokes may be placed on them when they are quite young, before they suspect the object. Careful and patient boys may take this matter in charge, and begin yoking and driving them when yearlings. The after management of the ox will be a very easy matter, if the calf has been treated as indicated above. The goad and the lash should be used sparingly. The yelling and shouting of the average driver are absurd and more than useless. As in the case of nearly all dumb animals, when once the beast knows what the master wants that the brute will perform. Care should be taken in breaking steers not to blunderingly or carelessly get them into tricks or notions, through fear, like dodging, starting, or running away. Oxen, while at work, are usually large consumers of food. They will devour enormous quantities of hay if they are not given a feed of grain or roots. A good feed for working cattle is turnips, carrots or mangold-wurzels chopped, and corn meal, or meal and bran mixed, poured over them. Oxen kept on this feed will not consume so much hay as otherwise, and will be maintained in good heart for labor. When oxen are worked in winter they should be shod. Care should be taken not to have the boxes of yokes too small, nor yet too large; in both cases the animal will labor uneasily.

Ox-Yoke. To make this yoke it is necessary to have a stick of light, strong timber, such as butternut, walnut, sycamore, basswood, soft maple, or wild cherry, each of which is excellent material. The size of the stick necessary is 10 by 16 inches and 5 feet long. This should be sawed in two, cutting out two pieces of the heart, making two pieces 10 by 7. One side and one edge of the piece should be dressed square; the center found, the first bow-hole is then bored 12 inches from this center; the second bow-hole 12 inches from the first. Mark, and bore the holes from each side, making them meet in the center, to secure accuracy. A 2-inch auger should be used, and the holes then burned with a hot iron

to make them smooth. The yoke is then laid out 3½ inches thick in the center between the bow-holes, and 6½ inches thick in the center between the two bows, where the ring is placed; the ends are beveled off, and lines of proper curvature laid out between the points marked. The yoke may be fashioned with jig or band saw, or adz, and should then be finished up true and square from the face side with a drawing knife. It should then be laid upon its back and 4½ inches marked off from the center for the width of the yoke, taking off about 1¼ inches from each side. The ends are then tapered off and rounded. The bottom, or inside, of the yoke must now be rounded, first by a broad chamfer, and then rounding and finishing smooth; the top is left square, except to chamfer the corners or edges of the yoke. The bows are 28 to 30 inches in length and 2 inches in diameter. Instead of a staple, use a broad iron strap, which goes around the yoke, having screws cut on the end and a plate held down by nuts screwed over it, to clasp the yoke and strengthen it. In the bottom of the strap is placed two pieces of cast iron, which have a flange upon the edge, and four slight projections upon the top, for which small holes are bored in the wood. The two castings are so formed that when they are placed in position they have a hole in the middle, in which the ring is inserted; the strap is placed around them and put upon the yoke, and the nuts on the top screwed tight. Such a yoke is much stronger than if the staple passed through it.

Oxygen, a colorless, odorless and tasteless gas. It is somewhat heavier than air, its specific gravity being 1.1056. Oxygen is the most abundant element in nature. It exists free in the atmosphere, of which it forms a fifth part. Combined with other elements, it constitutes two-thirds of the entire globe. Water is eight-ninths oxygen by weight. Fully one-half of the weight of all minerals, three-quarters of the weight of all animals, and four-fifths of the weight of all vegetables is oxygen. It is capable of entering into combination with all the elements except fluorine. But in the state in which it is usually obtained heat is necessary to bring about the union. Combustion, in the ordinary use of the term, is union with oxygen, attended with light and heat. When hydrogen, sulphur, charcoal and iron, for example, are brought in contact with oxygen at a suitable temperature, they burn, evolving heat and light and producing oxides of these substances. Oxygen is therefore an intensely active substance, in which the rapidity of ordinary combustion is vastly increased. Oxygen gas is essential to respiration—that is, to the evolution of carbonic acid from the blood, but requires to be diluted with nitrogen, as in the air; otherwise it destroys life by producing over-activity. Seeds cannot germinate without oxygen, and must not therefore be buried too deep in the compact soil. The leaves of trees, also, cannot perform their functions without its presence, although they are always exhaling a large quantity of the gas. See Ozone.

Oysters, To Cook: see page 482.

Oyster Plant, or Vegetable Oyster: see Salsify.

Ozone, is oxygen in an active or highly electro-negative state. In a word, it is active oxygen. (See Oxygen). It is half as heavy again as oxygen. Ozone is found free in the air after a thunder-storm. It acts to oxidize and destroy impurities in the air. Atmospheric ozone burns up miasmatic exhalations, and hence preserves the air pure. It is especially active during a thunder-storm. The recently invented processes and apparatus so extensively advertised for generating ozone for purposes of disinfection, cost much more than they are really worth.

P

PACE or **Amble,** a certain gait of a horse in which both legs of one side are raised at once. It is one of the most easy gaits for a saddle-horse, yet it is not recognized in the art of horsemanship. The action of the pacer is neither so safe nor so pleasant as that of a racker, whose feet are set down one after the other in regular one-two-three-four time. This, however, is only a variety of the pacing gait.

The word "pace" also signifies the peculiar manner of locomotion in a horse or other animal. The natural paces of a horse are the walk, the trot, the gallop and in a few instances the "pace," or amble, as described in the above paragraph.

Pack, a large collection of hounds, 25 couple constituting a true pack. It means also a number of wolves together. See Flocks.

Pack-Saddle, a saddle adapted to the carrying of heavy packages or burdens.

Paddock, a small pasture immediately adjoining a stable.

Paint and **Painting.** There is perhaps nothing that pays so well in the care of the farm buildings as the use of paint; and not only for the protection it affords, but the superior elegance it gives to the plainest structure by its tasteful application makes it too valuable to be ignored or neglected by the farmer. As almost all painting is done by professional artisans, we deem it unimportant to the farmer to go into a detailed description of the process. When you have any painting to do, it should be done in the fall, winter or early spring, as all paint applied in cool weather dries slowly and makes a hard, glossy surface; if applied in hot weather the wood rapidly absorbs the oil, leaving the lead on the outside, to crumble off. The mild days of February and March are well adapted to outside house painting. No room should be painted while in use.

The character of the work to be done will determine the kind of brushes to use. One or two flat and three round brushes of various sizes will be sufficient, and wire-bound ones are the most durable. After use, the brushes should be thoroughly cleaned with turpentine and covered with tallow.

If the house be new, the knots should be covered with a varnish of gum shellac and alcohol, to prevent the exudation of resinous substance which would discolor the paint. The first coat should be made of white lead and fresh, raw linseed oil, boiled oil and turpentine being used in the subsequent coats. For inside work, equal parts of boiled oil and turpentine are used for the first coat, and 75 per cent. turpentine is used for the second, and nearly all turpentine for the third. The color desired should be in the second and third coats, the first being simply white lead. In repainting old houses, sand paper or pumice stone should be used to smooth down all irregularities of the surface, and then paint as if applying a second coat.

Good mixed paints can be purchased in small cans, thus saving the trouble of mixing them.

We give recipes for making some cheap paints, which the farmer can make and apply himself on out buildings, fences, etc.

Cheap Paint. Take a bushel of well burnt lime, white and unslaked, 20 pounds of Spanish whiting, 17 pounds of rock salt, and 12 pounds of brown sugar. Slake the lime and sift out any coarse lumps and mix it into good whitewash with about 40 gallons of water, and then add the other ingredients, and stir the whole together thoroughly, and put on two or three coats with a common brush. This is a cheap paint. Five dollars' worth ought to make the building look a hundred dollars' worth better. This makes a coat that does not wash off, or easily rub off, and it looks well, while it will go far to preserve the wood. It is therefore especially adapted to the outside of buildings that are exposed to the weather. Three coats are needed on brick and two on wood. If you want to get a fine cream color, add 3 pounds of yellow ochre to the above. If you prefer a brown color, add 4 pounds of umber, 1 pound of Indian red and 1 pound of lampblack. If you want a gray or stone color, add 4 pounds of raw umber and 2 pounds of lampblack. This will be more durable than common whitewash.

Fire and Water-proof Paint. Slack stone lime by putting into a tub, covered, to keep in the steam; when slacked, pass the powder through a fine sieve, and to every 6 quarts add a quart of rock-salt and a gallon of water; then boil and skim clear; to every 5 gallons of the liquid add pulverized alum, 1 pound; pulverized copperas, ½ pound, and stir slowly; add powdered potash, ¾ pound; then very fine sand or hickory ashes, 4 pounds; then use any coloring matter desired, and apply with a brush. It looks better than any ordinary paint, and is as durable as slate; will stop small leaks in roofs, prevent moss

from growing thereon, make it incombustible, and render bricks impervious to water.

Palate, the roof of the mouth of an animal. In young horses, particularly when they are changing their teeth, the palate is generally very full or swollen, and sometimes protrudes lower than the upper front teeth and is supposed to occasion difficulty in feeding. See the article Lampas, page 787.

Palpitation of the Heart: see Heart.

Pancakes, or **Griddle-Cakes.** Use a frying-pan for pancakes; heat it; put in a teaspoonful or two of lard and run it quickly over the bottom; then pour in a large ladleful of batter—enough to cover the bottom of the pan with a thin sheet. Turn with a tin spatula, very carefully, to avoid tearing it.

Clean snow is a good substitute for egg, in pancakes, 2 tablespoonfuls being equivalent to one egg.

COMMON PANCAKES. Beat 3 eggs, and stir them into a pint of milk; add a pinch of salt, and sufficient flour to make it into a thick smooth batter; fry them in boiling fat, roll them over on each side, drain and serve them very hot, with lemon and sugar.

Another recipe: Take 1 teacupful of sour cream and 3 teacupfuls of sweet milk; add a level teaspoonful soda, and teaspoonful salt dissolved in a little hot water, and flour enough to make a batter that will pour (not drop) in a heavy stream from a spoon.

BREAD PANCAKES. Soak pieces of stale bread in water until quite soft; drain through a sieve, then rub the bread through a colander. To a quart add three eggs and milk enough to make a soft batter.

BUCKWHEAT CAKES: see page 152.

GRAHAM GRIDDLE CAKES. One pint of milk, half a cup of sour cream, half a teaspoonful of soda, the same of salt; stir in Graham flour not as stiff as for fine flour cakes (no eggs); have the griddle quite hot; or with yeast the same as with buckwheat.

CORN-MEAL GRIDDLE CAKES. Scald half a pint of Indian meal; half a pint of the same, dry; flour, and stir all into a pint of milk, with a tablespoonful of butter and 1 egg. Spread very thin on the griddle.

Another: Take 1 quart of sour milk or buttermilk, gill of molasses, teaspoonful baking soda, a little salt, 1 egg, and mix with meal enough to make a good batter; have lard enough in a flat kettle boiling to swim the cakes; dip a spoon in the lard to drop the cakes, or omit the molasses and eat with butter.

GREEN-CORN GRIDDLE CAKES. Mix 1 pint of grated green corn with three tablespoonfuls of milk; 1 teacup of flour, half a cup of melted butter, one egg, a teaspoonful of salt, and a little pepper. Drop this upon a griddle and cook well.

OATMEAL GRIDDLE CAKES. Take 1½ cups oatmeal, 2 teaspoonfuls of sugar, 1 saltspoonful of salt, and a piece of soda about the size of a pea. Stir all well together with cold water and let it stand all night. In the morning put 1 egg, 1 cup of milk, and enough flour to give it the right consistency of a batter. Fry in a griddle with very little fat—a small piece of beef suet, which is the best to use.

OATMEAL CAKES. Take 2 cups of cold boiled oatmeal; mix 1 egg through it; 1 tablespoonful of sugar, and pepared flour enough to make into cakes; dip each side into rolled cracker and fry brown.

COMMON FLAT-JACKS. One quart sour milk, thicken it with flour; 2 teaspoonfuls of saleratus and a little salt.

Pancreas (pan′cre-as), a glandular viscus of the abdomen, situated beneath the stomach, and one of the most important of the digestive organs. This is the sweet-bread in the lower animals.

Panic Grass, a genus of grasses with spreading tops, many of which are common throughout the United States, some being useful as forage. There are 17 species in the Northern States, all but one of which are native. The introduced species is the familiar "barnyard" grass. Besides the above, the Hungarian grass or millet is a true panic grass.

BARNYARD GRASS. This is an annual, growing two or three feet high, with a heavy, juicy stem and rough, heavy seed-tops. Its favorite habitat, as denoted by its name, is the barnyard, growing sometimes even upon manure heaps. It is greedily eaten by horses and cattle, and makes hay of passable quality. In some parts of the country it has been cultivated.

SLENDER CRAB-GRASS. This is a Southern annual, with straight stems, terminated by three to five slender and erect spikes of flowers. The leaves are one to two inches long, smooth below and sometimes a little hairy above. It grows mostly in dry, sandy soil, and is of little value.

GUINEA GRASS. This is a perennial of vigorous growth, a native of Africa and extensively cultivated throughout the tropics.

Old-witch, Tickle and similar grasses belong also to the genus Panicum.

Pansy, the most gorgeous and fantastic flower of the violet family. It is a familiar and hardy annual, of easy cultivation. Florists have made many beautiful varieties of it, so that one can order almost any color or mode of variegation. It will probably never become too old-fashioned for popular favor.

Par, of the value of its face, or 100 per cent.

Paraffine, a tasteless, inodorous, fatty matter distilled from cannel coal and other sources.

Paralysis, of horse: see page 794.

Parasite, plants which attach themselves to other plants, and animals which live in or on the bodies of other animals, so as to subsist at their expense. The dodder is a parasitic plant, the louse and the intestinal worm parasitic animals. There are parasites which prey upon every part and every organ of the human body. The principal species are noticed under their respective heads and in the article on Insects, Injurious.

Paregoric, an anodyne made of a mixture of

opium, oil of anise and camphor, the latter to modify its effects to some extent, making it quite safe for children. The dose for an adult is from one to two teaspoonfuls.

Paris Green: see page 865 under head of Use of Poisons.

Carbonate of lime will be found a good substitute for Paris green or London purple in destroying potato beetles. A few pounds dusted from a dredging box is enough for an acre of potatoes. There has been no such terror added to farm life of late years as the introduction of deadly arsenical poison into daily use, and any innocent material that would be as effective would certainly be very welcome. The number of cases in which the human or other animal life has been lost through the careless use of Paris green is saddening, and the worst of it is, the casualties increase as the public becomes familiarized with the handling of the poison. See Arsenic.

Parotid Gland, the largest of the salivary glands, seated under the ear and near the angle of the lower jaw. For inflammation of the parotid gland in the horse, see page 794.

Parsley, a hardy biennial plant used for soup and garnishing meats. Sow in drills one foot apart in light, rich soil. The seed is usually from 15 to 25 days vegetating. Thin plants to four inches apart when two inches high. The beauty of the plant may be increased by several successive transplantings.

The best recommended varieties are the dwarf curled, the fine doubled curled, Myatt's garnishing, Dunnett's selected, Carter's Covent garden garnishing, Carter's champion, fern-leaved, moss curled and Enfield matchless.

Parsnip. The parsnip belongs to the same tribe of plants as the carrot and grows in similar soil. Give the richest and deepest soil to the long varieties; the turnip sort will grow well on shallow soil; pulverize the ground well and plant the seed in earliest spring in rows 18 inches apart, covering the seed about half an inch deep. To keep well in the ground over winter, draw a little earth over the tops. For winter use they may be pulled in the fall just before the ground freezes, buried thinly and allowed to freeze, or be frozen without burying if they are cooked at their first thawing. This is more convenient than to dig frozen ground for them to the depth of a foot or more during the winter.

VARIETIES. *Large* or *Long White Dutch.* The standard kind.

Hollow-Crowned, *Cup* or *Guernsey.* Superior in quality.

Round Early or *Turnip.* Good for shallow soil and easy to pull.

Abbott's Hollow-Crowned. Smooth and sweet.

Sutton's Student. A good English variety.

Maltese. A new, long English variety.

Parsnips are not sufficiently appreciated, perhaps because of their too sweet taste; but this can be overcome to a palatable extent by judicious cookery; they are excellent when sliced after boiling and warmed in a sauce made by mixing flour, butter and milk over the fire and seasoning it with salt and pepper; as soon as warm they are served with a little chopped parsley and a squeeze of lemon juice. Parsnips fried brown with slices of salt pork and a seasoning of salt and pepper make an excellent dish.

Parsnips are always good the first season they are planted, and also the next spring when they first come up they are good; but after they take their second growth they are always poisonous and will always kill any one that eats them.

Partridge: see Ruffed Grouse, page 611.

Parturition (par-tu-rish'un), the act of bringing forth young. We treat of the parturition of domestic animals in their respective articles.

Paste. *Paste for Scrap-Books.* For a paste that will not strike through the paper, we may recommend ordinary flour paste, with the addition of about five per cent. of alum. To keep the paste from spoiling, a little carbolic acid and about five grains of corrosive sublimate to the pound may be added. The acid has the effect of preventing the formation of microscopic growths and animalcules, and the sublimate effectually keeps away the flies and winged insects which are apt to lay their eggs in the paste, where they will hatch in spite of the carbolic acid. Recently salicylic acid has been used for the same purpose.

A Good Paste That Will Keep. Four parts, by weight, of glue softened in fifteen parts of water, then heat with the water until a clear solution is obtained, and add sixty-five parts of water with stirring. Mix thirty parts of starch with water to a thin milk, and stir this into the glue solution, and keep the mixture at the boiling point for a time. Stir in a few drops of carbolic acid, and store in covered vessels to prevent loss of water. It will not sour.

Pastern, that part of the horse's foot between the fetlock joint and coronet of the hoof. It is the seat of ringbone.

Pastry, food made with baked paste, as pies, tarts, etc., which see.

Pasture, grass land entirely devoted to the grazing of stock. For the various kinds and cultivation of forage proper for pastures, see Grass and Clover.

Pastures ought to be properly divided, and this work requires a great deal of judgment. Good fencing is costly, and it is a difficult point to determine between the advantage of small ranges and the expense and inconvenience of keeping up numerous divisions. Milk cows, working animals and fattening stock need the most copious pasturage; then young stock; while sheep will thrive on shorter feed than either, and greedily consume most plants which the others reject. By this means a field will be thoroughly cleansed of all plants which animals will eat, and the remainder should be extirpated. The same care should be taken to prevent the propagation of

weeds in pastures as in other fields. Every pasture should, if possible, be provided with running water and shade trees, or other ample protection against the summer sun. In the absence of trees light and cheap sheds can be made. Excessive heat exhausts and sometimes sickens animals. Pastures ought also to be protected against "poaching," or treading up in the spring or late in autumn, when the ground is soft. Wherever a spot of ground becomes bare it should be renewed with fresh seed, manure and cultivation. Mosses should be destroyed.

While pastures do not need manuring, they do generally need fertilization by the use of salts, ashes, gypsum, lime, etc. In the course of time pastures become exhausted and require rotation. See Manure. In natural grass lands, which have a good natural or even an artificial drainage, pastures should very rarely or never be broken up. As a rule, the older they are the better. They become filled with a large variety of grasses, all nutritious and valuable in their seasons, and when once broken up it will take many years, even if well re-seeded, to firmly establish them again.

The treatment of pastures must of necessity differ largely in various parts of our country, depending upon the surface of the land, the extent and character of bottom land in which they may be situated, the kind of stock to which they are devoted, the density of the population, the circumstances and habits of the people, etc.

Whether a frequent change of pasture for stock is the most beneficial, is still an undecided question.

Patents are granted by the United States, to persons who invent any new and useful machinery or compound. The grant is called letters patent, and runs for fourteen years. The several States have no power to issue letters patent. It is an exclusive right of the general Government. Letters are usually obtained by a petition in writing signed by the person who has made the invention. This petition must contain a statement of the residence and citizenship of the party applying and that he desires to obtain letters patent of the United States for a new and useful machine, naming it. This petition must be accompanied by specifications which must particularly and minutely describe the manner of construction and working of such machine. Also, there must be a drawing in duplicate, showing a front and side view of the machine. In addition to the petition, specifications and drawings, there must also be forwarded a small and perfect machine, called a model. These when perfected are sent to the Commissioner of Patents, Washington, D. C., who will examine the same, and, if he finds that it is new and useful, will issue letters patent to the inventor. A person may obtain a patent for an improvement on a part of a machine as well as for one entire. All patented articles must be plainly stamped or marked "patented," giving the date of the patent, in order to preserve to the inventor his rights under his letters patent.

The patent law provides a penalty of $100 for every marking of an article as patented when no patent has been issued therefor. Patents are assignable in whole or in part, by an instrument in writing known as a patent deed. This instrument to render it valid as against third persons must be recorded in the Patent Office at Washington.

The person to whom such patent deed is made is called an assignee, and the person to whom letters patent are issued is called the patentee.

The patentee may, by an instrument in writing under seal, grant to another person or corporation the exclusive right to make and sell his patented article in the United States or some portion thereof. Never buy a patent right or any interest in one unless from some reliable person with whom you are acquainted or who comes well recommended. Have nothing to do with the thousand and one fellows who travel round selling patent churns, etc., for nine times out of ten they are swindlers and frauds.

Pathology, the science or doctrine of disease. As physiology teaches the nature of the functions of the body in a state of health, so pathology relates to the various derangements of these functions, which constitute disease.

Pawing, a horse striking the ground with his fore foot while he is in a standing posture. It is a habit of no consequence when moderate, but becomes a vice when frequent and violent. For a remedy see page 713.

Pawpaw, a small tree bearing heavy, oblong, pulpy, edible fruit. The flowers and foliage of the tree are very handsome, but the fruit is not generally admired.

Pea. The pea has long been known as a culinary vegetable in China, Japan and India, but probably not originally a native of a very warm climate. The pea is now raised all over the civilized world for eating green, or at the time when the seed are fully formed but not ripe. Besides the ordinary culinary pea there is a variety known as the Chick pea, which is cultivated as food for horses in some countries, and also the Cow pea, which is extensively cultivated in the South as food for horses, cattle and swine (see Cow pea). There are two distinct classes, the dwarf and the running. While the dwarfs are early and require no brush, the taller or running varieties produce qualities we do not find among the dwarfs. Hence we must continue to propagate the taller varieties.

Fig. 1. — *McLean's Little Gem.*

The principal insect infesting the pea is the familiar weevil, Fig. 2, which may be driven out by a little heat when the seed is gathered. It is advised to plant those varieties not subject to this pest.

The culture of the pea is very simple, as every one knows. In planting cover very shallow, say only an inch deep. The dwarf varieties will stand liberal manuring, but with this treatment the tall kinds will run too much to vine. The dwarf varieties may be in rows two feet apart, but the taller should be four feet apart or in rows alternating three and four feet apart, the wider spaces for walking through in picking time.

FIG. 2. — *Pea Weevil.*

VARIETIES.

For earliest planting, which may be as soon as the ground can be worked in the spring, the varieties may be as follows:

DWARF, WRINKLED and SWEET:

Carter's Extra Early Premium Gem. More prolific and longer podded than the Little Gem.

Laxton's Alpha. The best early wrinkled market pea.

OTHER DWARFS:

Tom Trumb. One of the very earliest; very productive; pods well filled; height of vine 10 inches.

FIG. 3. — *Champion of England Pea*

McLean's Blue Peter. Pods larger than Tom Thumb but not so numerous; vines 10 inches high.

Hancock. The best early hard pea.

Carter's First Crop. Earliest of all.

Extra Early Dan O'Rourke. Early, standard; vines two feet high.

Kentish Invicta. Crop ripens all together; vines 2½ feet high; a new English variety.

Second planting:

DWARF, WRINKLED and SWEET:

McLean's Little Gem. One of the most popular.

McLean's Advancer. Probably the best of this class.

Hair's Dwarf Mammoth. Very large; vines 18 inches high.

OTHER DWARFS. *Carter's Little Wonder.* A kind of wrinkled Marrow, which may supersede the Advancer, the seed being larger; vines 20 to 24 inches high, and of very robust habit.

Fill-Basket. Large, handsome and prolific.

Brown Dwarf Marrowfat. The earliest of all the Marrowfats.

Dwarf Blue Imperial. An old, standard sort; vines two feet.

Royal Dwarf Marrowfat. Not so tall as Large White Marrowfat; earlier than Champion of England.

For late planting:

DWARFS. *Yorkshire Hero.* Peas remarkably large and fine; vines 2½ feet high; wrinkled, sweet.

McLean's Premier. Said to have every good quality; vines 2½ feet high; wrinkled, sweet.

Carter's Challenger. A dark green Marrow; 2½ feet high.

Dwarf Sugar. A string pea with edible pods.

TALL VARIETIES. The wrinkled and sweet are:

Champion of England. Well known; standard.

Carter's Commander-in-Chief. A green Marrow with long, well-filled pods.

OTHER TALL VARIETIES. *Large White Marrowfat.* Standard.

Black-Eyed Marrowfat. Another old favorite.

Laxton's Supreme. One of the green Marrow class, yielding remarkably long and well-filled pods; vines five feet.

FIG. 4. — *American Wonder Pea.*

Laxton's Superlative. New candidate for popular favor.

TO COOK PEAS. Peas should be well picked over but not washed; put them into a coarse lace bag made double, or a fine-netted one made for the purpose, and put them into boiling water; let them boil for half an hour; put them into the dish with a little salt and butter. As peas grow older they should be boiled longer; and when they are quite old put a pinch of soda into the water in which they are to be boiled.

To can peas see page 185.

Peach. This certainly ranks among the most delicious of all the fruits cultivated. Pliny states that the peach was originally brought from Persia, where it grows naturally. Although not a tropical fruit it requires a great deal of warmth to bring it to perfection. On the virgin soils, and in the early settle-

CRAWFORD'S LATE.

SNOW. OLD MIXON CLING.

ment of our country, the peach was easily propagated and bore abundant crops, but it is now the most uncertain of all fruits attempted to be cultivated. Indeed, so liable is it to casualties, as to have become almost entirely discarded in large sections of the United States where it was once cultivated without difficulty. It is now generally cultivated on an extensive scale for markets in certain favorable sections by those who make its culture an exclusive business.

PROPAGATION. This is very easy. A stone planted in the autumn will vegetate the ensuing spring, grow three or four feet high, and may be budded in August or September. Two years from this time it will usually produce a small crop of fruit, and the next season bear abundantly, unless the growth is over-luxurious. In nursery culture it is customary to bury the peach-stones in autumn, in some exposed spot, in thick layers covered with earth, where they are allowed to lie all winter. As early in the spring as the ground is in good condition the stones are taken up, cracked, and the kernels planted about an inch deep in a mellow soil, in the nursery rows where they are to grow. In the latter part of this season they should be budded, the buds being inserted quite near the ground. The next March the stock should be headed back, and the trees will, under favorable conditions, grow five or six feet high this year. Be sure that the peach-stones are from orchards where there are no yellows. To render the peach quite dwarf plum stock of hard wood should be employed.

SOIL AND SITUATION. The very best soil for the peach is a rich, deep, sandy loam; next to this a strong, mellow loam; next a thin sandy soil, and the poorest is a heavy, compact clay soil. The best situation is a southerly slope near the top of a hill where high winds are broken off. In districts of country, however, where the fruit in the blossom is liable to be cut off by spring frosts, it is safer to plant on the north sides of hills or on eastern sides of large bodies of water. In setting in the orchard the trees may be 16 to 25 feet apart, according to the expected size of the tree. Whether to transplant from the nursery into the orchard in the fall or spring depends upon local conditions.

CULTIVATION. As to the cultivation of the orchard by the plow, many horticulturists, especially in the North, are in favor of the method, while at the South they say that the plow injures the surface roots, damaging the tree and the crop. In most peach orchards in the East and South, the soil, being poor, is enriched by what is added to the surface; the roots of the trees therefore grow near the surface and are easily destroyed by the plow. As to pruning, there is a great difference of opinion as well as of practice. The Michigan cultivators generally shorten in the long and heavy branches, thin out the smaller ones where too numerous, leaving a few small twigs next to the main trunk on the south side, to prevent sun scald. February and March are the best time for pruning; but much may be saved to the tree as well as to the orchardist if he can discriminate in time, by rubbing off the buds before they grow into large limbs. Of course, as with all fruit trees, the peach tree should not be allowed to overbear. A heavy mulching put on the ground around the trees when it is frozen, and permitted to remain on in the spring, will prevent the trees from blooming too early. Sometimes it pays to cover the trees, by wrapping old calico around them for winter protection.

Training peach trees against walls or espaliers is but little practiced in this country.

INSECTS AND DISEASES. The peach borer does great mischief to this tree by girdling and devouring the whole circle of bark just below the surface of the ground. It is three-fourths of an inch long, penetrates and devours the bark and sap wood, and, after passing the winter in the tree, it enfolds itself in a cocoon under or upon the bark, and emerges again in a winged form in June, when it commences depositing eggs in the soft portion of bark at the surface of the ground. *Remedies:* Heap up around the tree a foot high, earth, ashes, etc., in the spring, and remove from the tree in the fall, so that if there are any grubs there, the winter will freeze them out; or, draw away a little earth from the tree in the spring, and wrap the body up with strong, coarse paper, a foot high, securing it with tying and replacing the earth; or, hunt for the grubs with a sharp knife and kill them.

Leaf curl usually appears in May or June; the leaves curl up, become thick and swollen, with hollows on the under side and reddish swellings on the upper; in two or three weeks they fall off and are succeeded by new and vigorous leaves. The blister is a similar affection in the leaf and leaf-stem, and both these injuries are caused by the peach-tree louse and fungus. *Remedy:* Rub off the affected twigs as soon as discovered during the summer and prune them off during the winter. In the latter season they can be easily recognized by the fine fungus threads.

The peach curculio makes extensive ravages in some parts of the West. The remedy for it is similar to that for the plum curculio, except that it is absolutely necessary that there be unity of action over a large extent of country, and for this purpose State legislation is requisite.

Extremes of cold and heat, although alone are not sufficient to injure the tree materially, when accompanied by other exposures, seem to aggravate disease and hasten death. It is maintained that the peach fruit bud can stand a temperature of at least 40° below zero without injury, provided it is protected by a layer of snow, or otherwise kept shaded, and not exposed to severe winds. Very often a peach tree stands opposite an opening between buildings, or at an exposed corner, where the wind is unusually severe or constant. Late frosts in spring often kill the fruit. No one need expect that such trees should bear fruit. A long drouth in connection with hot weather hastens the maturity of the fruit, which is consequently thin and imperfect.

Of all the diseases which attack the peach, the

yellows is by far the greatest epidemic,—or, if we may coin a word, epidendric. Most peach-growers regard the yellows as contagious. The symptoms of this incurable disease are: The production upon the branches of very slender, wiry shoots a few inches long and bearing starved, diminutive leaves; these shoots are not protruded from the extremities but from latent buds on the main portions of the stem and larger branches; the leaves are very narrow and small, pale yellow or colorless. The fruit ripens prematurely, has specks and large spots of purplish red, and internally the flesh is more deeply colored, especially around the stone. These symptoms are generally slight the first season, and are aggravated each succeeding season until the tree dies. The fruit from the tree the first season of attack seems as good to the palate as ever; but its healthful character is dubious: after the first year it should of course never be eaten. This disease is propagated by budding and grafting, as well as by the seeds. The cause of the yellows is still a mystery; some think it a result of overbearing, or bad cultivation, or both. Mr. Downing says that the yellows has but little progress in European countries, where pruning is practiced and overbearing not allowed. *Remedy:* Prompt and total destruction of the tree; and for this purpose State legislation seems to be necessary, as many persons are too slow in applying the remedy, and are consequently the source of a public calamity. Even the ground which has been occupied by affected trees should not again be planted with the peach until after several years.

A species of "rot" sometimes attacks the fruit of the peach-tree in the West, for which no specific remedy is yet proposed.

VARIETIES. We will describe only those varieties which are recommended for cultivation:

Alexander, *Alexander's Early*, *Amsden's June*. Medium size, greenish white, nearly covered with red; a partial cling; end of July; very good dessert and market; fruit showy and of good flavor. Amsden's June is thought by some to be a distinct variety from the Alexander.

Allen's October, is said to be one of the best for profit.

Chinese Cling. Large, sides compressed, suture quite shallow, skin creamy white, shaded and marbled with red; flesh white, red at the stone, which is adherent, melting, and of a rich, vinous flavor; ripens first to middle of September.

Cooledge's Favorite. Large, especially on one side, suture prominent at the top only, white, with a fine, crimson, mottled cheek, juicy, rich and high-flavored; very good dessert and market; tree unusually productive and is very hardy; middle of August.

Barnard. Fair size, dark-red on yellow ground, freestone, flesh yellow, firm and of an aromatic flavor, good dessert and very good market, beginning of September; apt to overbear, when the fruit is small; tree very hardy.

Crawford's Early. Large, the swollen point at the top prominent, the suture shallow; skin yellow, with a fine red cheek; flesh yellow, free, best, early August; tree vigorous, fruitful and hardy.

Crawford's Late. Very large, fine dark-red on a yellowish ground; flesh deep yellow, but red at the stone; a rich vinous flavor; best; early September; tree lacks productiveness when young or on light soil.

Crockett's Late White. Medium to large, oblong, greenish white, some red in the sun; flesh pale, sweet, not very juicy, free; last of September.

Early Beatrice. Small, whitish red, somewhat marbled, freestone, very good dessert, fair market, middle of August; a beautiful peach.

Early Louise. Medium size, purple red on greenish white ground, freestone, very good dessert and market; early August; high quality.

Early Rivers, *Rivers' Early*. Large, yellowish pink or pale straw color, freestone, best dessert and market, but lacks color for the latter purpose; middle of August.

Early York, *Large Early York*. Medium to large, pale red, thickly dotted over a pale ground in the shade but quite dark red in the sun; flesh greenish white, remarkably tender and melting, free, very good dessert and market; last of August. The Red Rareripe is larger, more deeply marked with the suture, ripens later and is richer flavored.

Felt's Rareripe is a new and promising variety.

George the Fourth. Medium to large, deeply divided by a broad suture, one side larger, pale yellowish white, finely dotted with bright red and deepening into a dark red cheek on one side; flesh pale, red at the stone, which is small, free and of a remarkably rich and luscious flavor; best dessert, poor market on account of tenderness; last of August; tree very hardy and vigorous, and bears regular and moderate crops.

Hale's Early. Medium size, greenish, mostly covered and mottled with red when ripe; flesh white, best dessert and very good market· middle of August; subject to rot; tree hardy and productive.

Haines' Early Red. Medium size, depressed at the top, suture well marked, one side of the fruit larger than the other, pale white, marked with red and nearly covered with deep red; flesh greenish white, fair dessert and market; last of August; hardy and productive.

Heath Cling. Very large, narrowing to both ends and terminating at the top with a large swollen point; suture distinct on one side; skin downy, cream-collored white, with a faint tinge of red or brown in the sun; flesh greenish-white, exceedingly juicy and luscious, very good dessert and market; October; needs a long season.

Indian Cling is a variety recommended for the West.

Lemon Cling, *Kennedy's Carolina*, *Yellow Pineapple*, etc. Large, narrowed at the top, with a terminal point like a lemon: skin fine yellow, with a dark brownish-red cheek; flesh firm, yellow, slight red at the stone, rich, sprightly, vinous, sub-acid; fair

dessert, very good market; ripens end of September.

La Grange. Large, greenish white with some red occasionally on the sunny side; flesh pale, high-flavored, free-stone; end of September; one of the best for profit in Central Illinois.

Morris' White Rareripe. Medium, suture of moderate depth, swollen point small; skin rather downy, greenish white on all sides at first, but white with a creamy tint when fully ripe, and having a slightly purplish cheek where fully exposed to the sun; flesh white to the stone, a little firm; free-stone; fair dessert and market; best cooking and valuable particularly for canning on account of its color.

Mountain Rose. Large, white and red; free-stone; very good dessert and market; very fine in respect of form, size and color; beginning of September.

Old Mixon Cling. Large, suture distinct only at the top, one side of the fruit slightly larger; skin yellowish white, dotted with red, or with a red cheek, varying from pale to lively red; flesh pale white; best dessert and cooking; very good market; middle of September; an old standard for profit.

Old Mixon Free. Large, one side swollen, suture visible only at the top, cavity but slightly sunk at the stem; skin pale yellowish white marbled with red, the cheek a deep red; flesh white but quite red at the stone; sugary, vinous, very good dessert; best market; middle of September; an old variety which still holds a high position as a market peach.

President. Large, suture shallow, very downy, pale yellowish green, with a dull red cheek; flesh white but deep red at the stem, high flavor; stone very rough, free; middle of September.

Rivers' Early: See Early Rivers'.

Slocum. Ripens the beginning of September.

Smock Free. Large, narrow toward the stem, rather compressed on the sides; light orange yellow mottled with red or often with dark red cheek when fully exposed; free-stone; flesh bright yellow, red at the stone, fair dessert, best market; October; one of the latest profitable market peaches in Southern Michigan.

Snow. Medium to large, suture faint except at the top; skin thin, clear, beautiful white or yellowish white on all sides; flesh clear white to the stone; fair market and dessert; middle of September; free-stone; young growth yellowish green; blossoms also white.

Stump the World. Very large, brownish red on white ground, very good dessert, best market, end of September; free-stone.

Troth's Early, Troth's Early Red. Medium, whitish, bright red in the sun; flesh white, red at the stone, which is free; medium dessert; good market, early in August; tree productive.

Venus (*Belle Bausse? Vineuse Native?*) is a small fine-flavored peach, very productive.

Ward's Late Free. Large, white with a beautiful crimson cheek; flesh white, slightly tinged with red at the stone; very good dessert; first of October.

Yellow Alberge. Medium, with a well marked furrow running half round; yellow with a deep purplish red cheek; flesh yellow but deep red at the stone, which is free; a luscious fruit; middle of August.

Yocum is a new and promising seedling.

To Pickle, Preserve and Spice Peaches. For the best mode of canning peaches, see page 184. We give the following excellent and well-tried methods of preparing peaches:

To Preserve Peaches. Take fine ripe ones, pare, cut in two, and remove the stones. Take double refined white sugar, finely pulverized. Weigh sugar and fruit, and let them balance evenly—that is, pound for pound. Put the fruit in a large earthen bowl, and strew over it one-half of the sugar, and let it stand till morning. Then take all the juice from them and put it into a preserving kettle with the rest of the sugar. Set over a moderate fire, and boil and skim it. While boiling, and after the scum has quit rising, put in the peaches, and cook until they are clear as amber, but not soft enough to break up. Put away in bowls and small vessels; when cool cover with thick paper over which you have brushed the white of an egg. We always find preserved fruit to keep best in a well ventilated closet or cupboard on the porch.

Pickled Peaches. To ten pounds of the fruit add one-half gallon of vinegar and three pounds of sugar and one-half ounce each of cloves, cinnamon, and allspice. Scald the vinegar, sugar, and spices, and turn it over the fruit the next morning. Drain the liquor off and scald it again, and once more pour it over the fruit while hot, and the succeeding morning scald the whole mass of fruit and liquor together, and you will have delicious pickles.

Another: This is a good recipe for all sweet pickles. Take peaches of full growth, ripe, but not soft, wipe them with a flannel cloth or pare them; stick three or four cloves in each peach, lay them in a stone jar, put one-half pound sugar to one quart of good vinegar; add cinnamon and other spices to the taste; let the vinegar come to a boil, skim, and pour it on the peaches. Let them stand two weeks, then pour off the vinegar and boil it; pour it on again and they are fit for use.

Spiced Peaches. Take four pounds of brown sugar and one gallon of vinegar. Cling peaches are usually preferred, as they cook up less than the free-stone. The peaches should be brushed and cut from the pits in halves. The pickles may not last so long as if cooked whole, but will afford more pleasure to visitors in the eating than the full orbed ones. Stick three or four cloves in each peach, tie a small quantity of spice in a cloth. Put the peaches in a stone jar, boil the syrup and pour it over the peaches boiling hot. Cover tight, let them stand a couple of days, pour off the vinegar, heat and skim and again pour over the peaches. Do this three or four times. Free-stones are better left on the pits.

Pea-Fowl. Pea-fowls are bred and kept for an ornament. Sometimes they are found upon the farm, but they have no business there, if other poultry is

kept. They are naturally an ill-natured bird, and will fight and kill other poultry, especially the cock, which will kill young chickens, and it is said will eat them. Public parks are the only place for pea-fowls. There their beauty is attractive, and whenever they choose to indulge in one of their unearthly screeches, they are far enough away not to deafen everybody. But although naturally wild and ill-natured, pea-fowls, if they are well taken care of, become tame, and often act very intelligently, tapping on the window, if they are neglected, and doing other things to show that they would like to be attended to. The hen always seeks and makes her own nest, and lays and sits in strict seclusion. Sometimes the attempt is made to hatch pea-fowl's eggs under a common hen, but the common hen cannot or will not raise a brood of pea-chicks. She will not remain with them longer than two months, while the pea-hen remains with her chicks full six months; and they need her care all that time, too. The manner of rearing is about the same as that of rearing turkeys. They must be kept from the rain, and fed about as turkeys are fed, with the addition of some worms or finely chopped raw meat. It requires three years for them to develop into maturity. Of course there is no profit in them, considered as poultry. They are not very often found upon the table, although it is said that a year-old bird makes very fine eating. As these birds pair of course there must be as many males as females.

Pea-nut. In some parts of the United States the pea-nut, or goober, as it is known in some sections of the South, is quite extensively raised. One peculiarity of the pea-nut is that when the plant flowers, the young seed-pod enters the ground where the seed ripens. The usual mode of cultivating it is to plant in drills three feet apart, one nut in a place, at a distance of 12 inches apart. Weeds are not permitted to grow among them, and at the time when they blossom the drills are bedded up so as to make a mellow surface for the young nuts to strike in. When ripe the vines are pulled and dried, without getting wet, the nuts whipped off, cleaned up in a common fanning-mill and sacked for market. A light gray soil, not very sandy, is best adapted to their growth.

Pear. This may be said to be a modern fruit, especially as a good article of dessert. The wild varieties are the most austere of all fruits, and the pear of ancient times was but little better; but the modern cultivated pear stands at the head of luscious and nutritious fruits. Dietetically it is perfect.

PROPAGATION. The pear is propagated by grafting or budding on seedling or sucker stocks, the former being far preferable. To raise good seedling stocks, clean the seed as soon as possible after the fruit has matured, and sow it, as apple seeds, in drills, in deep, rich soils. The ground should be trenched 20 inches to two feet deep and enriched with manure or a compost mixed with ashes. If the young plants do not have a vigorous growth from the start they are apt to be killed out by diseases and insects. At the end of two years the seedlings should be transplanted to the nursery rows for budding.

Budding, which is preferable to grafting, is best done about the first of August. To prevent winter-killing, the young trees should be covered in the fall, or they may be heeled in, in a sheltered place. The thorn makes a very good stock for the pear, except that if grafted above the ground the tree is often apt to be broken off by high winds at the point of union: this is obviated by grafting a little below the surface. The thorn is especially good for clayey soils. To render the pear a dwarf, quince stock is generally preferred. The dwarf pear, however, is usually short-lived, seldom enduring more than 15 or 20 years in bearing, but it is a pretty and economical way of raising a good many sorts, and getting fruit speedily, in a small garden.

The young pear, not being very abundantly supplied with fibrous roots, should never be transplanted from the nursery to the orchard after they have become very large. Small, thrifty plants five or six feet high are much to be preferred.

SOIL, SITUATION AND CULTURE. The best soil for this fruit tree is a strong loam of moderate depth, on a dry or well drained sub-soil. A soil that is too rich and deep, like some of the Western alluvials, forces the tree into such luxuriant growth that its wood cannot all ripen well, and is liable to be killed by winter blight. Soils that are too light, on the other hand, may be improved by trenching if the sub-soil is heavier, or by top dressing with heavy muck and river mud, if it is not. In the North it is better to plant on a southern slope.

It is the general opinion at the present day that for a long time past too much pruning has been practiced upon the pear tree. Shortening in or pruning back the ends or shoots, either in summer or winter, retards the fruit-producing period and abridges the productiveness of the tree. Fruiting spurs will not form where the growths are constantly interrupted and excited by pruning. In soils of moderate fertility and in a favorable climate, young shoots will in most cases be covered with fruiting spurs the second year after their formation if left to their natural mode and condition of growth. The only pruning then that is really essential, after the tree has become established, is to thin out the crowded branches. If low-headed trees are preferred, those branches which have become destitute of fruiting spurs near the body of the tree may be cut out and a young shoot be allowed to take the place of the one removed. There will be no lack of young shoots for this purpose, as they will be produced from the base of the cut branch. Select the strongest and best place to occupy the vacancy, if such occupancy is desired. This mode of cutting back branches is more essential with dwarfs, as the quince roots are unable to support a tall, heavy-headed tree; but in all other respects dwarf pear trees should be treated the same as standards.

The pear succeeds so well as an open standard and requires so little care for pruning that training is

seldom thought of in this country except for dwarfs, or in the gardens of the curious or skillful. The method generally pursued here is to cultivate the trees as bushes, with low heads, rather than as pyramids, quenouilles or espalier. To do this the main shoot is headed back more severely than the branches. If, for this purpose, summer pinching has been neglected, the heading should be done the latter part of winter by the use of the knife, shortening back from one-half to two-thirds on the preceding year's growth.

In orchard culture the pear is usually planted about 30 feet distant each way; in small gardens, where the trees are cultivated as dwarfs, 20 feet distant is sufficient. Some fruit-growers are in favor of what is called clean cultivation, which consists in keeping the surface of the ground clear of weeds by light plowing, etc. This cultivation should commence early in the season and not be continued later than the middle of July. After a standard tree has been set for three or four years the cultivation should cease and grass allowed to grow, which should be mowed and placed around the tree. Every autumn the ground should have a top dressing of manure and lime; this is better than an occasional heavy manuring. In warmer latitudes, where the growing season is longer, the pear can receive more extended cultivation, as it has time to ripen its wood before winter.

Diseases and Insects. By far the greatest enemy to the pear is a disease called the pear blight, or fire blight. This alone does more mischief in a pear orchard than all the diseases and insects together in an apple orchard. So extensive is it, indeed, that many persons deem it unprofitable to undertake to raise any pears at all. As to the cause and remedy for pear blight opinions are as various as they are concerning anything within the whole domain of horticulture. The symptom of this dreaded affection is plain enough, which is simply the death of the tree, by piece-meal, commencing with some of the branches and extending over the whole tree. Usually, however, the devastation is only partial; it is always very capricious in all its features. Mr. Downing teaches us very distinctly that there are two kinds of blight,—one caused by an insect, the other by frozen sap. He describes the insect at length and characterizes the effect of his work as follows: "In June or July shoots at the extremity of the branches suddenly turn brown, and in two or three days the leaves become quite black and dry, and the wood shriveled and hard. The disease usually progresses farther down gradually to the point where the insect laid its egg, sometimes farther." In the blight caused by frozen sap a thick, brownish, sticky matter exudes from the tree and sometimes drops from the limbs where wounded with a knife, and in the spring blackened patches are to be seen, which extend further and further during the summer. But also other causes are assigned, as fungus, peculiarities of climate, root-pruning, excessive top-pruning, or some other mistake in cultivation, situation, etc. While many young scientists look at the diseased part through a microscope and announce to the world with confidence that the fungus which he sees is the cause of the malady, an older scientist queries which was the cause of the other. Every dead or dying plant is permeated with microscopic fungoids. The remedies of course are still more various; as, varnishing with raw linseed oil, washing with strong lye, or with lime and sulphur, saturating the soil with unbleached ashes, planting the trees scattering in a peach orchard or otherwise, cutting out the black patches as they appear, confining sulphur in an auger hole just below the affected part, etc., etc. The most reliable of all these remedies is perhaps the most troublesome one,—that of closely searching for and promptly cutting off and burning the affected twigs. Some think there are signs of the disease running itself out. As a preventive the tree should be taken from unaffected districts, planted in a dry soil, avoiding severe summer pruning; if there is a vigorous young growth in the fall and danger of winter coming on before it is sufficiently ripened, lay bare the roots two or three weeks, and during the winter cut out all limbs which have discolored, or soft, sappy spots on them.

A slimy, slug-like worm, of a dull olive brown, and nearly half an inch long, sometimes eats the upper side of the leaves of the pear-tree during the summer.

Pear-Tree Slug.

The best way to destroy it is to sprinkle over the leaves early in the morning, ashes, plaster, dry dust, quick-lime, powdered white hellebore, or Persian insect powder, or showering the tree with a solution of carbolic acid or carbolic soap-suds.

The pear-leaf blister is caused by an insect, the smallest of all true insects, being only a 200th of an inch long. The blisters are reddish spots an eighth of an inch or more in length, principally on the upper side of the leaves; afterward these spots turn brown by the death of the parts. As many of these mites find their way down the stem of the leaf to the bud, and show marks of their presence at the latter place, the affected branches can be identified, cut off and burned. Prompt and early attention to this work is the only reliable remedy proposed.

A species of curculio attacks the pear in some sections, but its ravages are not very extensive. For remedy, see Plum.

Scaling of the bark is a disease similar to the blight, but is not extensive.

The fruit of the pear tree is sometimes subject to splitting and cracking open, and the omnipresent fungus is discovered in this case also, as a "cause," in the estimation of those who look through a micro-

scope for the first time; but like many other mysterious diseases and troubles, this affection is clearly and definitely referred, for our enlightenment, to "the effect of atmospheric influences."

The pear is a peculiar fruit in one respect, namely, it has usually to be picked from the tree and ripened in the house. A very few varieties should be allowed to ripen on the tree. The proper season for gathering is when a few full-grown specimens, but worm-eaten, fall to the ground, or when there is a change of color, or the fruit separates easily from the stem. They should be laid away in shallow drawers, or boxes like bureau drawers, on a thickness of woolen cloth, with another woolen cloth laid over them, and in a cool, dry room; then, according to variety, from three days to three weeks they will be in their best condition for eating. Winter dessert pears should be allowed to hang on the tree as long as possible,—until the nights become frosty; they should then be picked and wrapped separately in dry paper, and packed in kegs, barrels or small boxes, and kept in a cool, dry room free from frost.

VARIETIES. Bartlett. Large, oblong, obtuse pear-shaped, uneven, skin very thin and smooth, clear yellow, with a soft blush on the sunny side in exposed specimens, rarely marked with faint russet; stem one to one and a half inches long, stout, inserted in a shallow cavity; basin shallow; flesh white, exceedingly fine-grained, buttery, somewhat musky and of a highly perfumed vinous flavor; very good dessert and cooking, best market, first part of September. One of the worst to blight. Tree upright, with yellowish-brown shoots and narrow, folded leaves.

Belle Lucrative, Fondante d'Automne. Medium size, variable in form, from obovate to obtuse, pear-shaped to globular; pale yellowish green, slightly russeted; stem little more than an inch long, stout, often fleshy, obliquely inserted in a slight, irregular cavity; basin of moderate depth; flesh sugary and rich, best dessert, fair cooking and market, last portion of September; tree moderately vigorous and productive. Shoots yellowish-brown.

Beurre d'Anjou. Large, obtuse, pear-shaped, greenish, sprinkled with russet, sometimes shaded with dull crimson, sprinkled thickly with brown and crimson dots; stem short, thick, fleshy; cavity surrounded by russet; flesh whitish, not very fine, brisk vinous flavor, pleasantly perfumed, best for all purposes, November; tree, vigorous and productive.

Beurre Giffard. Medium size, pear-shaped, tapering to the stem, which is rather long; skin greenish yellow, marbled with red on the sunny side; flesh white, delightfully perfumed and vinous, very good dessert, fair cooking and market, early August; must be gathered early, and does not continue long; tree of moderate growth, with slender, reddish shoots.

Bloodgood. Medium size, turbinate, inclining to obovate, regular, pale green, sprinkled with small russet dots and considerably covered with russet; stem three-fourths of an inch long, curved; flesh yellowish white, gritty around the core, rich, very good dessert, fair cooking and poor market, August; skin thin and of a musky perfume; core small. Tree short-jointed, with deep reddish-brown wood, and bears early and regularly.

Buffum. Medium size, oblong obovate, a little smaller on one side, fair, deep yellow (brownish green at first) finely suffused over half the fruit, with bright red sprinkled with small brown dots or a little russet; stem an inch long; cavity slight, basin moderate; flesh white, buttery, not very juicy, but sweet and of good flavor; good for all purposes, September. This pear is easily distinguished by its upright, reddish brown shoots, and peculiar brownish green of the fruit before ripening. Tree very productive, healthy and vigorous, but the fruit is liable to vary in quality.

Clapp's Favorite. Large, slightly pear-shaped, uneven, pale lemon yellow, marbled and faintly splashed with crimson and fawn where fully exposed to the sun, thickly sprinkled with brown dots and sometimes patches and traces of russet; stem nearly an inch long, somewhat fleshy and stout; cavity and basin slight; flesh white, fine-grained, buttery, sweet, vinous, etc.; very good for all purposes, but inclined to rot at the core; early September. Tree a strong grower and highly recommended for the latitude of Iowa.

Doyenne d'Alencon. Medium size, nearly pear-shaped, rough, yellow, shaded with dull crimson or carmine, sprinkled, netted and patched with russet brown dots; stem of moderate length, rather large; cavity medium; basin deep, round; flesh somewhat granular, buttery, sprightly, rich and highly perfumed, very good, December to April. Tree moderately vigorous and productive; young shoots dull olive brown.

Duchesse d'Angouleme. A very large and magnificent pear for all purposes, but at the North it loses quality; oblong obovate, with an uneven, somewhat knobby surface, dull greenish yellow and considerably streaked and spotted with russet; stem one to two inches long, very stout and bent; cavity irregular, deep; basin knobby; flesh has all the good qualities. Tree is a strong grower but is unproductive if its cultivation is neglected. Not subject to blight.

Flemish Beauty, and many other names. Large, nearly pear-shaped, slightly rough, pale yellow, but mostly covered with marblings and patches of light russet, becoming reddish brown at maturity on the sunny side; stem rather short; cavity deep, round and peculiarly narrow; basin small and round; flesh yellowish, not very fine-grained, musky, very sweet, good for all purposes, September; fruit very showy, but soon decays at the center, drops and sometimes scabs; must not be allowed to mature on the tree; generally the best market variety for the Northwest.

Easter Beurre, Bergamotte de la Pentecote, Doyenne d'Hiver, etc. Large roundish obovate, obtuse, often rather square in figure, yellowish green, sprinkled with russet dots and some russet, which give it a brownish cheek in some specimens; stem rather short, stout; cavity obtuse and abruptly sunken; eye small; basin shallow, plaited and angular; flesh

APRICOTS.

BARTLET PEAR.

APPLE QUINCE.

BOSTON NECTARINES.

white, fine-grained, very buttery, melting and juicy, with a rich and sweet flavor; fair dessert, good cooking, poor market, January to March; tree upright, thrifty, does better in the South; requires a warm exposure and a favorable season.

Glout Morceau, Victoria, etc. Rather large, varying in form, but usually obovate obtuse pear-shaped, smooth, thin, pale greenish yellow, marked with small green dots, and sometimes with patches of greenish brown; stem rather slender and straight, an inch or more long; cavity small and regular; basin moderately deep; flesh has all the good qualities, but in heavy soils is somewhat astringent; better on the old trees and well ripened. December.

Gray Doyenne, Doyenne Gray, Red Doyenne, etc. Medium size, obovate, but usually a little rounder than the White Doyenne; wholly covered with a smooth cinnamon russet, rarely a little ruddy next the sun; stem half to three-fourths of an inch long, curved; cavity deep and abrupt; basin smooth, shallow; best for all purposes; October. Shoots upright, grayish brown.

Howell. Rather large, roundish pear-shaped, light waxen yellow, often with a finely shaded cheek, thickly sprinkled with minute russet dots and some russet patches; stem medium; cavity is generally wanting; basin rather large and uneven; flesh whitish, brisk, vinous, very good for all purposes; October. Tree a good bearer but subject to blight.

Julienne. Small, but varying in different soils, obovate, regular, clear bright yellow on all sides; stem light brown, speckled with yellow, a little more than an inch long, pretty stout; cavity shallow; basin shallow and a little plaited; flesh white, firm at first, half buttery, sweet and moderately juicy; August. Tree thrifty and upright, with light yellowish brown shoots.

Lawrence. Medium size, obovate obtuse pear-shaped, nearly regular, lemon yellow with traces and patches of russets and thickly speckled with minute brown dots; stem of medium length and rather stout; cavity russeted and irregular; basin broad, shallow, uneven or slightly corrugated, and thinly russeted; very good to best; December. Tree a moderate grower, healthy, vigorous, an early and abundant bearer.

Louise Bonne de Jersey, William IV. Large, oblong pear-shaped, a little one-sided, glossy, pale green in the shade but overspread with brownish red in the sun and dotted with numerous gray dots; stem about an inch long, curved, rather obliquely inserted, without depression, or with a fleshy, enlarged base; eye open; basin shallow, uneven; flesh greenish-white, very good for all purposes, September and October Fruit of better quality on the quince than on the pear. Tree very productive; should be grown as a dwarf.

Madeleine, Sainte Madelaine, Citron des Carmes, etc. Medium size, obovate pear-shaped; stem long and slender; set on the side of a small swelling; pale yellowish-green, very rarely with a little brownish blush and russet specks around the stem; basin very shallow, furrowed; flesh slightly perfumed, good dessert and cooking and fair market; July; sometimes slightly astringent; the earliest pear of good quality. Tree has long, erect olive-colored branches.

Onondaga. Large, obtusely pear-shaped ovate obovate, somewhat coarse and uneven, thickly covered with russet dots, fine rich yellow at maturity, generally with some traces of russet, and sometimes with a sunny cheek; stem rather stout, of medium length, inclined; cavity small, basin narrow and somewhat uneven; flesh buttery, slightly granular, good dessert, very good cooking and market; late autumn; a showy fruit. Tree very vigorous and productive, young wood olive brown.

Ott. A seedling of the Seckel; small roundish obovate, greenish yellow, partially netted with russet, reddish on the sunny side; stem long, curved; cavity shallow; basin round, open; flesh sugary, perfumed and aromatic, excellent, but somewhat valuable; middle of August. Tree moderately vigorous and very productive; young wood reddish olive brown.

Passe Colmar and many other names. Rather large, varying considerably from obovate to obtuse pear-shaped; skin rather thick, yellowish green, becoming yellow at maturity, a good deal sprinkled with brown russet, especially around the stem and blossom end; stem an inch and a half long; cavity obtuse, uneven, sometimes wanting; basin shallow; flesh yellowish white, buttery, rich, juicy, sweet, aromatic, good to very good; December and January. Tree vigorous and an abundant bearer, but very variable in the quality of fruit; shoots long and bending, and of a dark olive brown.

Prende du Pont, although an inferior pear, is hardy in Northern Illinois. Not described under this name in Downing's work. Is it Prairie du Pont?

Rousselet Stuttgard. Small, pear-shaped, greenish yellow, netted and patched with russet and sprinkled with russet and green dots, brownish crimson in the sun; stem rather long, curved, enlarged at its insertion, generally without depression; basin shallow, flesh rather coarse, juicy, half melting, with a spicy aroma. Last of August. One of the most reliable of the early kinds. Tree vigorous and a good bearer; young wood reddish purple.

Seckel. Small, regularly formed, obovate, brownish green at first, becoming dull yellowish brown, with a lively russet red cheek; stem one-half to three-fourths of an inch long, slightly curved; cavity shallow and basin almost wanting; flesh whitish, buttery, very juicy and melting, with a peculiarly rich, spicy flavor and aroma. Mr. Downing does not hesitate to pronounce this the richest and most exquisitely flavored variety known; best dessert; fair market, October; tree hardy, vigorous, very productive, but sometimes tardy, and carries a symmetrical head.

White Doyenne, Doyenne White, Virgalieu, and a score of other synonyms. Medium to large, regularly formed, obovate, varies in proportionate length on different soils; skin smooth, clear, pale yellow, regularly sprinkled with small dots, and often with fine

red cheek; stem brown, three-fourths to one inch long, a little curved; cavity small, round; basin shallow; flesh white, fine-grained, very buttery, highly delicious, best dessert; good cooking and market, October; tree hardy, has all the good qualities and is an old standard variety; the branches are strong, upright, yellowish gray or light brown.

Winter Nelis. Medium size, narrowed toward the stem; yellowish green at maturity, dotted with gray russet and a good deal covered with russet patches and red streaks, especially on the sunny side; stem one inch and half long, bent; cavity narrow and basin shallow; flesh yellowish white, fine-grained, buttery, highly flavored and rich; best dessert, good cooking and market; December and January; fruit in the West inclined to be knotty; tree hardy, healthy, a regular bearer, etc.; branches diverging, rather slender; dark reddish brown.

To Preserve and Pickle Pears. The mode of canning pears is given on page 184.

Fresh Pears. Take nice, ripe Bartlett pears; pare them, cut in halves and core them; weigh, and to each pound of fruit allow 6 ounces of sugar; cook the pears until they are soft in a little sugar and water, and put the pears and syrup hot into the jars; seal immediately.

Spiced Pears. Take 4 pounds of sugar and 1 gallon of best cider vinegar; pare and halve as many pears as the syrup will cover; tie cinnamon, cloves and allspice in a cloth, and boil till the fruit looks clear. If intended to be kept some months, it will be better to put them in self-sealing cans. Do not put in too much spice as it will make them dark.

Preserved Pears. Peel the pears and core them; cut them in halves; weigh them; take 1 pound of sugar to 1 pound of fruit. It is best not to have them too hard; if so, they should be boiled in water first. Make a syrup of the sugar; put in some preserved ginger, and lemon sliced, to flavor it; boil the pears until quite soft; take them out in a dish to cool; boil the syrup 10 or 15 minutes longer.

Pickled Pears. Put up the same as for sweet pickled peaches. Any kind of fresh fruit can be put up in the same way.

Pearl Barley: see page 58.

Peat, a substance which seems to be closely allied to coal, and which, there is no doubt, has been produced by the decay and decomposition of vegetable matter. See Fuel.

Pecan (pe-con′), a species of the hickory genus of trees, which bears soft-shell, sweet, edible nuts, which are as finely flavored as the hickory-nut. The difficulty of collecting pecans in quantity accounts for their comparatively high price in the market.

Peck, a measure of capacity comprising two gallons, or one-fourth of a bushel.

Pectorals, medicines which relieve coughs and other diseases of the respiratory organs.

Pelts, the dry, unprepared skins of animals, especially the skins of sheep or lambs.

Pemmican, dried buffalo meat mixed with about five-ninths melted fat; put into a tin or skin while still soft and warm. It is largely used by the Indians and travelers in unsettled regions.

Penmanship. Literally, "penmanship" is synonymous with "writing," both signifying the expression of thought by the use of characters made upon a smooth surface with a pointed instrument; but by the growth of language the former term has come to be limited to the art of making graceful characters in the expression of thought, while the latter includes this with spelling, grammar, composition, and ofttimes even good sense and a high order of thought. We sometimes say a man is a good writer, when we mean that he expresses good ideas, and in good language.

History.

Penmanship was invented more than 3,000 years before Christ, and was at first very crude and clumsy, pictures being employed instead of letters. That system was called hieroglyphic. These pictures, by increasing use, became more simple in their outline until they were called letters, having lost most of their resemblance to the objects originally delineated. This gradual process is well illustrated on the last three pages of Webster's Unabridged Dictionary. The letters thus formed were still more simplified and refined, until what is called the Hebrew alphabet was formed. But the Phoenician alphabet was invented, as a still easier one to write, and from this the Greek and Latin alphabets were mostly derived. The phonographic alphabet, however, invented in England in 1837, is the simplest possible.

Penmanship, performed in a "workman"-like manner, is a modern invention, and the one now in vogue as the most workmanlike, or beautiful, is called "Spencerian," after the inventor, the late P. R. Spencer, of Geneva, O. It is also called "semi-angular," being a compromise between the most rapidly written, angular style, but least legible, and the most legible, but more slowly written, round hand. For the printing-office the heavy, round-hand is preferred, while for deliberate correspondence and book-keeping the semi-angular is generally chosen.

Importance

The importance of good penmanship is nearly always under-estimated. No matter what position in life one may hold, the ability to write a good, clear, legible hand is a priceless possession. It gives one a higher standing among all classes of people, is a real aid to proper habits of thought and pure language, and an actual necessity to the man of business.

Materials.

Paper. Ruled foolscap, smooth and heavy, is the best paper for practice, and therefore the best for the finest execution. Weight it down at the top, so that no hesitation in moving the pen over it will be produced by fear of displacing it. In writing, always have under the hand an extra sheet or scrap of paper to protect the writing paper against the oil and dirt of the skin.

Pen. For fine or beautiful writing, a sharp, well-made steel pen is best. Any steel pen, however, is so rapidly corroded with ink that it becomes unfit for use after a day or two of service. When one has very much rapid writing to do the gold is preferable, as it is smoother and therefore not so apt to produce pen palsy; and it will last for years. Good steel pens are difficult to find in the market.

Ink. The best is that which flows freely and is jet black when it first goes upon the paper. To prevent ink from spreading, and to give it body and luster, a little gum arabic is dissolved in it. Fluid inks, like Arnold's, although not black when first used, are favorites in business offices, as they do not rot the paper, are durable, and the writing done with them can be copied by pressure against moistened sheets of paper. Red ink is used for some purposes in book-keeping, but inks of other fancy colors are seldom used, for any purpose.

Whatever ink you get, see that it is not of that uncertain sort that flows irregularly and produces different shades according to the flow.

The inkstand or bottle should be kept corked when not in use; and if a glass one, it should be kept in a dark place, as light decomposes most kinds of ink. Do not pour different kinds of ink together. Sometimes, it is true, an improvement can be made in this way, but often the mixture results in an ink too poor to be used at all. For convenience, it is best to have just enough ink in the stand or bottle to supply the pen properly when it is dipped in with the point striking the bottom. When ink becomes too thick to flow freely, thin it with strong tea.

India ink is the best for drawing and heavy shading. Most of the so-called "India ink" of the stores is counterfeit.

Always have a pen-wiper at hand. The best material is either soft, porous paper, or chamois or buckskin.

Position, etc.

Writing masters and the books generally teach that to write well one should sit erect; and, at the same time, many of the teachers themselves, when they become fully engaged on a piece of writing and are not thinking of setting an example of position, will bend over the upper portion of the body more or less. Now, while an erect position of the body is essential to health and a good appearance, it generally throws the eyes a little too far away from the table for beginners in writing. especially when fine, close work is required. Physiologists and oculists tell us that the normal distance of the eyes for reading ordinary type is sixteen inches, and that this distance does not change materially during the growing years of childhood and youth. Sitting erect, therefore, to give a certain angle to the elbow and freedom to the muscles involved, would give the half-grown child about the normal range of vision for writing, but the adult nearly twice that. The latter must therefore at least bend his head over or incline his body down toward the left, in order fully to accommodate himself to the best position. There is an irreconcilable conflict here between nature and art. Of course, certain aged people and long-sighted persons will find the "regulation" position just the thing for them.

Again, the old precept that the right side of the body should be toward the table or desk is not insisted on at the present day, except so far as the writer desires to rest his elbow upon it; and a good penman does not always need that.

Holding the Pen. It is almost impossible to "make" a child hold the pen just as an adult does, or deems necessary; still, it is well to know what the model is, and aim at it. The pen should be held between the thumb and the tip of the second finger, with the tip of the first finger resting upon the upper side. The rear portion of the fore-arm should rest upon the table, while the fore part and the hand should be free. The third and fourth fingers should be partially folded under the hand, and the tip of the little finger, underneath the third, be allowed to rest upon the paper, glide along over it, and thus form a support, guide, etc., for the movements. Hold the back of the hand pretty well upward, so that the first knuckle will be almost directly over the thumb.

The pen should be held with as light a grasp as practicable, which accomplishment will be naturally attained by practice and the lapse of years.

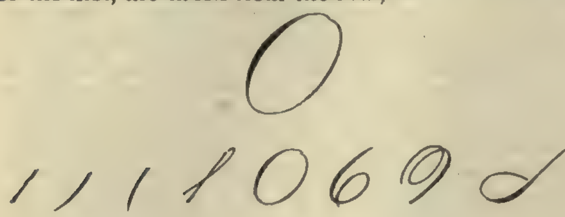
Movement. The "finger" movement is made by the fingers only, when the whole fore-arm rests upon the desk, and is not favored by the best penmen except for copy-hand, card-making, etc., where great precision is required.

The "whole-arm" movement is made when the whole arm is free from any support, except that the hand rests, as before stated, upon the third and fourth fingers. This movement is called into play in making large, flourished capitals.

The "muscular" or "combined" movement consists in moving the whole of the fore arm with the hand as one piece, while only the elbow joint rests on the table and serves as a kind of pivot. This is evidently the best for all kinds of ordinary writing, and is less fatiguing than any other. It is necessarily combined more or less with the finger movement, the latter being specially called into use in the formation of loops and long up-and-down strokes.

THE PRINCIPLES.

The principles, or simple strokes of the pen, with which all letters, both small and capital, are mostly formed, are eight in number, and with the exception of the first, are taken from the oval,—



1 2 3 4 5 6 7 8

The first four are for the small letters, and the last four for the capitals. The first principle is a straight line inclined to the right at an angle of about thirty-eight degrees from the perpendicular. Its length is that of the body of the small letters, or "one space" high. The pupil should practice writing this simple stroke until he can make it perfectly at every effort.

Do not attempt any shading or heavy marks of any kind, until you have learned to write all the letters perfectly.

Principle No. 2 is the right-hand lower quarter of the oval, and is struck upward. No. 3, also written upward, is the left-hand upper section of the oval. Practice writing these until you satisfy yourself.

Next, join these three elements together *at a round angle, almost sharp*. This is the Spencerian, or "semi-angular," feature of penmanship. Principles 2 and 1, however, join at the top sharply, as in the letter *i*

No. 4 is three times the height of 1, 2 and 3. The second, or downward stroke, is perfectly straight, and at the same angle as No. 1. Make the turn at the top as graceful as possible. The place of crossing the two strokes is a little over one-third the height.

The pupil will at once observe that by the use of the first three marks above described the letters *m n u i* are formed. He may now practice writing these letters. Then principle No. 4, to form *l h b* and invert it to form *y j* These are called "extended loop" letters.

The width of the body of each small letter should be two-thirds of a "space," except that *m* is twice two-thirds, and *w* once and a half two-thirds, or one full space.

After the learner has become thoroughly familiar with all the foregoing elements, and has by practice become able to write all the above letters with a fair degree of grace, he is ready to commence the analysis of each letter, taking one at a time.

Extension.—The unextended letters occupy what are generally termed one "space," and they are: *a c e i m n o r s u v w x*

The "extended" letters comprise all the rest, which are divided into four classes, namely:

1. Those letters involving the fourth principle, as: *b l h k f*
2. Those involving the fourth principle inverted, as: *g j y z*
3. "Stem" letters, extending two spaces high, as: *d t p*
4. Stem letters extending a space and a half below the line of writing. *p q*

Small Letters.

a 3, 3, 2, 1, 2. Be sure to close this letter at the top, to prevent its resembling *u*, and to come fully down to the line with the principle 1, to prevent a similarity to *o*. It has one semi-angle, namely, at the last turn. The downward written third principle retraces the upward for half its length. Take particular care that this retracing be so exact that no shading is effected. This letter touches the ruled line at three points.

b 4, 2. This letter is finished with the second principle extended to its full height, and there tipped by a short horizontal curve, concave side upward. This little curve may be considered a section from the base of the oval. The usual faults are to curve the downward stroke in the middle, and to close by joining the upper extremity of the third principle to the fourth.

c 2, a turn, 1, 3, 2. On reaching the termination of the first stroke, a slight downward motion is made, followed, with a semi-angular turn, by continuing up to the top with the second principle (very short, of course), thus forming a small direct oval. By strictly observing these directions one will avoid making a *c* appear like an *e* or an *i*, as is very often done. It is, however, just as graceful to introduce this letter with principle 2, then lifting the pen, and recommencing at the point usually called the "dot." By this method its first portion is made to resemble the first portion of *a*.

d 3, 3, 2, 1, 3. These principles are the same as those for *a*, but No. 1 is extended to twice its elementary height, or two "spaces," where the junction is made square instead of sharp. A slight shading, therefore, necessarily results at that point. In rapid writing, the most common fault in the construction of this letter is the omission to close

the third principles with the first, at the height of one space. To this point the downward stroke retraces the upward. Another error is to form a loop by the first two principles.

e 2, 1, 2. This letter is very simple. In rapid writing it is too generally merged into an undotted *i*. The introductory in the example here requires a lifting of the pen.

f 4, 2, 2. Extend principle 4 two spaces below the line, and then, by a semi-angular turn to the right, move the pen up just above the ruled line, and there finish by a second principle, either with or without a small round loop at the juncture. The width of this letter below the line should be the same as that above. The most common faults are to curve the downward stroke in the middle, and to omit closing the second principles with the first above the line of writing. Another fault is to introduce the letter with the second and first principles, instead of the fourth, and still another is to make the lower portion too broad or too short. The upward stroke of the lower portion, it will be observed, is not strictly a second principle.

g 3, 3, 2, 4 (inverted), or *a*, with the inverted fourth. The most common fault in general practice in writing this letter is to leave the top open, making the whole character verge toward a *y*. Rapid writing tends also to throw it into the form of a figure 8.

h 4, 3, 1, 2. The most usual error in the formation of this letter is to convert the second upward stroke (principle No. 3) either into a straight line or the opposite curve, No. 2. Also, we are generally inclined to make the crossing of the fourth principle too low down.

i 2, 1, 2. The dot should be one space above, and in line with the body of the letter. The most prevalent error, in connection with this letter, is the omission to dot it.

j 2, 4 (inverted). It is the practice of some good penmen to make the top of *i* and *j* square, like the apex of *t*.

k 4, and a wavy imitation of the printed form. The right-hand portion of this letter is variously analyzed by teachers of penmanship. We would advise the learner to practice from any graceful copy. After making the fourth principle, some penmen extend up a space and a half high with the third principle, then down a little with the second, and finish with the first and second, as above. Others, after writing No. 4, lift the pen to the top of the second space, come down a little more than half way with either a principle 1 or a compound consisting of the third and second joined without interruption, meeting No. 4 just below the upper line of the first space, and then finishing the usual way. It is very difficult to form this letter gracefully, and the faults in its execution are many.

l 4, 2. The turn at the base of this letter is semi-angular. A common error in rapid writing is to make this letter too low.

m 3, 1, 3, 1, 3, 1, 2. If the elements as here numbered are strictly written, this letter will be properly formed. The spacing between the first principles should be uniform.

n 3, 1, 3, 1, 2. Probably the most common fault in ordinary writing is to change this letter into *u*.

o 2, 3, 2, and short horizontal curve. The slant of this letter should of course be that of principle 1, and this is determined by imagining its longitudinal axis extended. Conceive a line drawn through its greatest length, and see that the letter is so made that this imaginary line is parallel with principle No. 1 of the other letters. A common fault is to finish this letter with principles 1 and 2 instead of the horizontal curve, thus making it appear like an *a*.

p 2, 1 (extended), 3, 1, 2. The base of the extension should be square. It will thus appear slightly shaded, like the top of *t*. In order to avoid the common fault of spreading this letter too much, principle 3 should be shortened, and commenced on the stem about half a space high. Half angles at the junctions of principles 3, 1, 2.

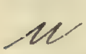
q 3, 3, 2, 1 (extended a space and a half below), connecting line, 3. The first portion of this letter is made, of course, on the same plan as *a*. The first principle is then extended a space and a half below the ruled line, where the characteristic half angle is made, and the pen is directed up to the ruled line, where it smoothly glides into the formation of the third principle, thus completing the letter.

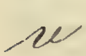
r 2, 1 (with a "shoulder"), 2. This letter and the next are extended slightly above the upper line of the first space, where a "shoulder" is formed. In this letter this little turn is made by retracing principle 2 to the upper line, and then curving to the right sufficiently to introduce principle 1 with a similar but opposite curve. The base of this letter should be a half wider than the top. A common error is to form a small circle at the top. Other errors are, to make the letter too spreading, and to merge it into an undotted *i*.

s 2, shoulder, 3, 2. Some writing masters introduce this letter with a straight line extending upward. The shoulder, like that of *r*, is commenced by retracing principle 2, and then introduces principle 2 again, but with a greater curvature, extend-

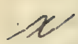
ing this down to the line, and slightly upward to the left until it meets the introductory line. Some penmen make a dot here, and consider the letter finished; others retrace the base of this curve and finish with the second principle, or with the compound of 2 and 3. In writing for printers it is well to make this letter more like the printed form. The most common fault, in writing this letter, is to merge it into an undotted *i*.


2 (extended a space and a half high), 1, 2. Avoid leaving the top perfectly sharp. The most universal error with reference to this letter is the omission to cross it. The cross is a light, straight, short horizontal mark through the stem just above the upper line of the first space. To avoid spreading the ink, this little mark is often made after the stem and disconnected from it; and it is also often converted into a flourish, either after the stem or entirely above it. Avoid the fault of spreading this letter at the base. The downward stroke should retrace the upward for about half its length, and then depart from it so gradually that no interruption is visible in either stroke.


2, 1, 2, 1, 2. The most common fault is to convert the middle upward stroke into a straight line or the opposite curve, thus merging it an *n*.


3, 1, 2, and short, horizontal curve. Width only one-half the height. Do not turn principle 2 into a straight line.


2, 1, 2, 1, 2, and short, horizontal curve. The last part is of the proportions of *v*


3, 1, 3, and cross. The cross is made by an upward stroke, at a slightly lower inclination than principle 1. Some penmen make a perpendicular mark instead of the first principle.


3, 1, 2, 4 inverted. Do not close the top and make a *g* of this.


3, 1, 4 inverted. The last principle is introduced by a curve, and sometimes a loop also. There are several methods of writing this letter, equally good.

JUNCTION, ETC.

As the learner will have already observed, the introductory and terminal elements of each letter are so formed and arranged as to render mutual junctions easy and graceful. A letter, for example, ending with principle No. 2, readily joins with a succeeding letter commencing with the same principle, this curve, as it were, serving a double purpose, as *nu*. But fully as often the succeeding letter commences with principle No. 3, in which case a kind of compromise is effected by uniting the two principles into what is termed a compound curve; as, *un*.

The 2d, 3d and 4th principles introducing letters at the beginning of words are commenced a little below the line.

The letters in each word should be so written as to appear to be equi-distant, even at some sacrifice in the stroke of the primary elements.

Uniformity of slant is particularly essential to beauty.

With the foregoing instructions, the pupil ought now to become able, by practice, to write any word correctly, so far as the small letters are required, especially if he has any mechanical talent and a sense of the beautiful. There are variations from the forms above given, equally correct and beautiful, which the learner will see in the writings of others and select according to his taste.

Capitals.

The frame-work from which the capital letters are principally constructed are given on page 1020, and numbered from 5 to 8 inclusive.

The Direct Oval, numbered the 5th, the width of which is two-thirds its height. It is called direct, because it is of itself one of the capital letters, although such a naming of this figure is in "direct" contradiction to what is understood by the term in natural philosophy, or mechanics. Practically it does not differ from the spiral, before described. It is the practice, however, to contract the spiral, in finishing the final flourish, by directing the pen back and upward toward the middle of the last oval, as exemplified on these pages.

The Contracted Oval, or spiral, the body of which is half the height of the stem. This is numbered the 6th. The proportions of this oval are of course the same as those of the larger, and the second downward line must be as nearly parallel with the main stem as practicable, to cross at the base, if continued into a flourish. It forms the termination of several capitals.

The Capital Loop, being No. 6 inverted. It is number 7. The same proportions and parallelisms must be observed. It is still further contracted, as an introductory to two or three letters.

The Capital Stem, the oval portion one and a half spaces high, numbered the 8th. It is a matter of taste whether the downward portion of this character should be perfectly straight for most of its length, or a compound curve, with the curvatures barely visible. If learners are taught or permitted to curve at all, they are inclined to curve too much. Its inclination being of the standard regulation, the finishing oval is necessarily more inclined than the thirty-eight degrees, but this does not mar the beauty of form in the outline of the letters to which it belongs.

All the above rest on the line, are three spaces high, and have the standard inclination, namely, thirty-eight degrees from the perpendicular.

Plain Capitals.

A B C D E F G H I J K L M N

O P Q R S T U V W X Y Z & Dr.

Flourished Capitals.

A B C D E F G H I

J K L M N O P Q

R S T U V W X Y Z

John J. Oswald Chicago, U S A

Farming Vermont Staply Co With me $275

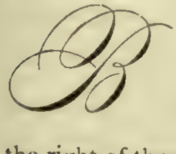
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

The American Encyclopedia of Practical Knowledge

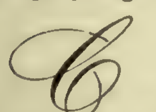
Thomas Co. Flowering

We now proceed to analyze each capital letter, with such instructions and cautions as seem to be necessary.

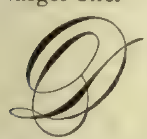
8, 1. The pen has to be lifted once or twice in the construction of this letter. The finishing stroke in the middle may be either a light, straight, horizontal line, or a curve from the left-hand lower section of the oval page.



Indirect oval full size, principle 2 struck downward, small loop, and indirect oval half size. The first stroke, or stem, however, may be that of principle 8. The spaces on the right of the stem should be only one-fifth as wide as that on the left. The width of the upper and the lower sections should be equal, and the upward, finishing stroke of the small oval should have the same inclination and be the exact counterpart of the right-hand section of the same. The lower oval may be slightly larger than the upper.

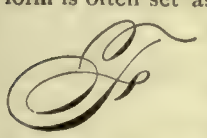


Principle 6, introduced like principle 4. The downward final stroke should be such that if continued a spiral would result, like a series of barrel hoops three-fourths upon each other in a direct line. The axis of the small oval should be parallel, or rather coincident, with that of the indicated larger one.



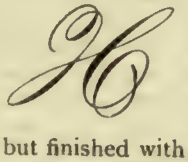
Capital stem, small loop at the base, direct large oval, continued into a smaller one, with the sides parallel and axis of the standard slant. At the base the pen should touch the line in two places, as the example shows, and the width of the space on the right of the stem should be one-fifth of that on the left.

Two direct spirals joined by a small loop, the upper spiral being only half the length of the lower. While this is a beautiful letter to form, and apparently easy to write, the faults committed with reference to it are too numerous to mention. It should never be introduced by the long upward stroke of the pen, as if a principle 4 were required, although this form is often set as copy.



3, 2, compound horizontal, 8, with a light horizontal cross line in the middle, tipped with another light stroke parallel to 8. Principles 3 and 2, introducing what is called the "cap," form a figure about half the size of an *o* or *a*. Principle 8 should commence immediately under the middle of the compound curve of the cap. Some writers connect principle 8 with the cap without lifting the pen, thus forming a loop similar to the base of capital *L* inverted.

2, 3, 2, and 8. The upper portion may be considered principle 5, contracted to two spaces. As an oval it should be of the same width top and bottom. The finish of principle 8 is generally a dot. A continuation, as in the example here given, is considered a flourish. Principle 8 in this letter is two spaces high. Be careful to have the general slope of each section of this capital precisely alike.



7, 6. Principle 7 in this letter has its loop contracted to less than half size. Another form of this letter, equally tasteful, consists of 2, 8, 6,—the first portion thus being a capital *S*, but finished with principles 3 and 1 combined, three

spaces in height, as here illustrated, and a small loop and turn near the base, for the cross, more easily illustrated than described. The latter form requires a lifting of the pen, but is probably more in use at the present day than the first form above given.

3, 3, 8. The first two upward strokes of the pen in this letter are connected by a small loop, which should be bisected by the stem 8. To make this turn gracefully requires considerable practice, as the finishing stroke should cross the introductory at right angles.

3, 8 extended. This is the same as the preceding, but finished with the inverted 4th, written proportionally larger. Always extend this letter below the line.

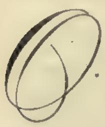
7, 8, compound curve, 6. In this letter the proportions and connections are best shown by the example. The right-hand portion comprises the same elements as are in the small letter. This is not so difficult a letter to write as it appears to be.

Direct oval, occupying the middle portion of the spaces, finished by a modified No. 8. The base should touch the ruled line in two places, the loop at the base should be perfectly horizontal, and the finishing stroke should be No. 2 made as near the stem as practicable. The stem should intersect the horizontal curve at the middle. This capital contains two compound curves, and is a beautiful letter with which to practice them.

8, 1 and 3 extended, 6. It is almost impossible, in ordinary practice, to keep the top of this letter wide enough, or the base narrow enough. See that the

axes of the implied ovals are parallel and incline to the right of the perpendicular the required thirty-eight degrees.

8, 1, 3. The last stroke is only two spaces high, and ends with a dot. It should be parallel with principle 8 in the letter, and the junction with principle 1 at the base should form a half angle. This is the same as the first part of *M.*

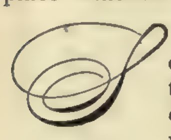


5. This, as before intimated, might be more strictly termed an oval spiral. The top and bottom should be of equal width, and the major axis at the regular inclination. Close it at the top, and on crossing at the center of the base, continue round and complete the letter (or flourish) with the 2d principle.

This is equal to the first portion of *B*, already described. A small dot, touching the stem, is the finishing point of this letter. Instead of the loops on the left of the stem, it is just as well to form an indirect No. 5, finishing as above.

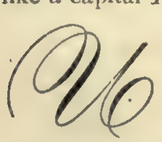
7, finished as *L*. The figure 2, described a little further on, is made on the same plan. Of course, as will be seen, the descending portion of principle 7 here is curved.

8, 2, 1, 2, with connecting lines and and loops. This is the same as *P*, above described, finished with 1, 2. The small connecting loop should be in equal sections on each side of the stem, or a sharp junction can be made at that place without a loop.



2, 8. The downward stroke should cross the upward about midway, and the finishing should likewise be precisely a space and a half high. In rapid writing it is almost impossible for many persons to avoid merging *S* and *L* into each other; and yet, especially in writing for printers, there is scarcely anything more important in the whole range of penmanship.

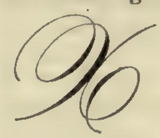
3, 2, compound horizontal, 8; or, the same as *F*, without the cross at the middle. It is advisable not to continue the flourish across the middle of this letter, else it will be too much like a capital *F*.



7, 2, 6. Although this is an easy letter to form, it is well to fix in the memory the elements which it comprises, as it occurs so rarely in practice that one is liable to forget the theoretical principles of its formation.

7, 2 and 3 compounded and ending with a dot two spaces high. It commences and ends like a *W*. Do not make the angle at the base sharp, or the upward stroke a straight line.

7, slightly curved; 2, prolonged three spaces high; 1, extended down to the ruled line; 3, extended two spaces high and terminating in a dot. The first and second angles are sharp; the third is a half angle.



7, 6. Principle 7 here is of course greatly curved. Another method of framing this capital is the plan of the small *x*. There is seldom an occasion for writing this letter as a capital, and hence one is liable to forget the plan of its formation.

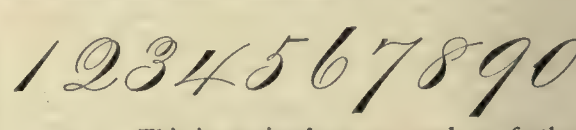
3, 1, 2, 4 inverted. Another method, equally good, is to finish on the line, instead of below it, with a small capital stem,—principle 8,—like *G*. This letter may also be introduced with principle 7.

7, slightly curved, and 4 inverted. This also, by another method, is completed on the line, by an outline similar to the printed form. Its principles may be regarded as 2, horizontal curve, 1, and horizontal compound curve.

Two compound and one simple curve. The first is essentially principle 8, or the capital stem; after turning at the base a similar compound curve is struck upward, a space and a half high; a turn is made to the left there, and the simple curve brought down two-thirds of the way, finishing with principle 2.

The Arabic Figures.

All the numerals are made a little more than a space high, and from the same elements that form the letters, as above described.



1. 2, 1. This is so simple as to need no further explanation.

2. 7, and horizontal compound curve, or a capital Q.

3. Two open indirect ovals, connected by a small loop, the upper oval one-half the length of the lower. It is capital *E* reversed.

4. 1, horizontal straight mark, 1. The two strokes of principle 1 are parallel, two-thirds of a space apart; and the first one may be only one space high, and should be square at the top. The horizontal mark

1. The liberal arts soften the temper. A B

2. Discretion is the better part of valor. A

3. Truth is the basis of every virtue.

4. Hope springs eternal in the human breast. E

5. So shall sweet thoughts my constant inspiration be. I

6. Wise men learn by experience; fools do not.

7. As fresh and pure as a sunny morning in May. T X Y Z

8. The right is the supreme good, and includes all other goods.

9. In all ages have liberty and eloquence been united.

10. We often see rank or riches preferred to merit or talent. Dr.

11. Let neither indolence nor vice canker the promises of the heart.

12. The love of money is the bane of bliss. I

13. A fool is known by a multitude of words. A B C D E

14. Fruitless war is only splendid murder. Abel

15 Storms purge the air without, within the breast. Ring

FIRST LESSON.

A specimen of my writing at beginning of school.

ı ı ı ı ı ı ı ı ı ı ı ı ı ı ı ı

SECOND LESSON.

n n n m m m n m u u u n u m n u m m

nun mum a e i o u man men au in on un

THIRD LESSON.

a d q o l h b f k e c i i s v w x g j y z p t d

a b c d e f g h i j k l m n o p q r s t u v w x y z

FOURTH LESSON.

1 2 3 4 5 6 7 8 9 0 1776 & &Co. remember

common number communication very uncommon many

FIFTH LESSON.

A B C D E F G H I J K L M

N O P Q R S T U V W X Y Z

SIXTH LESSON.

Art Bay Can Din Elf Gun Hen Ink Jug

Kin Let Man Nun Oat Pen Quit Run

Sly Ton Urn Vie Wax Xerxes Yes Zed

SEVENTH LESSON.

America Benjamin Columbus Daniel Emerald

Fitzgerald Georgia Henrietta Ivanhoe

Juniata Kingdom Lemuel Marion and Etc.

EIGHTH LESSON.

Nevada Oliver Portugal Quincy Riverside
Sandusky Theodore Union Vinnie
William Xenophon Ypsilanti Zenobia

NINTH LESSON.

A specimen of my running hand. Mississippi.
A sample of my business penmanship. Commission

TENTH LESSON.

Know then thyself. Presume not God to scan:—
The proper study of mankind is man. Immortality.

ELEVENTH LESSON.

Vice is a monster of so frightful mien, as to be hated
needs but to be seen. Yet, seen too oft, familiar with
her face, we first endure, then pity, then embrace.

TWELFTH LESSON.

Full many a gem of purest ray serene, the dark, unfathomed caves of ocean bear;
Full many a flower is born to blush unseen, and waste its sweetness on the desert air.

should be about one-fourth of a space above the ruled line. In the example above given it is slightly curved, which is just as well.

5. 1, open indirect oval, and dash or curve. Principle 1 is only a third of a space in length, and the oval portion is connected with it by a small loop, and may end with a dot. The finish at the top may be precisely the same as for *v* and some other letters.

6. 6, contracted within the limits above specified, but should never be shaded on the final stroke.

7. Diminutive 1, horizontal compound curve, 1 extended a little below the line, ending square.

8. 3, 2, 3. Some writers strike this in the opposite direction, thus: 1, 2, 3.

9. 3, 2, 1. This is the same as *a* or *g*, with the introductory and finish omitted. Like 7, it should end square, a little below the line.

0. 3, 2, horizontal curve. This is the same as *o*, extended a little higher.

As figures should never be connected, no "introductories" and "finishing" strokes—principles 2 and 3—are furnished them. But it is just as important to make graceful figures as letters.

Shading.

Shading is a gradual swell or enlargement in a line, and the general principle for its application in penmanship is to shade only those elements in a letter which are uncrossed by other elements. As a rule, there should be only one to three shades in a whole word; and these should be so evenly distributed throughout the word, the sentence and the page, as to make them appear well balanced. We will now classify the small letters in the order of their preference in this regard:

a d g q o The first downward stroke in each of the letters given above is the part to be written heavily. The heaviest of the shade is in the middle of the curve, and the swell should be perfectly gradual from point to point. In very heavy writing the lower part of the inverted 4th principle is also shaded in all the letters containing it; and for some fancy writing those parts only are shaded.

t d p Shading heaviest at the square ends of these letters.

h r s v w y z These constitute the third group of small letters, in the order of choice, that may be shaded in any given word.

The other letters—*b c e i l m n x* —should rarely, if ever, be shaded. When they are, the first downward stroke is the place to apply the principle. *c e l f* would require the gradual swell, and *i j u* that which is heaviest at the junction, making that part square, as the top of *d*

Flourishing.

In this art precept and example are equally necessary; and no one should attempt it until he can form all the letters, as taught by the elements, with a fair degree of gracefulness and rapidity. In other words, the learner must have attained full control of the muscles which are called into play in writing before he undertakes the far more difficult task of flourishing.

The art of flourishing by no means consists of haphazard sweeps of the pen, but of systematic turns. The general rule for this highly ornamental art is to continue the spiral that has already been begun in the letter, which is nearly always a capital. At the commencement of the letter, the continuation, of course, consists in beginning the introductory further back. The extent of the flourish depends altogether upon the taste of the writer. The finish is generally a contracted oval. There is scarcely any limit to the ingenious devices in which an accomplished amateur may indulge; but the rule is to keep the flourishing line parallel with its neighboring lines, or, as at the commencement or the closing, across other lines at right angles as nearly as practicable, consistent with an easy, gradual change from the spiral to the contracted oval. In other words, avoid acute angles and abrupt turns as much as possible.

Off-hand flourishing, not connected with letters, is best done by holding the pen-holder to the right, yet keeping the point square upon the paper. The first and second fingers should be under the holder, and the thumb above it. The pen is thus in position for horizontal strokes. The body must be so raised that the whole arm will swing clear from the table, the hand resting upon the nail of the little finger. In the execution of the work, *always move from left to right*, shifting the paper around instead of your hand, to suit the direction of the curves you are about to make.

In conclusion, we can confidently say that, with enthusiasm or love of the art, the study of the foregoing principles and directions, inspection of good examples or specimens and considerable practice, the pupil will certainly succeed.

Teaching Penmanship.

Although text-books and copy-books have been abundant for the last twenty-five years, sufficient for all capable persons to become proficient in the art of penmanship, yet the demand is fully as great as ever for writing teachers, if not even greater; for the people now see more than ever the necessity of good

penmanship; and, while they have not the energy to learn the art from the books alone, the most of them will welcome a teacher and endeavor to accomplish something under the inspiration of his living presence. Instruction books are a necessity, for reference as a guide to accuracy and completeness, but there is no substitute for the real presence of a faithful friend.

As there are a few incompetent and unprincipled teachers in the country, it is well for the good ones so to instruct the people, both by precept and example, that they may distinguish the good from the bad. But such instruction cannot be given in a few sentences of boasting or denunciation, but by faithful conversation and conduct continued through several weeks of time.

After a capable person has made himself proficient in this fascinating art, he will probably have some ways of his own as to the best method of teaching it; and, indeed, one can generally teach better in his own way than in that of some one else. Still, as almost any one will pick up a few good items from the published experience of others, we venture here to suggest some aids, from which a beginner may derive benefit.

The success of a school mainly depends upon the teacher. He is the life and soul of the class. If he possess love of order, tact, versatility, knowledge of human nature and self-possession, with ability to illustrate principles and entertain his class with anecdotes and pleasantries, he can succeed pecuniarily as well as sociably and professionally. If he desires to follow the business for a number of years, it is well to select a dozen or twenty villages, and continue his rounds in them once or twice a year regularly. There is money in a good reputation. By this policy very little special advertising will be necessary in the subsequent rounds, and all the machinery of the business will run easily.

In advertising, it is not a good plan to endeavor to attract attention by odd or sensational dodges, or even by boasting. His advertisement in the local newspaper may be something like this:

"Writing School.—Mr. W. L Austin will open a Writing School in Caledonia Hall Monday Evening next, at 7 o'clock promptly. See specimens at Hyde's Book Store. No payments for tuition will be received in advance. Terms, $2.50 for the course, payable during the last week of the term."

Generally, in addition to the above, a favorable editorial notice can be obtained, which will greatly aid the enterprise.

It is usually a good plan also to issue a hand-bill or circular, which may be worded or planned like the following:

"Writing School. Mr. W. L. Austin, of Detroit, Mich., will give the first of a course of twelve lessons in penmanship at Caledonia Hall, beginning Monday evening, Oct. 8, 1883, and continuing every evening, except Sunday, until completed. Terms $2.50. No money received in advance. Stationery and all the necessary material, of the best quality, furnished pupils at the lowest prices, or students may bring their own. Also, bring a lamp, with a shade. Come early, and do not miss the first lesson.

Commendations.

"Mr. W. L. Austin, who has been a resident of this city a number of years, is a young man of excellent character and a very fine penman. He proposes to teach the coming season, and I take much pleasure in recommending him to all who desire good instruction in the very useful art of writing.—Rev. Aaron D. Phelps, Pastor of Christian Church."

"Mr. Austin has just closed a large and successful writing school here; and it is the opinion of those who attended that it is the best we have ever had. His work is thorough, and he is in all respects an honorable young man.—*Logansport (Ind.) Sentinel*."

"Specimens on exhibition at Hyde's Book Store."

A large poster, which should contain but few words, might be thus worded:

"Writing School. See small bills, giving full particulars of W. L. Austin's Writing School, soon to begin here. Specimens of his penmanship at Hyde's Book Store."

Of course the above would be tastefully displayed, according to the typographer's art.

The best way to advertise and canvass is something like this: 1, To have a circular left at every house in the community; 2, Call at the newspaper offices, insert a short advertisement, and ask the editor to call attention to the opening of the school, giving him one of your circulars, by which he may see that you are well spoken of as a penman, as a teacher and as a gentleman; 3, Have a dozen or two of the large posters put up about the village; 4, Visit the families of the place, not to get subscriptions, but to show your work and what you propose to do; 5, Visit the schools of the place, exhibiting specimens of your penmanship, showing how attendance at your school will not interfere with the daily studies of the scholars, and giving the teachers free tickets to your course.

It is very important that a good room should be obtained for the writing school, and kept neat and comfortable during the exercises. A school-room is best, where seats and desks are already supplied. The charge for the use of such a room is usually but a trifle or nothing. Give free tickets to those who are responsible for the room and who grant you permission to use it.

Do not advertise your school contingently,—that is, conditioning it upon the amount of patronage you receive; for that is a sure way to fail. Say positively you will commence on such an evening, at such an hour, naming the place.

The school assembled, take pains to secure the strictest order and quietness. During the exercises no whispering should be allowed, and the stillness should be so perfect that if any pupil is using a scratching pen it can be heard.

Slips are best for copies, as they can be easily slid down on the sheet and kept near the pen. About two dozen copies will generally be sufficient to occupy the time of most pupils during the term, and should be arranged to embrace all the principles and exercises

it is necessary for the student to understand in plain writing. These copies may be written or printed : the printed are more perfect and save the teacher much drudgery. The printed forms should exhibit the true character of the letters as they should be written with the pen, and not be merely printed from "script" type

Numbered in the order of their succession, from one to twenty-four, these slips should be wrapped together in a package, which should be pasted on the inside of the copy-book, on the cover, whence they can be drawn as required by the student. When the copy is finished, the slip should be placed at the bottom of the package. The wrapper holding the copies should be firm and tight enough to prevent the copies from falling out of their places. If the copies are kept clean and smooth, they can be used again. Another plan, but more laborious, is, for the teacher to distribute the copies at the commencement of each session of the school, and collect them at the close.

Those of the class who excel may be furnished with copies of various commercial forms, or even of examples of flourishing or fancy shading, on which to practice toward the close of the term.

Should a second term of lessons be given to the same students, they should for half a dozen evenings review the copies of the first term, after which they may be drilled in commercial forms, composition of business letters, flourishing, etc., according to their tastes, capacity and stage of advancement.

All copies should be prepared before the school commences.

More than in anything else, is it necessary for the writing teacher to be prompt in opening each session at the hour appointed: otherwise troubles will increase upon his hands. The causes of this are so obvious that we need not repeat them.

A portion of the time, during each session, while the pupils are practicing the elements, the teacher will find it convenient to have the whole class make their pen movements in unison, as singers in keeping time. The teacher leads by calling out the principles by number, as, 3, 1, 3, 1, 2, while the whole class follow, forming for example the letter *n*. This process can be followed with all the letters, both large and small. There is considerable advantage in such a a practice, derivable more from recondite elements of human nature—metaphysical reasons—than from anything visible.

The copies which we have given on pages 1030-1 are adapted to a course of twelve lessons in penmanship, so arranged as to be both progressive and complete.

On calling the school to order and furnishing every member with the necessary outfit, it is well to have each write a sentence as well as he can, at the top of the first page, as a specimen with which to compare his best at the close of school. This will be a great satisfaction to each pupil, as well as an evidence of the efficiency of the teacher.

Then draw the oval on the blackboard, and explain how principles 2 and 3 are taken from it. Next drill on position, holding the pen, movements, etc., and proceed, as indicated by the copies in this work.

A session of an hour and a half to two hours is sufficiently long, and during the evening there should be an intermission of ten or fifteen minutes.

Pennyroyal, a perennial plant of the mint family. It flowers in August and September; it is warm, pungent, aromatic, stimulating and diaphoretic, like spearmint, but not so agreeable. The infusion is warming to the stomach and allays sickness. It relieves spasms, hysterics, flatulency and colic, and promotes expectoration in dry comsumptive coughs. It promotes perspiration and is most valuable in obstruction of the menses. It is very disagreeable to most insects and will therefore drive them away

Peony (pe'o–ny), a very gorgeous, hardy flower propagated from the roots. It presents a wonderful combination of colors. Plant in spring or autumn and leave in the ground undisturbed until you wish to propagate by dividing the roots. It will grow in any soil not covered in winter and spring with surface water.

Medical Properties and Uses. The root is the part used, and is considered an excellent nervine and anti-spasmodic tonic. When fresh, the root has a strong, disagreeable smell, and rather sickening, bitter-sweetish taste; when dried, these unpleasant properties are measurably lost. It has long been used as an anodyne and anti-spasmodic remedy in certain nervous affections, as epileptic and other fits, in St. Vitus' Dance, and also in whooping-cough. For this latter complaint, it is thought best to use it in combination with the black cohosh root, in the form of syrup. Peony is generally used in infusions, one ounce or so of the root coarsely powdered or bruised, to one pint of boiling water. Dose from a third to a half a teacupful, three or four times a day; of the powdered root, about a teaspoonful three times a day, in case of fits or chorea. It was regarded by the ancients as a sovereign remedy for fits or epilepsy.

Pepper. A well-known spice of an aromatic odor, and an extremely pungent and acrid taste.

Black pepper is the fruit of a species of climbing vine, a native of the East Indies, and found on the slopes of mountains in the southern parts of both peninsulas; it is also cultivated extensively in Malabar, and the eastern islands, Sumatra, Java, Borneo, and those which are near. It was formerly known only as the product of these countries, the whole globe being supplied from them; but it has been lately introduced into Cayenne. The berries grow in spikes of from twenty to thirty, are at first green, and when ripe are of a bright red color. After being gathered, which they are while green, are spread out on mats, with their skins on and dried in the sun ; thus they become black and more or less shrivelled. Those which are

least ripe and in the fittest state for gathering, shrivel the least; but when they are more ripe they often shrivel up entirely or remain nothing but dust. The quality of pepper is tested by rubbing it between the hands, and what is easily reduced to powder is unsound and bad.

White pepper is not the product of a separate plant, but is made from the black by steeping it in lime and water and the removal of its black skin. Pepper is sold extensively ground. This is never pure, but adulterated with various cheaper articles.

Red pepper (*Capsicum*) is a name given to numerous herbaceous plants natives of tropical countries, but some varieties are cultivated throughout the United States in gardens. The pods are the part used, being yellow or red when ripe. The red (Cayenne) pepper of commerce is the long, small red pepper.

This powerful spice has become a necessary article in cooking and seasoning, and is much esteemed for its flavor and the quality which it is supposed to possess of promoting or aiding digestion. It is very doubtful, however, if its use is conducive to health. In fact, the black variety may be considered very detrimental. The Cayenne is preferable, yet should be used sparingly.

To pickle pepper and make pepper mangoes, see article on Pickles.

To cultivate the red or Cayenne variety, start in a cold frame or hot-bed, transplant the young plants toward the close of May in a very warm location, in rows 18 inches apart; thin plants to a foot apart in the rows; or, when but few are wanted, it is more economical to sow the seed where the plants are to remain. Very rich ground is necessary.

VARIETIES. Spanish Monstrous. Six inches long and two in diameter.

Chili. Sharply pointed, two inches long and half an inch thick.

Long Yellow. The name is properly descriptive.

Large Bell. A standard sort.

Cayenne. Small, long and tapering; very hot; best for seasoning pickles.

Large Sweet Mountain. Very large and excellent for mangoes.

Cherry. Small, smooth and round; a great bearer.

Squash, or Flat. Best for pickling; in most popular use.

Long Red, or Santa Fe. Very productive.

Yellow Squash. A fine, large variety.

Pepper-grass: see Cress.

Peppermint, an herb used for sauces, perfumes and in medicines. It is distilled and its oil formed into an essence. It belongs to the same family as spearmint and pennyroyal, both which are cultivated in a similar manner. The soil should be moist, mellow and rich. The roots are put in the ground about six inches apart, and in rows two feet apart, about corn-planting time. In the garden they may be set one foot apart each way. In drying it must be done in the shade and the branches not permitted to get wet. When for the oil they should be cut when in blossom. St. Joseph county, Mich., is the principal point in the United States for the cultivation of this plant.

Pepsin, the active principle of the gastric juice of animals. See Dyspepsia.

Perambulator, or **Odometer,** a wheel so connected with another wheel in machinery as to measure the distance traveled. It can be attached to a wagon and measure the distance it travels along the road.

Perch, in long measure, five and one-half yards or a rod; the one-fortieth of a rood in land measure. Stone masonry is usually measured by the perch, meaning a mass 16½ feet long and a foot each in height and breadth, or 16½ cubic feet. Perch is the name of a family of excellent fresh-water fish described on page 473.

Percheron Horse: see page 692.

Perennial (per-en'ni-al) herbs are plants that die down to the ground in the autumn, while the roots continue to live and send up plants annually for many years. Such roots should be divided each year in the spring. Annuals are plants whose roots live but one year, the plant reproducing its species by seed; biennials are such as spring from the seed, forming a plant during the first year which does not mature its seed until the second season, when it dies.

Perry, the cider of pears.

Persimmon. This fruit is grown between latitudes 30° and 40° north. It is seldom seen north of the latter point, but is common south of it. The tree averages about 35 feet in height, and resembles the white ash, but when trimmed and cultivated has symmetrical heads like the hard maple. The fruit when green is remarkably astringent, but when ripe is sweet and luscious and very palatable. The fruit varies from that of a small plum to a medium-sized peach, and is very difficult to keep.

Perspiration, the insensible transpiration or exhalation continually going on at the surface of the skin and membranes. Sensible perspiration is called sweat.

Petroleum, a bituminous oil obtained from under the earth. It is the crude oil from which kerosene and other oils are distilled.

In veterinary practice petroleum or rock oil was formerly recommended in chest diseases, but it has been succeeded by more certain and successful drugs for this purpose. However, it is still occasionally used as an external application for sores and for the destruction of lice, etc., in the skin. It is apt to leave a blemish by causing the hair to fall off, and in some cases in which it has been used extensively the hair did not come on again. The better way to use coal oil is to mix equal parts with some other oil having no acrid principle.

Pewee, or **Phebe Bird.** This is a small, well-known bird of the North. It lingers around bridges,

old mills and caves, in some secure part of which it makes its nest of mud, grass and moss, with soft lining within to receive the pure white eggs with reddish spots near the larger end. It is quite domestic and innocent of mischief. The wood pewee comes a little later than the above and loves the dark, quiet retreats of the forest. Here, sitting on a dry branch, it may always be found in summer and early autumn, watching for insects, and uttering its low, melancholy notes. It makes its nest on a horizontal branch, constructing it of lichens and mosses without and of fine grasses and hairs within. The eggs are four or five, light yellowish, and spotted with reddish on the larger end. The short-legged pewee is a familiar bird throughout North America.

Pheasant. See Ruffed Grouse, page 611.

Phebe Bird: see Pewee.

Phlegm (flem), the mucous liquid thrown up from the bronchia or lungs.

Phonography: see Short-Hand.

Phosphate, a salt formed by a combination of phosphoric acid and a salifiable base, as lime. It is necessary to the formation of bone and therefore becomes a most valuable mineral manure. Soil deficient of phosphate does not furnish animals sufficient of this bone-making substance.

Phosphorus, an elementary substance, not metallic, solid, colorless, brilliant, and very inflammable. In common air it burns with great rapidity. At ordinary temperature it naturally attracts the oxygen of the air, and burns spontaneously, emitting a luminous vapor.

Phrenitis (fre-ni'tis), in cattle, see page 233; in horses, see Inflammation of the Brain, page 749.

Phylloxera (fil-ox'e-ra): see pages 590 and 862.

Physician: see Doctoring.

Physiology, the science which treats of the functions of the organs of animals or vegetables.

Piccalilli, To Make: To one peck of green tomatoes take 3 good-sized heads of cabbage, 12 green peppers and 2 large onions. Slice your tomatoes, put them in salt and water over night, drain well in morning; chop tomatoes, cabbage, pepper and onions, mix them all thoroughly together, cover with vinegar, cook until quite tender, then drain through a colander; then take 1 pint of grated horse-radish, a half ounce each of allspice, cloves and mustard; mix with 1 pint of sugar, and vinegar enough to cover the whole; stir all well together and put in a stone jar.

Pickling is the term used to express the mode of preserving animal or vegetable substances from putrefactive fermentation, or decomposition, by immersion in vinegar. Almost any eatable plant may be pickled, and the number so used is very great.

We have given directions for making almost all kinds of pickles in the articles of the respective fruits and vegetables: we will therefore only give such in this connection as are mixed, and the cucumber pickle.

In pickling observe the following rules: Always procure the best vinegar, as the success of your pickles depends on its quality. Use glass bottles for your pickles; if earthen jars they must be unglazed, as the vinegar acting upon the glaze produces a mineral poison. Use saucepans lined with earthenware, or stone pipkins to boil your vinegar in. If you are compelled to use tin or copper, do not let your vinegar remain in one moment longer than necessary. Do not allow it to cool in them, as thus it would then become poisonous. Employ also wooden knives and forks in the preparation of your pickles. Fill the jars three-fourths full with the articles to be pickled, and then fill the bottle or jar with vinegar.

When greening, keep the pickles covered down, as the evaporation of steam will injure the color. A little nut of alum may be added to crisp pickles, but it should be very small in proportion to the quantity or it will give a disagreeable flavor.

Cucumber Pickles. Make a pickle, or brine, in a clean tub, that will bear a small potato; wash the cucumbers and put them in; cover with cabbage leaves, and place something heavy on the top to keep them under the brine; let them lie in this as long as you wish. To make a few at a time, take them out and let them remain in cold water over night; then put half vinegar and half water, and a small piece of alum in the kettle with the pickles, and set them on the back of the range. Be careful not to let them boil. Turn them over every fifteen minutes, so they will all get done through; you can tell by breaking one in half, and if it is green it is done. Take them out, put in a stone jar, throw away the vinegar, put in fresh vinegar, with some cloves, peppers and allspice, a few of each; let it boil up, and throw it over the pickles in the jar, and then cover. They will be ready for use in a few days. Can be kept a year if desired.

Mixed Pickles. Take anything that can be pickled, such as onions, sliced cucumbers, cabbage, mangoes, peppers, small green tomatoes, cauliflowers, martinoes, celery, green beans, nasturtiums, watermelon rind, small green cucumbers and Chili peppers. Lay them in salt and water, with enough turmeric to turn them yellow. Let them stand twenty-four hours, stirring frequently; then drain and dry them, and put them into the jars. To every quart of vinegar allow a tablespoonful of mustard-seed, one of turmeric and one of whole black peppers, some garlic if you like. Spice to your taste with mace, cloves, ginger, red pepper and horse-radish. Boil all but the mustard-seed in a bag with the vinegar; let it stand till cold. Boil some eggs quite hard, mash them in enough sweet oil to make a paste; then stir it into the vinegar, and pour over the pickles. Put a handful of salt to every jar. Let them stand three days, covered tight, and they will be ready to use.

Mangoes. Cut out a small strip at the side of the peppers, and take out the seed with a teaspoon; fill

them with chopped onion, peppers, horse-radish, mustard-seed, cloves and allspice. Sew on the piece taken out, and prepare them the same as for cucumbers; they should remain in the salt and water forty-eight hours.

GREEN TOMATOES. The same as for cucumbers; a few green peppers can be put in with them.

GREEN PEPPERS. Take fresh, hard peppers; take out the seed and fill each one with chopped cabbage, onion and whole mustard-seed; put on the top that you remove to take out the seed and to fill it; tie it on with a string to keep the stuffing in, and put them into salt and water; let them remain in it forty-eight hours. Then pour over them hot vinegar. They can be put into the salt and water before the chopped cabbage is put into them, if preferred.

PICKLED ONIONS. Peel the onions, which should be fine, white ones—not too large. Let them stand in strong brine four days, changing it twice. Heat more brine to a boil, throw in the onions, and boil three minutes. Throw them at once into cold water, and leave them there four hours. Pack in jars, interspersing with whole mace, white pepper-corns and cloves. Fill up with scalding vinegar, in which you have put a cupful of sugar for every gallon. Cork while hot. They will be ready for use in a month, but will be better at the end of three months.

PICKLED CAULIFLOWER. Pick the whitest and closest bunches. Cut into small sprays or clusters. Plunge into a kettle of scalding brine and boil three minutes. Take them out, lay upon a sieve or a cloth, sprinkle thickly with salt, and, when dry, brush this off. Cover with cold vinegar two days, setting the jar in the sun. Then pack carefully in glass or stoneware jars, and pour over them scalding vinegar seasoned thus: To one gallon allow a cup of white, sugar, a dozen blades of mace, a tablespoonful of celery seed, two dozen white pepper-corns and some bits of red-pepper pods, a tablespoonful of coriander seed, and the same of whole mustard. Boil five minutes. Repeat the scalding once a week for three weeks; tie up and set away. Keep the cauliflowers under the vinegar by putting a small plate on top.

PICKLED CABBAGE is generally called "sour krout" (German, sauer kraut). To make it, see page 1113.

Picture Frames, TO CLEAN: see Furniture.

Pie Plant: see Rhubarb.

Pie. We give the following well-tried recipes for making many different kinds of pies. To make a good pie crust take a quart of flour, which will make four large pies. Sift the flour and stir in a quarter of a pound of butter and a teaspoonful of baking powder, then moisten with ice water if you have it, using just as little as will make the flour stick together. The secret of good, tender paste is speedy work. Do not work it with warm hands.

APPLE PIE. Peel the apples, slice them thin, pour a little molasses and sprinkle some sugar over them; grate on some lemon peel or nutmeg. If you wish to make it richer, put a little butter on the top.

BUTTER PIE. Very rich. Take a piece of nice butter, not too salt, large as a hen's egg; ⅔ of a cup of sugar, 1 cup of sweet cream, 1 tablespoonful of flour. Stir butter, sugar and flour together; then stir in the cream; add nutmeg if liked; pour into a crust; put crust in strips across the top; bake until slightly browned.

CARROT PIE. A very good pie may be made of carrots, in the same way that you make pumpkin pies.

CHICKEN PIE. Take 2 or 3 nice young chickens and boil them until the meat will come off the bones real easy, then pick all the bones out; make a crust the same as for other pies but roll it rather thicker; put your crust in a dripping-pan; put in a layer of chicken seasoned with salt, pepper and butter; have plenty of broth; then put on another crust, then another layer of chicken, then put in all the broth, then the top crust; pinch the crust firmly around the top. Bake in a slow oven about two hours.

CHOCOLATE PIE. Two cups of sugar, three-quarters of a cup of butter, one cup of milk, three and a half cups of flour with two teaspoonfuls of some condensed baking powder sifted into it; five eggs, leaving out the whites of four. Bake in Washington pie tins; this will make three pies of two layers each, with the chocolate between and on top. For the chocolate frosting take the whites of the four eggs beaten stiff, with one and a quarter cups of powdered sugar, two tablespoonfuls of chocolate placed in a saucer and steamed over a teakettle until creamy; one teaspoonful of vanilla.

COCOANUT CUSTARD PIE. Boil one quart of milk, take it from the fire and stir into it six well beaten eggs, half a pound of sugar (if you do not use the dessicated cocoanut; if you do, less sugar is required); a pound of cocoanut, and two teaspoonfuls of vanilla. This can be baked with a crust and will make two large pies, or without a crust in a buttered pudding dish.

CRANBERRY PIE. It should be made in the same way as gooseberry, allowing the same amount of sugar and a little more water.

CREAM PIE. For 3 pies take 7 eggs, 1 quart sweet cream or milk, 1 pound pulverized sugar and 2 ounces corn starch. Flavor to taste. Use only bottom crust, and bake very slowly.

Another: One large tablespoon of butter, 3 of sugar, 2 of flour, 2 eggs and a little more than ½ pint of milk. Beat the sugar and butter to a cream; beat the eggs well and mix them with the milk; then stir in the flour, etc. Flavor with whatever you like. This is for one pie.

CUSTARD PIE. For a large pie, put in 3 eggs, a heaping tablespoonful of sugar, 1½ pints of milk, a little salt and some nutmeg grated on. For crust use common pastry.

DRIED-APPLE PIE. Soak the apples in cold water all night, having first looked them over carefully; in the morning look them over again, to make sure that

there are no bits of core left on; rinse in several waters, then cook slowly; when done, mash with a potato masher, till the sauce is smooth and far removed from lumpiness; sweeten and spice to suit the taste. If you have any boiled cider, put in just enough to moisten the apple, then make a crust as rich as for mince pie; bake till top is slightly browned. Some dried brackberries cooked with the apples will give an excellent flavor.

ELDERBERRY PIE. Stew the berries very juicy, adding vinegar enough to make them tart; sweeten and spice to taste; thicken with flour; remove from the stove, and put in plenty of butter or a pinch of salt.

FRUIT PIES. Line your dish with a good crust and fill with cherries, peaches, strawberries, or any ripe fruit that you have, regulating the quantity of sugar by the sweetness of the fruit; they may be covered or not as you like. Green gooseberries and rhubarb should be stewed and sweetened before making into pies.

GAME PIE. Divide the birds, if large, into pieces or joints. They may be pheasants, partridges, etc. Add a little bacon or ham. Season well. Cover with puff paste, and bake carefully. Pour into the pie half a cupful of melted butter, the juice of a lemon, and a glass of sherry, when rather more than half baked.

GOOSEBERRY PIE or TART. Pick off all the stalks and little blossoms, and put them on to stew after they have been washed; a very little water may be put in the bottom of the sauce-pan to prevent its burning. To each quart of gooseberries allow three-quarters of a pound of sugar. When they are all broken add the sugar, and let them cook for a few minutes longer. To prepare for tarts, a little more water should be put to the berries; they should then be strained, and to each pint of juice put a pound of sugar and boil it fifteen minutes. Line the plates with paste, fill them with the gooseberries, and put on the strips or an upper crust.

LEMON PIE. One lemon, one cup of sugar, one tablespoon corn starch; rub smooth with a little water; one-half cup boiling water, one egg; butter the size of a walnut; one crust.

Another: Line a common-sized pie-plate with crust, rubbing it as full of flour as you can. Take one large lemon, grate off the yellow part and squeeze the juice into the middle of the pie; place the pulp around the edge; one egg, beaten with three-fourths of a cup of white sugar, one-half cup of cold water, sprinkle in some of the grated rind, and cover with a crust.

LEMON CREAM PIE. One and a half pints milk, 3 tablespoonfuls corn starch, 1 cup sugar, 2 tablespoonfuls butter, 1 teaspoonful each extract lemon, cloves, and cinnamon, juice of 2 lemons, yolks of 4 eggs. Boil the milk; add the corn starch, dissolved in little of the milk; when it re-boils take it off, beat in the yolks, butter, lemon juice, and extracts; pour at once into pie-plates, lined with paste having a high rim, and bake in a hot oven until the paste is cooked about twenty minutes.

MARLBOROUGH PIE. One cup of stewed dried apples, sifted or made fine with a spoon; half cup sugar, one cup milk, small piece of butter or some sweet cream in place of butter, two beaten eggs, nutmeg, no top crust.

MEAT PIES. Have a good crust ready; let your meat be cold, put in seasoning as you like, and cut small pieces of butter over the top, before putting on the upper crust. Allow sufficient moisture.

MINCE PIES. The following is a recipe for the pastry of mince pies. Directions for making the meat are given in the article Mince Meat. Two cupfuls of flour, one cupful of lard, half a cupful of ice water, a pinch of salt; use a knife to cut the lard through the flour until fine; then add the water, and mix with the knife until no flour remains in the bowl; roll thin, and place small bits of butter over, dredge with flour, fold up, and repeat the process twice, using half a cupful of butter; roll the crust thin; have a quick oven; it will rise in flakes.

MOLASSES PIES. Take four eggs and one heaped tablespoonful of flour; beat together until well mixed; then add two cups of molasses and one tablespoonful of good vinegar; have paste rolled as for custard pies; bake in moderate oven; care should be taken or they will burn if oven is too hot. These will jelly nicely. The above quantity is enough for two pies.

ORANGE PIE. Two oranges, eight tablespoonfuls of sugar, four eggs, two-thirds tumbler of milk; beat the yolks, sugar and grated peel of the oranges, being careful not to grate off.

PIGEON PIE. Lay a rim of paste around the sides and edge of a pie dish, sprinkle a little pepper and salt over the bottom and put in a thin beefsteak; pick and draw the pigeons, wash them clean, cut off the feet and press the legs into the sides; put a bit of butter and a seasoning of pepper and salt in the inside of each, and lay them in the dish with their breasts upwards, and the necks and gizzards between them; sprinkle some pepper and salt over them and put in a wineglass of water; lay a thin sheet of paste over the top, and with a brush wet it all over; then put a puff paste half an inch thick over that, cut it close to the dish, brush it over with egg, ornament the top, and bake it. When done, pour in a little good gravy. You may put in the yolks of 6 hard-boiled eggs, or leave out the beefsteak if you think proper.

PORK PIE. Take the skin and fat from a loin of pork, and cut it into thin steaks; season them with pepper, salt and nutmeg; line a pie dish with puff paste, put in a layer of pork, then of pippins pared and cored, and about 2 ounces of sugar; then place in another layer of pork, and half a pint of white wine, and lay some butter on top; cover it over with puff paste, pass a knife through the top to leave an opening, cut the paste even with the dish, egg it once and bake it.

POTATO PIE. One pound of mashed potato rubbed through a colander; ½ pound of butter rubbed to a

cream with 2 cups of white sugar; 6 eggs, the whites and yolks beaten separately; the juice of 1 lemon, squeezed into the potato while hot; 1 teaspoon of nutmeg, the same of mace; bake in shells of paste, or in dishes lined with good paste, without covers. To be eaten cold.

PUMPKIN PIE. Cut up and peel a sweet yellow pumpkin, scrape out the inside, put to stew with only a little water; cover the pot until the pieces are soft, then stir these. Especial care is to be taken that the pumpkin does not scorch. When it is taken out and cold, sift through a colander; if there is too much water drain in a clean cloth. To 2 quarts of the prepared pumpkin add 3 quarts of milk, 1/3 of it being thick cream; 12 eggs, a little salt, a pint of molasses, a teaspoonful of ginger, and cinnamon to suit the taste. Stir well. Have a pie plate lined with paste. Stir up from the bottom and fill the plates. They must bake until they rise up in the middle.

RABBIT PIE. Skin and wash a fine, large rabbit; cut it into joints and divide the head. Then place it in warm water to soak until thoroughly clean; drain on a sieve or wipe it with a clean cloth. Season it with pepper and salt, a sprig of parsley chopped fine, and 1 shallot if the flavor is liked (but it is equally good without it). Cut the bacon into small pieces, dredge the rabbit with flour, and place it with the bacon in a pie dish, commencing with the inferior parts of the rabbit. Pour in a small cupful of water, or stock if you have it; put a paste border round the edges of the dish and cover it with puff paste about half an inch thick. Ornament and glaze the top, make a hole in the center and bake it.

RHUBARB PIE. Take the tender stalks of rhubarb, strip off the skin and cut the stalks into thin slices. Line deep the plates with pie crust, then pour in the rhubarb, with a thick layer of sugar to each layer of rhubarb: a little grated lemon peel improves the pie. Cover the pies with a crust, press it down tight around the edge of the plate, and pick the crust with a fork, so that the crust will not burst while baking, and let out the juices of the pie. Rhubarb pies should be baked about an hour, in a slow oven: it will not do to bake them quick. Some cooks stew up the rhubarb before making it into pies, but is not so good as when used without stewing.

RICE PIE. Boil your rice soft; put one egg to each pie, one tablespoonful of sugar, a little salt and nutmeg.

Another: Boil 1/2 cup of rice in milk till tender; after which add milk until it is a thin batter; the yolks of 4 eggs, and 4 tablespoons of sugar. Bake with one crust till brown; spread over the top a frosting made by beating together whites of 4 eggs and 6 tablespoons of sugar; flavor with lemon; put in the oven five minutes.

SQUASH PIE. Boil and sift a good, dry squash, thin it with boiling milk until it is about the consistency of thick milk porridge. To every quart of this add 3 eggs, 2 great spoonfuls of melted butter, nutmeg (or ginger if you prefer), and sweeten quite sweet with sugar. Bake in a deep plate with an undercrust.

SWEET-POTATO PIE. Take 2 eggs, 2 cups milk, about a cup of finely mashed potatoes, mix well, and sweeten to taste; bake without top crust.

TOMATO PIE. Make the crusts the same as for apple pies. Partly ripe tomatoes make the best pies. Peel and slice them; three tablespoonfuls sugar, a small spoonful flour, butter the size of a walnut; season to taste; lemon flavoring very nice. Green tomatoes the same, only less flour.

GREEN TOMATO PIE. Cut off both ends and slice the remainder; put in one good layer of tomatoes: then add four tablespoons water, one tablespoon flour, mixed with half cup sugar; now sprinkle a little cinnamon over, put on your crust, and bake in a moderate oven.

VEAL AND OYSTER PIE. Cut a pound and a half of veal into small, neat cutlets, and spread over each a thin layer of minced or pounded ham, season them with pepper, salt, and grated lemon peel, and roll each cutlet round. Line the edge of a pie dish with a good paste, put a layer of rolled veal at the bottom, over the veal a layer of oysters, then of veal, and the oysters on the top; make a gravy with a cupful of weak gravy or broth, the peel of half a lemon, the oyster liquor strained, and a seasoning of pepper and salt; cover a crust over the top; ornament it in any way approved, egg it over, and bake it in a moderate oven. When done, more gravy may be added by pouring it through the hole on the top through a funnel, and replacing an ornament on it after the gravy is added. Very nice oyster pies can be made without veal.

VINEGAR PIE. 1 cup vinegar, 1 cup sugar, 2 eggs, 1 cup water, and 1 spoonful of corn starch or flour. Seasoned with lemon, it is equal to a lemon pie. This makes a large pie. Bake with two crusts. As soon as it boils it is done. Should the vinegar be very strong use more water and less vinegar.

Pig: see Swine, and Pork, page 964.

Pigeon. The pigeon belongs to the dove family of birds. It is bred all over the civilized world and has been from a very early period. The varieties, however, known to the Greeks were very few, but were greatly increased among the Romans, with whom the breeding of these birds was quite a science. The same attention to them has continued in some modern nations, and the adepts in the art pretend that the almost innumerable varieties may be bred to a feather. There are several species and a very great number of varieties of the pigeon. Among the most important are the following:

CARRIER PIGEON. This is a domestic variety which from very ancient times has been employed more or less for the transmission of intelligence. In early times it was customary to attach the paper upon which the message was written to the neck; but in latter times it has been tied to the upper part of the

leg. Messages have been carried thousands of miles by them. They have been known to travel 800 miles without food.

The Wild or Passenger Pigeon is extremely rapid in flight, being able to perform long journeys at the average speed of a mile a minute. The rapidity with which it passes through a wood is perfectly astonishing; threading its way amid the closely grown branches with unerring course, it flashes upon the sight like a meteor and is gone. They migrate wholly for the purpose of procuring food, and hence their migrations do not occur at any particular season of the year. They go wherever they can find a supply of grain, rice or nuts. The number that sometimes move together are vast beyond conception. Millions associate in a single roost, completely filling a forest for 30 or 40 miles in length and several miles in breadth, and literally loading and breaking down large trees. From their roosts they fly off hundreds of miles, in some cases, to feeeding grounds and return at night.

Immense flocks of these birds are not so often seen now as formerly, on account of the settlement of the country and the destruction of the forests; and the birds themselves have diminished by being killed in vast numbers.

There are other domestic varieties besides the carriers, known as the tumblers, runts, etc.

Pig-nut, the name of two species of the soft-shelled hickory. The kernel is bitter, but after being frozen a time or two becomes somewhat edible.

Pig-pen, or **Piggery:** see Swine.

Pig-weed, the name of two very different weeds,—*Chenopodium album* and *Amarantus retroflexus.* The former is also called lamb's-quarter and goose-foot. See Lamb's-quarter, page 889. The *Amarantus*, as the name denotes, belongs to the Amaranth family, and being a common weed in rich gardens, is easily identified. It is sometimes called green pig-weed. For the sake of definiteness, we should drop the name pig-weed altogether and call the first mentioned above goose-foot and the latter green amaranth. Although both these weeds are abundant, they are easily subdued.

Pike, a family of voracious fresh-water fish: see page 474. There is also a variety of the Perch family known as the pike: see page 473.

Piles. The piles is a very common affection of the veins of the rectum, which occurs in both sexes and in all classes of society.

The patient first experiences a singular itching and uneasiness about the parts, which is soon followed by an enlargement of the veins, causing tumors that are filled with dark blood. These tumors, which are sometimes from three to six in number, are extremely painful, particularly on going to stool.

When the bowels are in a constipated state, it is often very difficult to procure a passage, owing to the obstruction produced by the tumors; but the attendant irritation brings on tenesmus and bearing down, which forces down the hardened contents, often bringing with them the tumors when they are situated low in the bowel. If they are large, they will usually remain without, and thus prove a source of great annoyance. But the tumors frequently burst, and thus will bleed sometimes very profusely.

When the piles bleed, they are called *open* or *bleeding* piles, and when they do not, they receive the name of *blind* piles.

Piles are occasioned by a relaxed condition of the parts, which may arise from the use of drastic purgatives, particularly those that spend their influence chiefly on the lower part of the intestines, such as aloes, and the most of the pills now offered to the public. Habitual costiveness, sedentary habits, and heavy lifting, may also bring them on.

Piles are seldom dangerous, unless they become so from the excessive loss of blood that they sometimes occasion.

Treatment. Recent cases of piles may soon be relieved by the use of astringent injections. The bowels must, however, always be kept regular by the use of proper diet, or by means of laxatives.

Old and confirmed cases of piles are sometimes considerably difficult to cure. In the treatment of these, it is necessary, in the first place, to get the bowels into a good condition by the use of laxatives, or laxative enemas. The use of astringent injections must then be commenced, and continued three or four times a day. In the meantime apply the following ointment: Flower of sulphur, 1 teaspoonful, mixed with one tablespoonful fresh butter, in which there is no salt. This must be applied by smearing it on a rag or bit of linen, which should then be introduced into the bowel, and left to remain until the syringe is used, when it should be renewed.

Sometimes the tumors grow hard and irritable, and in this state will not readily yield to the foregoing treatment. A poultice made with slippery-elm bark and milk will be found to give great relief. See Ointment, page 995. The best way to cure them is to inject, with a hypodermic syringe, a solution of equal parts of carbolic acid and sweet oil.

Pine. There are many species of this most useful of all trees. It not only furnishes ornamental trees in great variety, but furnishes most of the lumber used on this continent, and affords the material from which tar, pitch and turpentine are manufactured. The white pine is the most useful of all the pines, as it furnishes the largest quantity of lumber. It has five leaves in a sheath, pitch pine three, the red pine, the gray scrub, yellow, Scotch, Austrian, etc., have two leaves in a sheath. The white pine is one of the best trees for prairie planting. We have referred to the pine in the articles Evergreen, Forestry, Landscape Gardening and Hedge, to which we refer the reader for further observations.

Pine-apple, a tropical evergreen fruit. The name seems to be derived from the general resemblance of the fruit to some large cone of a pine tree. In rich-

ness of flavor the fruit cannot be surpassed, and it is usually pronounced the finest in the world. The pine-apple is propagated by planting either the crowns or tufts which grow on the fruit, or by the suckers which appear on the fruit stalk, or which proceed from the base of the plant. Exceedingly fine fabrics are made from a delicate filament obtained from the leaves by maceration.

PRESERVED PINE-APPLE. A pound of sugar to a pound of pine-apple; put the slices in water, and boil a quarter of an hour; then remove them and add the sugar to the water; put in the apple and boil fifteen minutes. Boil the sirup till thick.

Pink, a well-known, hardy, flowering plant of the Carnation family. It is very near akin to the true Carnation, but it possesses quite distinct characters of its own, and comprises countless numbers of varieties and hybrids. It is one of the most generally cultivated and highly admired of flowers. Pinks are propagated from seeds for new varieties and from pippings for the continuation and multiplication of existing varieties.

Pink Eye: see page 782.

Pip, the seed of an apple, or any other pomaceous fruit.

Pirouette (pir-oo-et′), in horse training, is a turning round and round.

Pisciculture, the culture of fish: see Fish.

Pistil (pis′til), the seed-bearing organ of a plant. Pistils occupy the center of the flower and terminate the axis of growth. A pistil is composed of three parts,—the ovary, or seed-bearing portion; the style, or tapering portion, into which the apex of the ovary is prolonged, and the stigma, usually situated at the summit of the style, consisting of a part, or sometimes a mere point, of the latter. The ovary, which contains the young seeds, is of course a necessary part of the pistil; the stigma, which receives from the anthers the pollen by which the seeds or ovules are vivified, is no less necessary, but the intervening style is no more essential to the pistil than the filament is to the stamen, and is therefore not uncommonly wanting.

Pitch, tar boiled down to a state of dryness. It is a solid black substance with a shiny fracture, and it softens at 90° and liquefies in boiling water. A good plaster for sandcrack and other veterinary purposes, consists of one pound of pitch and one ounce of bees'-wax, melted together.

Pith, the central part of the root, stem and branches of dicotyledonous plants. It is always comparatively soft and spongy, and often succulent. It is tubularly enclosed in stems and branches just as marrow is tubularly enclosed in bones, and it has therefore been called the medulla of plants.

Pithing, the instant killing of an animal by dividing the spinal marrow above the origin of the phrenic nerve. This method of killing takes its name from the word "pith," which the butchers in some countries apply to the spinal marrow.

Pitting, a method of planting trees, by preparing a pit of suitable size for the reception of each; also, a method of storing potatoes, turnips, etc., by putting them in heaps and covering with straw and soil; also, the taking of the pits (stones) out of stone fruits, as, to pit cherries.

Plague, a name applied to acute, malignant diseases of live stock, as Texas fever, pleuro-pneumonia, murrain, etc. It is very indefinite in its meaning, and is used in different localities to designate different epidemic or contagious diseases that may prevail among live stock. See the article Murrain, on page 233.

Plank. When lumber is sawed in pieces it has different names applied to it, depending upon the size and form of the pieces. Thus, when a piece of timber is sawed longitudinally, so as to produce a number of plates of timber, the sides of which are parallel to each other, such pieces are called planks. Planks are similar to boards, only thicker. A piece sawed as above less than one and a half or two inches, is called a board, but over that, and up to three or four, it is called a plank; larger than that it is called timber.

Plant, an organized and living body, without volition, subsisting exclusively upon inorganic food, and exhibiting some remarkable analogies to an animal, but originating in seed and completing the cycle of its existence by the reproduction once or oftener of seeds precisely identical in kind and power with that from which it sprang.

Plantation, a word used to denote a large farm, devoted to special crops, as cotton, rice, etc. This is its significance at the South, but in the North it is used to denote the nursery or plot of trees of different kinds.

Planter, a machine for planting special seeds, in hills, as corn-planter. In the South the word means the owner of an estate or farm devoted to special crops, as cotton planter.

Planting, the depositing of a young plant, or of the germ of a plant, in the place where it is intended to grow and remain. The word is very comprehensive in meaning, and is applied to almost every kind of deposition of productive plantlet, root, cutting, germ, or seed, whether in the garden or field, except aspersive sowing. The planting of slips, the planting of sets, and the planting of beans, or other large seeds, as are deposited one by one, are common modes of expression, and in spite of their bearing a widely different sense from such a phrase as the planting of trees. They are everywhere understood and do not cause any confusion or mistake. We have fully discussed the planting of vegetables and cereals in their respective articles, and the planting of trees in the article Forestry.

Plashing, a mode of making a hedge by binding down portions of the shoots, cutting partly through near the ground, and twisting them among the upright trees, as illustrated by Figures 4 and 5 on page 655.

Plaster. Adhesive or lead plaster, for binding up wounds, is to be had at drug stores all ready for use, as also "court plaster" (see page 297). Gypsum (sulphate of lime), sometimes called "land plaster," or simply "plaster," is fully treated on pages 457 and 632. It is also used in surgery for dressing limbs, in orthopedic surgery for supporting a deformed body or parts, and as an antidote for many poisons, especially the acids.

Plethora (pleth'o-ra), undue fullness of the blood-vessels of animals.

Pleura, the membrane which interiorly invests an animal's breast and sides. It covers the lungs so closely as almost to appear a part of them, and is here called *pleura pulmonalis*, and where it lines the inside of the chest it is called *pleura costalis*.

Pleurisy, inflammation of the pleura. For pleurisy in cattle, see page 233; in horse, see page 795.

Pleuro-pneumonia, in cattle, see page 234.

Plover, a genus of the *Grallæ* or waders, distinguished by having a moderate-sized compressed beak, enlarged at the end, and the hinder toe exceedingly small, not touching the ground. They inhabit all parts of the world, traversing temperate climates in the spring and autumn.

Plow, an implement which loosens and turns over the soil in such a way as to disintegrate it and expose new surfaces of it to the atmosphere. It performs substantially the same work as the digging action of the spade.

In reference to its history, the plow has been used in some form since man left his pastoral state. Illustrations of it are cut in the ancient monuments of Egypt, and Moses mentions it in the Bible. It was first a very rude and simple implement, and it long retained its primitive character among semi-barbarous tribes, but seems to have become speedily improved among the most enlightened nations. Some old representations of it on coins and monuments exhibit it as a mere wedge, with a short beam and a crooked handle; but accounts of it in the sacred and classical writings imply that among the Israelites, the Greeks and the Romans, it was generally known and used as an implement of considerable complication and of great power. Some improvements were made during the different centuries, but it has been left for America to make the most rapid strides in improving the plow, as well as other agricultural implements. During the last fifty years greater advances have been made than ever before.

Farm implements and machines for working the soil should be, as far as possible, simple and stout, because they mostly meet with an irregular resistance consisting of hard and soft soil and stones variously mixed together. A complex machine that meets with occasional severe obstruction, receives a blow like that of a sledge, and when this is repeated frequently the probability is that some part will be bent, twisted, knocked out of place or broken. If the machine be light, the chances are in its favor; but if heavy, its momentum is such that it can scarcely escape injury.

Every plow should do good work and do it easily. The inversion of the soil, especially if incumbered with vegetable growth, should be complete and perfect; and the mass of earth thus inverted should be left as thoroughly pulverized as practicable, instead of being laid over in a solid, unmoved mass.

The point and cutting edge of a plow perform the first work in separating the furrow-slice from the land. It is important that this edge should not only do the work well, but with the greatest possible ease to the team. The force required to perform this cutting is 55 per cent., over one-half of the draft. The point or share should therefore be kept sharp and form as acute an angle as practicable. Some plows which otherwise work well are hard to draw because the edge, being made too thick or obtuse, raises the earth abruptly. Where stones or other obstructions exist in the soil it is important that the line of the cutting edge form an acute angle or sharp wedge with the land-side. It will then crowd these obstructions aside, and pass them with greater ease than when formed more obtuse, for the same reason that a sharp boat moves more freely through the water than one that is blunt or obtuse. But when the soil is free from stones or obstructions, or is filled with small roots the sharpness of the edge is more important than its form.

A prominent difference between the good and bad plows result from the form of the mold-board. To understand the best form it must be observed that the slice is first cut by the forward edge of the plow, and then one side is gradually raised until completely turned over, or bottom side up. To do this, the mold-board must combine the two properties of the wedge and the screw.

The cutting part of the plow may be improperly formed like the square end of a chisel, and the sod may slide backward on a rise, with a very slight turn until elevated to considerable height before inversion; this must require more force of a team and make the plow hard to hold on account of the side pressure.

The share should also be placed so as to cut the slice to an equal thickness on each side. Some plows are made so as to cut deepest on the land-side, forming a sort of saw-teeth section to the removed earth below, and leaving what is called crested or acute ridges at the top. Such plowing requires as much force in cutting the slice, and nearly as much in turning it over, as when level furrows are made, and should therefore be avoided. The same result is produced when the plow is unproperly gauged, and the plowman is compelled to press the handles to the left to keep it from running too much to land, which makes it too laborious for both man and team.

VARIETIES. In olden times one plow did all kinds of work; now a farmer can have a plow adapted to his varied wants; for to-day plows are manufactured for every kind of soil, to do any kind of work desired, in any manner or location.

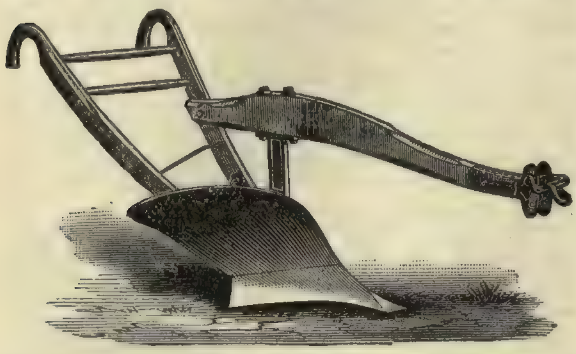


FIG. 1.—*Stubble Plow.*

We have endeavored to illustrate in this article the varieties of plows, giving a short description of them and their uses.

The "timber-land" plow (Fig. 3) is right or left hand, has a malleable iron standard, high landside, double shin, strapped beam, knee cutter and patent wrought frog. Adjustable for either two or three horses. This plow is built with particular reference to strength, and is well adapted to timber or hazel-brush lands and heavy soil.

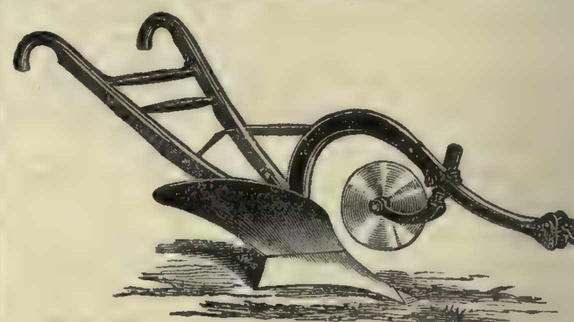


FIG. 4.—*Iron Beam Plow.*

Fig. 4 is a good specimen of the iron-beam style. It is strong and steady, while it gives great clearance under the beam to weeds, stubble, grass and brush, and is adjustable for two or three horses.

The illustrations of the various kinds and styles of plows given in this article, with a few exceptions, are taken from those manufactured by Deere & Co., Moline, Ill., their plows being standard throughout the United States.

Fig. 1 represents a good specimen of a standard stubble plow, with wood beam, and peculiarly adapted to light soils, which it thoroughly pulverizes. It has a hardened iron-center steel mold, hardened slip share, patent wrought frog and handle brace, both right and left hand, and a capped standard.

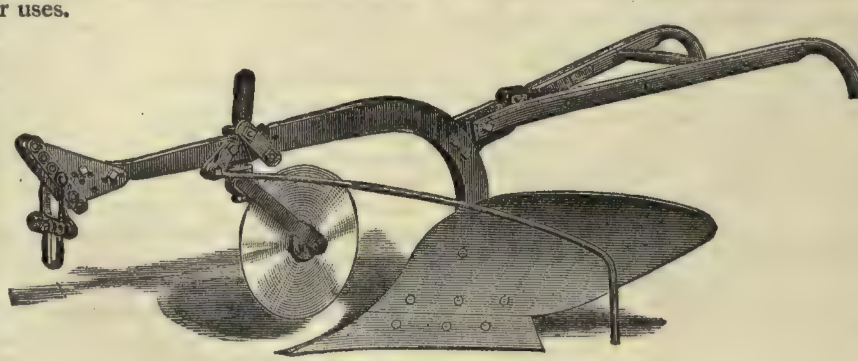


FIG. 2.—*Hand Plow for General Purposes.*

Fig. 2 represents an excellent "general-purpose" plow made by the Long & Allstatter Co., Hamilton, O. The cut exhibits a patent coulter

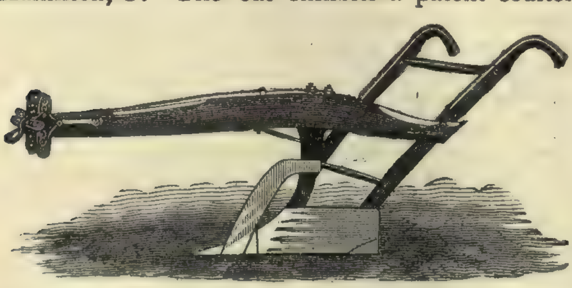


FIG. 3.—*Timber-Land Plow.*

and weed hook attached. The plow is double-shinned, made of hardened steel, has a liberal clearance at the throat, and is well adapted to all kinds of heavy work.

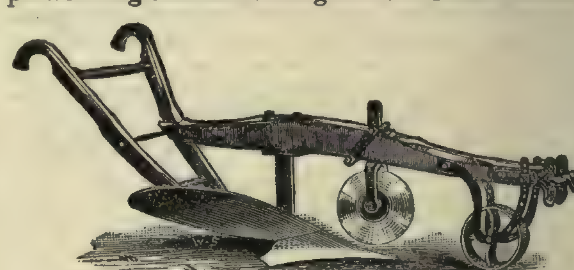


FIG. 5.—*Prairie Breaker.*

Fig. 5 is light and strong, and turns a flat furrow with very light draft, and is used for breaking prairie. It has a capped standard, hardened iron-center steel mold, unhardened steel slip share, patent wrought frog, with rolling cutter, gauge wheel and extra share, right and left hand.

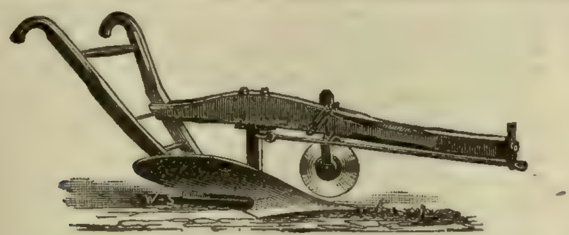


FIG. 6.—*Another Breaker.*

Fig. 6 is used for breaking where the sod is light. Its peculiarity consists in being stocked with draft rod and dial clevis, and in the shortness of cutting angle and flatness of share. It is of the same general construction as Fig. 5, except in points indicated.

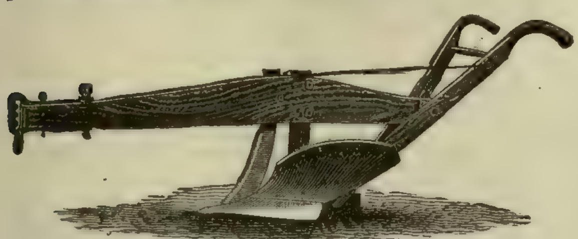


FIG. 7.—*A Road Plow.*

Fig. 7 is an extra strong plow, for four or six horses, and is well adapted to road-grading.

FIG. 8.—"*Wisconsin*" *Breaker.*

The "Wisconsin" breaker (Fig. 8) has a long, heavy land-side bar, welded to a share, heavy shoe cutter, with or without a gauge wheel.

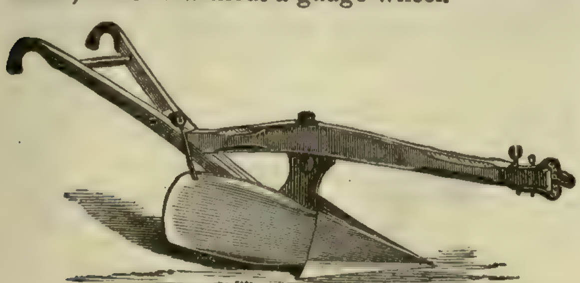


FIG. 9.—*Hillside Plow, Moldboard Side.*

Fig. 9 has a cast-steel share and mold, strong iron frame; suitable for two horses, and will turn a 12, 13 or 14 inch furrow, according to the nature of the soil and steepness of incline.

The hillside plow (Fig. 10) has a swivel moldboard, which is readily turned at each end of the furrow converting the plow alternately into a

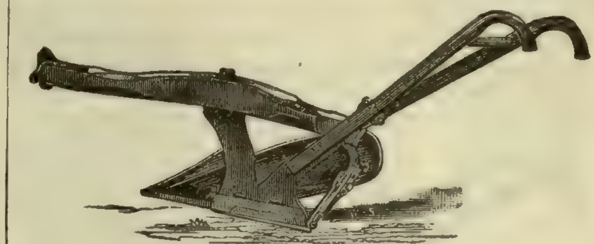


FIG. 10.—*Hillside Plow, Land-side View.*

right-hand and a left-hand plow, thus enabling one to retrace the furrows and turn all the soil down hill.

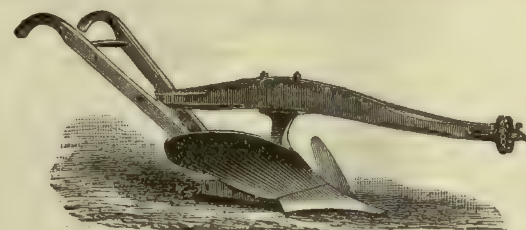


FIG. 11.—*Turf and Stubble Plow.*

Fig. 11 represents the best form of a turf and stubble plow for heavy and tenacious clay.

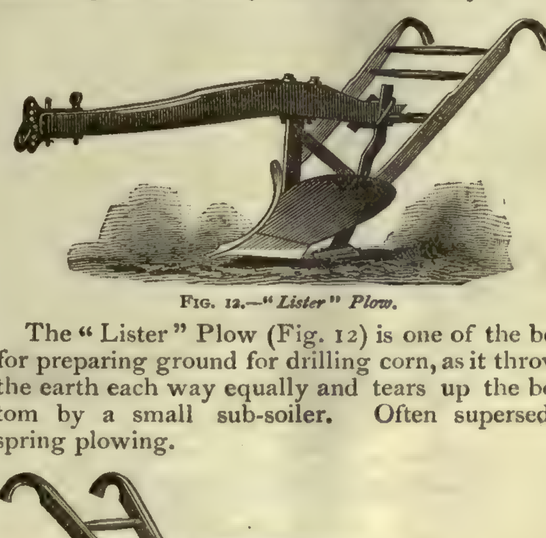


FIG. 12.—"*Lister*" *Plow.*

The "Lister" Plow (Fig. 12) is one of the best for preparing ground for drilling corn, as it throws the earth each way equally and tears up the bottom by a small sub-soiler. Often supersedes spring plowing.

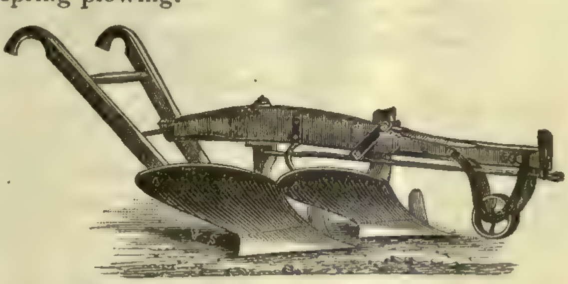


FIG. 13.—*Michigan Double Sod and Trench Plow.*

The Double Michigan Plow (Fig. 13) is acknowledged to be the very best plow in deep soils, where thorough cultivation or trenching is desired. The forward plow, called the "skim" plow,

raises and partly turns over the top of the soil, and the hinder plow brings up the subsoil, and, completely inverting the whole, places the subsoil on top, leaving the seed-bed mellow and deep. This plow requires a four-horse team.

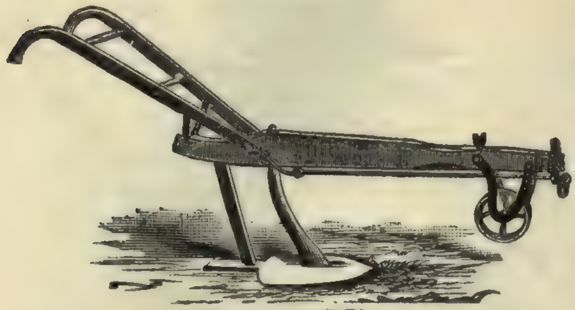


FIG. 14.—*Subsoil Plow.*

Fig. 14 is a subsoil plow intended to follow an ordinary old-ground plow, loosening up and exposing the subsoil to atmospheric influences to the depth of 10 to 14 inches, and leaving the ground in best condition to retain moisture, and the crop to withstand drought. Where the subsoil is inferior in fertility to the top, this mode of treatment is preferable to trench plowing. Much used by nurserymen for root-pruning, and for preparing soil for the cultivation of grapes. It requires a team of three or four horses.

There are other varieties of single plows, not much used, especially in the West, as the shanked subsoiler (several varieties), paring plow, mole plow and others. An adjustable ditching plow is made, which saves a great amount of labor.

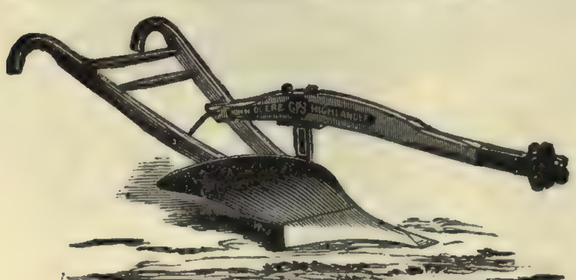


FIG. 15.—"*Highlander*" *Plow.*

The "Highlander" (Fig. 15) is made for heavy land, timothy sod, etc. It has a long, easy turn of mold, light draft, and inverts stubble completely without "flirting," leaving "readable" furrows to be pulverized by the harrow. Made of the same materials as (Fig. 25) and with the same modern improvements in all details.

SULKY PLOWS. One of the greatest improvements is the riding or "sulky" plow, which is now coming into general use, especially in the free soil of certain Western localities. There are several styles of these plows, differing in details, but all agreeing in having the plow-beam furnished with wheels, with a seat for the driver, while the form and manner of attachment of the plow and coulter, and the control of the working are peculiar to each different style. Those who have studied the mechanics of plowing, find that a large share of the power of the team, some say one-third, is exerted in overcoming the friction of the plow on the bottom and sides of the furrow; by supporting the plow upon wheels this friction is largely removed, the weight of the plow being mainly supported by the wheels. The force required to cut the furrow slice is, with ordinary plows, estimated at one-half of the draught. In the sulky plows, great care is taken to use sharp-edged coulters of the most serviceable form. An

FIG. 16.—*Gilpin Sulky Plow.*

excellent example of this plow is the Gilpin sulky plow, made by John Deere & Co., and which is illustrated in the annexed cut. This style has but one lever, is easy to operate, is adjustable to hill-side work, to various depths, etc., and will turn under stalks and weeds very nicely.

With sufficient power one man can run a set of plows at once. Thus united they are considered a single apparatus or machine, and denominated the "gang plow." Even a sulky gang plow (Fig. 17) has been constructed, which operates well. It is all made of iron and steel, and is quite durable.

FIG. 17.—*Gang Plow.*

Its ingenious construction and simplicity are shown in the fact that by one lever

it is operated to any required depth, opens up the first furrow and finishes the land by simply moving the lever from one notch to another, the plows maintaining a level position at all depths; and by pressing the same lever outward until it locks into a lug on the hub, the plows are lifted clear of the ground by a half revolution of the wheel.

It is of very light draft, as has been proved in many dynamometer tests; and the many farmers having them in use have become satisfied, by comparative team tests, that no draft is added by the weight of frame and driver; and this is accounted for by the well-known fact that a heavy load can be carried on wheels easier than a lighter one can be dragged on the ground.

Fig. 18.—*The Plow Sulky.*

The "Buckeye" plow sulky (Fig 18) is one that can be attached to any plow, made for the purpose by P. P. Mast & Co., Springfield, O. It is said to work well, even on rough ground, and that with it the plowman can turn a square corner. It can also be used with three horses as well as with two.

The Hughes sulky plow (Fig. 19), made by the Long & Allstatter Co., Hamilton, O., is a good arrangement, being simple, easy-working and stout. A subsoiler attachment (Fig. 20) is furnished, with these points: 61, blade; 62, standard with holes to regulate the depth; 63, angle piece which prevents accident from side movement; 64, is bolted to the beam casting; 65, loop bolted to brace in the plow bottom and having a break-pin near the ends which gives way when striking obstructions.

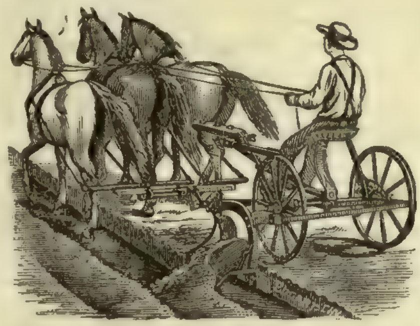


Fig. 19.—*Sulky Plow.*

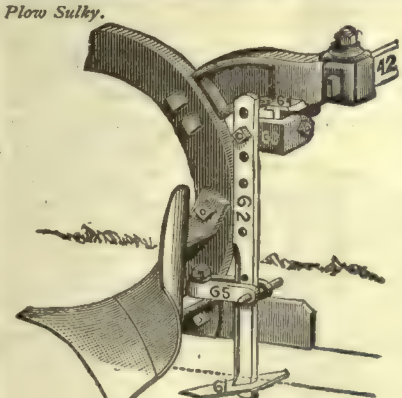


Fig. 20.—*Subsoiler for Sulky Plow.*

The soil is not thrown to the surface. By its use an ordinary three horse team with one of "Hughes" riding plows can turn a furrow six inches deep and subsoil from four to six inches more, thus

plowing the ground thoroughly from ten to twelve inches deep with less draft than seven inches can be reached with most other plows.

The plow and pulverizer (Fig. 21) is indeed a "revolutionary" farm implement, "turning over" the sod most completely, thoroughly pulverizing and aerating it, burying the weeds and leaving a fine seed bed,—all in one operation. It is claimed that less team power is required to produce a given quantity and degree of mellow ground by this machine than by any other process, as for instance the common plow and harrow separately, and that therefore both time and labor are also saved to a considerable extent. There are no cogs or other weak parts to get out of order, the machine is adapted to drilling in seed, and applying fertilizers at the same time that it breaks and pulverizes the land. The plows are quickly elevated by a simple lever, and the whole easily turns to and from the fields on its own wheels. It is made by the Sackett Plow and Pulverizer Company, New York.

Screw Pulverizer. The office of the plow is to turn over and stir the soil; to do this in some better and more effective manner than with the plow, has been the object of several inventors. One sought to accomplish this by means of revolving disks, and though this seemed full of promise at first, nothing has been heard of it for several years. The only invention for "plowing" other than with the plow, which to our knowledge has reached that point when it is offered for sale, is the Chicago Screw Pulverizer. The engraving (Fig. 22) shows sufficiently the general structure of the implement or machine; this has a screw-shaped blade, which must cut up and turn over the soil in a most effective manner. For breaking up prairie sod, and for preparing the land for the wholesale cultivation of wheat and corn, so common in the Western States, this pulverizer seems admirably adapted. The pulverizer seems to have made for itself a place in the agriculture of the Western and Southern States, including Texas. How far it may be useful on the farms of the older States, is yet to be shown, but the evidence as to its utility elsewhere is abundant and interesting. It is but a few years ago—within the memory of most of our readers—that the scythe was superseded by the mowing machine. That the plow will give place to some other implement, we do not doubt, and this "Chicago Pulverizer" looks as if a long step had been made in that direction, and the implement appears to be an improvement of real value.

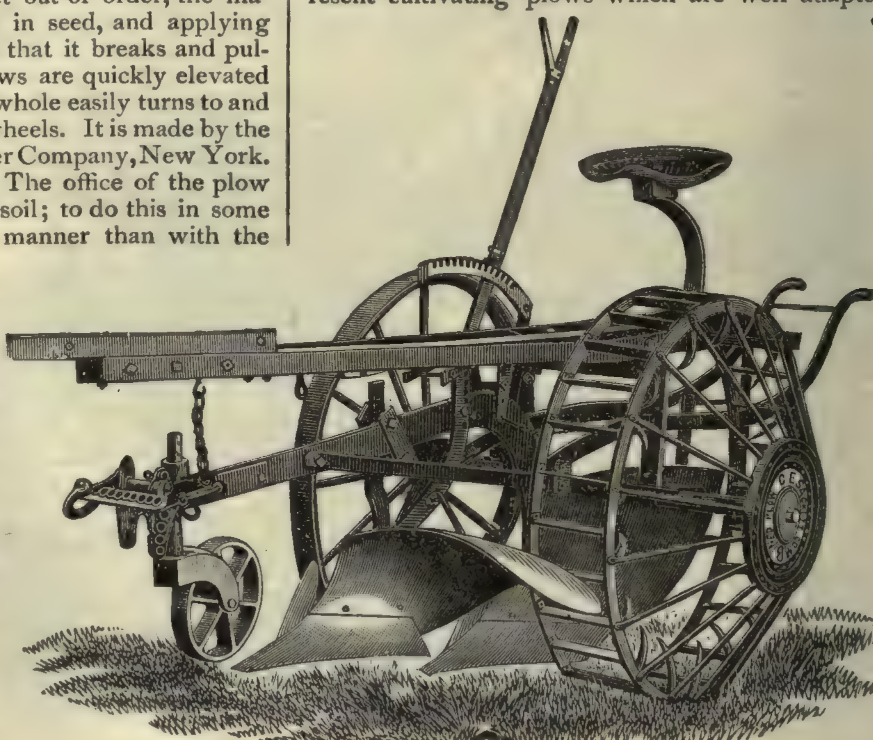


Fig. 21.—*Plow and Pulverizer.*

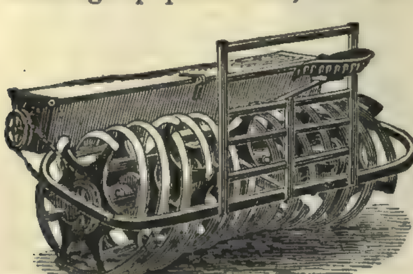


Fig. 22.—*Screw Pulverizer.*

Cultivating Plows. Figs. 23, 24 and 25 represent cultivating plows which are well adapted to deep cultivation and to work in hard or weedy ground. Some of these patterns have beaded

Fig. 23.—*Pony Plow.*

steel-heeled land-sides, hardened iron-center steel molds, patent wrought frog, cast-steel slip shares, etc.

The double diamond plow is just the thing to throw the earth from the young corn both ways at

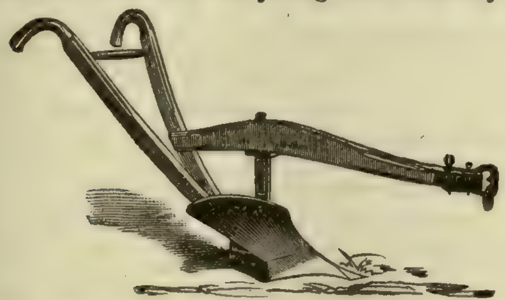


Fig. 24.—*Corn Plow.*

once, enabling the plowman to get over twice as much ground as with a single diamond.

All diamond plows are really breaking plows so far as they go, made small or narrow so as to work between rows of plants. They are just the

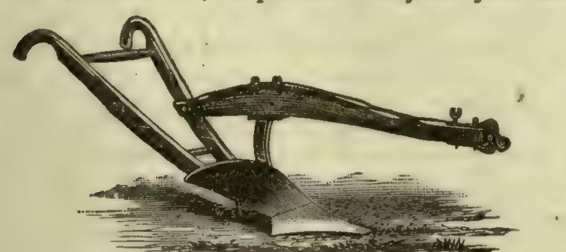


Fig. 25.—*Small Stirring Plow.*

plows, therefore, to tear up the ground deep, or shave off stout weeds at the surface of the ground; but the farmer must ever bear in mind that they must necessarily fail to do what other implements are made to do, namely, pulverize the earth and leave it level. They are of but little use, there-

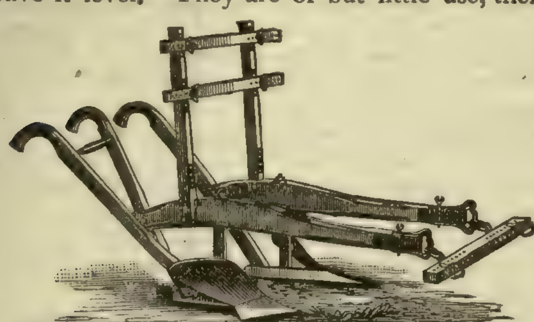


Fig. 26.—*Double Diamond Corn Plow.*

fore, in wet or cloddy ground. Every farmer will find it often to his advantage to have one of these plows on the farm. While they cannot take the place of pulverizing plows, or light cultivators, the work of the diamond plow cannot be done by other implements.

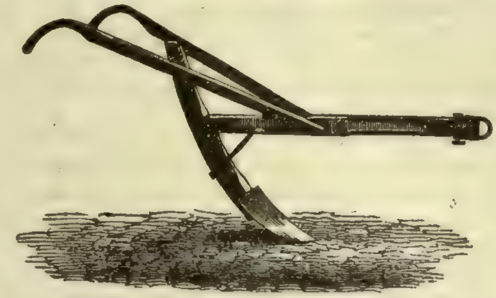


Fig. 27.—*Single-Shovel Plow.*

The shovel plow series commences with the single shovel (Fig. 27), and increases in number of

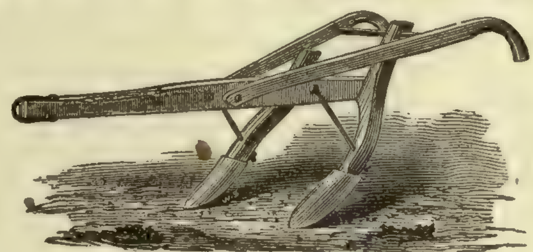


Fig. 28.—*Double-Shovel Plow.*

blades (Figs. 28, etc.) until it becomes what we call a "Cultivator" (which see), and gradually passes from that into the Harrow (which see).

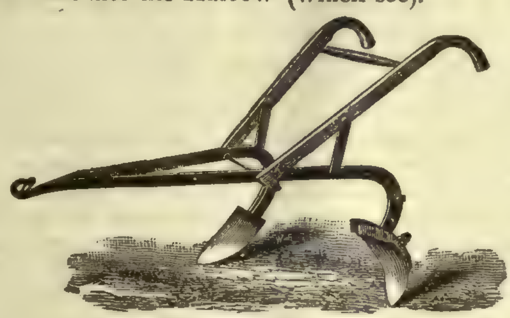


Fig. 29.—*Double-Shovel Breakpin Plow.*

Plowing. In the article Plow, above, many principles were of necessity inculcated which essentially underlie the art of plowing, but they all come under the head of Plow as an apparatus or machine. We endeavor to make this article complete by explaining everything of importance that relates to the manipulation of the plow, or the art of plowing. As to fall and spring plowing, deep and shallow plowing, etc., the wisdom of any particular course depends upon the circumstances of the case. It is a wise, general rule, however, to plow when the soil is in good condition, be it fall, winter or early spring. Plow in the fall if possible, especially green sward, because: 1. The sod rots during winter, thus fertilizing the soil for the coming crop; 2. The pulverizing effect of frost is fully realized; 3. The team and plowman can work easier in the comfortable autumn days; 4.

There is less hurry than in the spring; 5. The action of the atmosphere upon the soil for a longer time is beneficial; 6. Dry land does not suffer so much from drouth, and wet land may be worked on earlier in the spring.

On the other hand the following difficulties in fall plowing are met with: 1. It favors the springing up of weeds, necessitating replowing in spring; 2. Fall rains, should they be heavy, will pack the surface of clay soils, which the frost that follows does not always relieve, and never if pressed during the winter by a deep snow; 3. In this case the soil turns up rough in the spring, and generally is too wet and sticky, effects which the land will show for a year or two.

These objections do not apply to light soils. The practical farmer will be able to decide for himself. He must know his soil, and much, too, depends upon the season and latitude. Whenever it is possible to do the plowing during the winter and early spring—before freezing and thawing is over—it should be done, because every day then is so much gained, and saves an equal number for the busy season. In other words, it puts you so many days ahead with your work, and you can keep so much ahead throughout the season.

Plow deeply—the deeper the better—never less than 6 to 10 inches. If you have been plowing but 4 inches this year do not go down 8 inches next, unless you have a rich loam. In clayey soil go a little deeper each year, and give the virgin soil the benefit of the air, rain and frost. Sink the plow gradually to its greatest depth, and you have a deep surface soil, which is better from any point of view than a shallow one. In subsoil plowing the plow may be made to reach from six to eighteen inches below the bottom of the furrow made by the surface plow. The depth is regulated by the clevis, and depends upon the strength of the team. It is a difficult plow to hold and to pull, but a few hours' experience will master it. In a soil well underdrained, either naturally or artificially, subsoiling has a most beneficial and lasting effect. Upon land which needs draining no permanent benefit is derived. A run-down, or hide-bound meadow or pasture may often be restored to usefulness without the expense of breaking up, by running a large, single subsoil plow under it, a foot deep and two feet apart. Apply a top-dressing, and roll the fields after the subsoil plow has done its work.

To adjust the plow so that it will cut a furrow with the least draft to the team and the least exertion to the plowman, the team must be hitched as close to the plow as it can be and not have the whiffle-trees hit their heels in turning at the corners. As the length of the traces is increased, in plowing, the draft increases. Now put the connecting ring, or link, or dial clevis, at the end of the beam, in the lowest notch, and if it will not run deep enough, raise it another notch at a time until it will run just deep enough. Next, alter the clevis from right or left, as may be necessary, until the plow will cut a furrow-slice just wide enough to turn it over well. If the plow crowds the furrow-slice without turning it over, it shows that the furrow-slice is too narrow for its depth, and the plow must be adjusted to cut a wider slice. On the contrary, if the plowman is obliged to constantly push the furrow-slice over with his foot, and the ground he is plowing be very smooth and even, it shows that the mold-board is too narrow, or not sufficiently spiral. Sometimes, by adjusting a plow to run an inch deeper, it will do very bad work; and sometimes it is necessary to adjust it to cut a little wider, or a little narrower, before it will cut the furrow-slice as well as it ought to be cut. When a good plow is correctly adjusted it will glide along, where there are no obstructions, without being held, for many rods. When a plow is constantly inclined to fall over one way or the other, and the plowman must hold it up all the while, to keep it erect, there is either an imperfection in the plow, or it is not adjusted correctly. When a plow "*tips up behind*," and does not keep down flat on its sole, or when it seems to run all on the point, either the point is too blunt, or is worn off too much on the under side, or there is not "dip enough"—pitching the plow downward to the point.

To make a plow run deeper, raise the whiffle-trees at the end of the beam one or more notches higher in the clevis, or lengthen the draft chains. To make it run more shallow, lower the draft a notch or more in the clevis, or shorten the draft chains; or, which should never be done, shorten the back-bands or hip-straps of the harness. To make a plow take a wider furrow-slice, carry the connecting point one or more notches in the clevis to the right-hand. A notch or two to the left-hand will make a plow cut a narrower furrow-slice. Or, which is seldom allowable, a plow may be made to run more shallow by putting the gauge-wheel lower, so as to raise the end of the beam; and a plow may be made to cut a narrower furrow-slice by carrying the handle to the left hand, or wider by carrying and holding them to the right, beyond an erect position, neither of which is allowable except for a temporary purpose.

The practice of using three horses for plowing possesses such advantages that it is rapidly extending among farmers. Two horses alone are hardly strong enough for such deep and thorough work as the best farming commonly requires; and a single plowman can cut a wider and deeper furrow with three horses, and consequently do more work in a day. When four are employed, an

additional hand for driving is commonly necessary; and another disadvantage is, that the two forward horses, being at a distance from the plow, draw on a nearly horizontal line, and with much of the waste of power resulting from a line of draught in so unfavorable a direction.

In plowing an acre the distance traveled is as follows: 8-inch furrow, 12⅓ miles; 9-inch furrow, 11 miles; 10-inch furrow, 9 9-10 miles; 11-inch furrow, 9 miles; 12-inch furrow, 8¼ miles. In cutting a 9-inch furrow, the time required for an acre, going at the rate of 1½ miles an hour, is 7 hours and 20 minutes; 1¾ miles, 6½ hours; 2¾ miles, 4 hours; 3½ miles, 3 hours and eight minutes.

In plowing no considerable time is lost in turning corners, as the following table shows. Notice that in the shortest furrow given in the table more time is required in turning than in plowing:

Length of Furrow	Breadth of Furrow.	Hours of Work.	Time Lost in Turning.	Time Devoted to Plowing.
234 feet.	10 inches	10	5 hours 11 minutes	4 hours 14 minutes.
447 feet.	10 inches.	10	2 hours 44 minutes.	7 hours 16 minutes.
600 feet.	10 inches.	10	2 hours 1 minute.	7 hours 59 minutes.
636 feet.	10 inches.	10	1 hour 56½ minutes.	8 hours 3½ minutes.
822 feet.	10 inches.	10	1 hour 28 minutes.	8 hours 32 minutes.

Plow-share, plow-shoe, or plow point, the front part, which has the edge for cutting the ground underneath.

Plum. The plum has been cultivated in Europe for many centuries. The Damson, a leading variety, takes its name from Damascus, where it grows in great quantities, and from whence it was taken into Italy as early as 114 B. C. Good native plums used to be abundant in the West, but at the present day we are entirely dependent on cultivation for this luscious fruit, and even then there is generally a failure, mainly on account of the curculio. In the vicinity of Bristol, in Northern Indiana, good plums are raised in great abundance. Dried plums are called prunes.

Propagation and Culture. Sow the seeds of any free-growing variety, not the Damsons, and bud them when two years old, with finer sorts; plant the stone as soon as gathered, sowing in broad drills as peas, about an inch and a half deep. In good soil the seedlings will reach 18 inches to two feet high the next season, and in the autumn or ensuing spring they may be taken from the seed beds, their tap-roots reduced, and all that are of suitable size planted at once in the nursery rows, the smaller ones being thickly bedded until after another season's growth. The stocks planted out in the nursery will ordinarily be ready for grafting or budding about the ensuing mid-summer; the buds should be taken as soon as they are sufficiently firm; insert them on the north side of the stock, and tie the bandage more tightly than for other trees. In selecting scions, examine to see whether they have been winter-killed or injured by the weather of the previous season. Grafting by scions is done in April. Seedlings under the trees have often been taken up for suckers, and in this way many spurious varieties have been propagated. For dwarfing, the seedlings of the Mirabelle are chiefly employed. Open standard culture is the universal mode in America, as the plum is one of the hardiest of fruit trees. It requires little or no pruning beyond that of thinning out a crowded head or taking away decayed or broken branches, and this should be done before mid-summer, to prevent the flow of gum. Old trees which have become barren may be renovated by heading them in pretty severely, covering the wounds with a solution of gum shellac and giving them a good top-dressing at the roots. In cultivation, however, be careful not to tear the roots, as the tree is so liable to sprout, especially the later sorts.

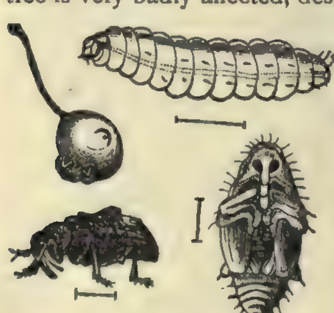
The best soil is a heavy clay loam in a wooded section of country: in prairie soil the trees are liable to winter-kill. While they need a great deal of moisture, and constantly, the ground should be well drained, like the bank of a stream where we see the native plum in its greatest perfection. In very sandy soil the curculio is worse, but a modicum of sand is good. A soil which is light and sandy it is well to prepare by adding pure yellow loam or clay. Very heavy clay burned slowly by mixing it in large heaps with brush or fagots, is at once an admirable manure and alterative for such soils. Swamp muck is also one of the best substances, especially that from salt-water marshes. Common salt is a good fertilizer for a plum orchard. Be careful not to stimulate the plum to too rapid growth by high cultivation. Fertility of the tree is often induced by cutting out a narrow ring of bark, or by driving nails into it.

Insects and Diseases. The curculio does more harm to the plum than all other insects and diseases together, and is a pest so persistent and successful that most people are discouraged from raising this fruit at all. About a week after the blossoms have fallen this small, dark brown beetle begins its work of puncturing the young fruit near the stem, making a kind of crescent-shaped wound, in which it lays its eggs. If it finds that the little plum has already been visited by one of its species it will go to another; hence all the fruit is soon punctured. The insect is so small and shy that unless we watch it closely it will escape our notice; but if we strike or shake the tree suddenly it will fall in considerable numbers upon the ground, drawn up as if dead, resembling a ripe hemp-seed. From the first of April until in August this insect may be found, but its depredations are mostly limited to May, June and July. The remedies are, at first the chip trap during the flowering season, then the intercepter, which is a mass of raw cotton fixed around the trunk of the tree with stiff, coarse paper and twine so as to catch the beetle as he crawls up the tree; but, most reliable of all, jarring the tree and catching the insect upon a sheet spread out below and killing it. This work, to be entirely successful, should be commenced before the blossoms fall. Take a sheet about nine feet square, stretched over a

frame, with a slot from one side to the center to admit the body of the tree, and this mounted on low block wheels; this is run under the tree, as indicated, and the large limbs one after another are jarred by a long-handled mallet which has cloth or rubber fastened over the face to prevent its bruising the bark; pick up the curculio and kill them as fast as they fall. Two hands can go over a hundred trees in about two hours; but this work has to be attended to two or three times a day for about three weeks, then once or twice a day for three weeks more, according to the weather, then three times a week until the first week in August. This is a great task, but where everything else is favorable for a good crop of plums one will be abundantly rewarded for his trouble. The young plums that drop to the ground wounded with the insect should be picked up and destroyed. The first that fall, however, are generally so small that it is too tedious to gather them. To keep the ground enriched with plum material, some orchardists scald these plums and throw them back under the trees. Some persons have been successful with the coal-tar smudge under the trees; probably this remedy would always be successful if thoroughly and persistently applied, at the proper times and for the whole period of exposure.

The plum-gouger bores a small round hole in the plum, deposits eggs, which hatch out there and the young find their way to the kernel and kill the fruit. Remedy: Coal-tar smudge.

Next to the curculio, the greatest obstacle in plum culture is the disease called the black knot, the knots, or black gum. In some parts of the country it has destroyed the whole race of plum trees. The bark first becomes swollen, afterward bursts and at length assumes the appearance of large, irregular, black lumps, with a hard, cracked, uneven surface, quite dry within. Purple-fruited varieties seem to be most subject to this disease. The cause of this malady is not well understood, but the remedy consists simply in looking up the affected parts as early in the spring as possible, cutting out and burning them, or, if the tree is very badly affected, destroying it utterly. Even then, for the completest success, all the neighbors should do likewise, that the pestilence bred on their farms do not spread around and become a public plague.



Plum Curculio.

Leaf blight, leaf rust and rot are also diseases of the plum that are sometimes a little serious. No special remedy other than general good care can be relied on as protectives against them.

VARIETIES. The following list comprises the best for cultivation throughout the North.

Chickasaw. This is a native wild species, and does best grafted in April on wild stocks. It is sometimes called the sloe. The fruit is about three-fourths of an inch in diameter, round, red or yellowish-red, of a pleasant sub-acid flavor, and ripens pretty early; skin thin; branches thorny, head rather bushy, and leaves somewhat narrow, appearing at a distance like those of a peach-tree. The full height of the tree is about 12 to 14 feet.

Damson. Small, oval, about an inch long, purple, covered with thick blue bloom, melting and juicy, rather tart, separates partially from the stone; September. Tree enormously productive, but a slow grower and subject to the knots; branches slender, a little thorny and downy. Best cooking, good market, but rather inferior as a dessert.

De Soto. A comparatively new variety, but promises well; more like the European than any other; fruit about the size of the Miner, is a clingstone, bright red when ripe, and matures two to four weeks before the Miner; rich, delicious flavor, and the tree an excellent bearer.

German Prune, Common Quetsche, Damask, etc. Long oval, nearly two inches long, peculiarly swollen on one side and drawn out toward the stem; suture distinctly marked; skin purple, with a thick blue bloom; stem three-fourths of an inch long, slender; flesh firm, green, sweet, and pleasant; separates from the stone, which is flat, very long and a little curved; good dessert, cooking and market; middle of September. Valued for preserving and drying. Fruit hangs long on the tree, which is an abundant bearer. Branches smooth.

Coe's Golden Drop, Golden Gage, etc. Very large, oval, with a well marked suture, light yellow, with a number of rich, dark red spots on the sunny side; stem nearly an inch long, rather stiff; flesh yellow, rather firm, adhering closely to the stone, which is quite pointed; good dessert and cooking, very good market; early September; a beautiful and excellent plum; does not ripen well in the North. Tree moderately vigorous, productive; branches smooth.

Green Gage. Rather small, round; suture faint; skin green or yellowish-green at full maturity, when it is often a little dotted or marbled with red; stem half to three-fourths of an inch long, slender; flesh pale green, exceedingly melting and juicy, freestone, sprightly and luscious, best dessert, very good cooking and poor market; early August; the standard of quality among plums. Tree is a slow grower, should be grafted into the Miner; is an abundant and regular bearer, though in wet seasons the fruit is liable to crack. Branches smooth; buds with large shoulders.

Harris. Freestone, ripens a month earlier than the Miner, has a leaf more peach-shaped, pointed and thin, but in other respects like the Miner.

Imperial Gage. Large, oval, suture distinct, stem nearly an inch long, slightly hairy and pretty stout; cavity even; pale green until fully ripe, when it is tinged with yellow, showing a peculiar marbling of dull green stripes and covered with copious white

bloom; flesh greenish, very juicy, rich, agreeable, best dessert, cooking and market, September. Tree a rapid grower, and has long, dark shoots, slightly downy.

Italian Prune. Medium, oval, suture moderate, dark blue, with a bloom; stem an inch long, rather stout; cavity small; flesh dark yellow, juicy, sweet, fair dessert, and good cooking and market, October. Tree vigorous, spreading; branches smooth.

Lombard, Bleecker's Scarlet, Beekman's Scarlet. Medium, roundish oval, slightly flattened at either end; suture obscure; stem quite slender, scarcely three-fourths of an inch long; cavity broad and abruptly narrowed; skin delicate, violet red and dusted thinly with bloom; flesh deep yellow, pleasant, but not rich, clingstone, fair dessert, best cooking and market, beginning of September. Tree vigorous, hardy and productive. The leading market variety.

Miner, or Hinckley. Medium size, oblong pointed at the apex, dark, purplish red, with a fine bloom, soft juicy, vinous, clingstone, excellent, early October; an improved and hardy variety of the Chickasaw; branches smooth, dark red. Propagated from pits, it will produce an endless variety, and the tree should then be propagated by grafting or budding. A slight frost, or cold winds, cast the young fruit. Mr. D. B. Weir, of Lacon, Ill., thinks the Hinckley a different variety from the Miner, the former being larger, a little more oblong, of a dark crimson and somewhat mottled.

Newman. A typical variety of the Chickasaw. Medium, roundish, oval, light scarlet, with a thin bloom, soft, light pinkish pulp, juicy, vinous, clingstone; ripens in August. Tree hardy, healthy, vigorous and productive; slender grower, is a beautiful tree in flower and fruit; best of the Chickasaw class.

Wild Goose. This is another improved variety of the Chickasaw. Fruit nearly as large as the green gage, purple, with a blue bloom, juicy, sweet, clingstone, last of July. Tree vigorous, suckers very persistently; leaves narrow, twigs slender. Does well but in few places.

To Preserve Plums. To every pound of fruit allow three-quarters of a pound of sugar. Divide the plums, take out the stones, and put the fruit on a dish with pounded sugar strewed over; the next day put them into a preserving pan and let them simmer gently by the side of the fire for about thirty minutes; then boil them quickly, removing the scum as it rises, and keep them constantly stirred, or the jam will stick to the bottom of the pan. Crack the stones and add the kernels to the preserve when it boils.

Pickling Plums. Best vinegar, 1 pint; sugar, 4 pounds; plums, 8 pounds; spices to taste. Boil them in the mixture until soft; then take out the plums, and boil the sirup until quite thick and pour it over them again.

Plunge. A horse is said to "plunge" when he leaps heavily and violently forward, in order to free himself from the rider.

Plush is a woolen fabric having a sort of velvet nap on one side, composed regularly of a woof of a single woolen thread and a double warp; the one of wool, of two threads twisted, and the other of goat's and camel's hair. Some plushes, in imitation of these, are made of other materials.

Pneumonia, inflammation of the substance of the lungs. It is one of the worst kinds of inflammation, and is often complicated with pleurisy and other inflammations of the chest. For pneumonia in the horse, see page 796; in cattle, see pages 234–5.

Pod, a two-valved pericarp (the seed-enveloping part of a fruit) with a linear receptacle along the edges of which the seeds are alternately arranged.

Podophyllin (po-do-fil'in), the medicinal principle extracted from the root of the May apple: see May Apple.

Point, a feature of quality in an animal; a score made or counted, in any competing exercise; a standing on game.

Pointer, a dog used to locate game: see pages 332, 348–9.

Points of Cattle: see page 207.

Poisoning. Cases of poisoning are so common and so awful in their effects that we have deemed it proper to treat the common articles of poison, giving the symptoms resulting from poisoning by each, the antidotes and treatment of the patient, in their respective alphabetical order, and also to give a very full list, with antidotes, in this connection. This will enable a person to tell at a glance, and with the least possible loss of time, what are the antidotes for the various poisonous articles. We have very fully treated of the mineral, vegetable and animal poisons commonly met with, and by which people are generally poisoned, in articles under their respective heads, as Arsenic, Mercury, Iodine, Corrosive Sublimate, etc., etc.

When it is not known precisely what poison a person has swallowed, produce copious vomiting as soon as possible, by warm water and salt, or warm water, salt and ground mustard, or water alone,—anything to bring about vomiting. In taking warm water, be sure that in your haste you do not administer it so hot as to scald the patient. Salt and ground mustard, each a heaping teaspoonful in a glass of water, will be found a quick emetic. This should cause vomiting in one minute. Some of these emetics should be given immediately on its being known that a poison has been swallowed. After several quarts of water have thus been thrown up from the stomach, give some bland beverage, as milk or whites of eggs, with water: no sugar.

When it is known what substance the patient has swallowed, for acid poisons the following should, in general, be administered: Large draughts of chalk, whiting, magnesia, or soap in water, about as thick as cream, followed by milk and whites of eggs, mixed with water. Or, if these cannot be procured at once, warm water, salt and ground mustard. For alkaline

poison, as alkali, potash, soda, ammonia, etc., give vinegar or lemon juice, the latter in great abundance. In the absence of the above, an emetic, only in the form of pure water, may be given, in connection with the stomach-pump. Avoid drug emetics.

For alkaloids, such as morphine, quinine, etc., emetics and the stomach-pump must be relied upon rather than chemical agents. Astringent liquids may be administered, such as tannic acid, which precipitates many of the alkaloids from their aqueous solution, absorption of the poison being thus retarded.

After the poison has been completely removed, the patient should be placed under appropriate treatment. After irritant poisons have been taken, stimulants and sedatives may be required. After narcotics strong coffee will be found useful.

The following is a very full list of poisons with their antidotes. The name of the poison is given first, and the antidotes immediately follow:

Acetate of Morphia. Infusion of galls; tannic acid; green tea; coffee; stimulants; dash of cold water.

Acetic Acid. Magnesia; calcined magnesia; chalk; carbonate of soda.

Aconite. Tannic acid; green tea; bromine; chlorine; iodine.

Alcohol. Acetate of ammonia; common table salt.

Alum. Carbonate of soda; carbonate of ammonia.

Antimony. Astringents; tannic acid; alkalies.

Arsenic. Hydrated peroxide of iron; hydrated magnesia.

Arsenite of Copper. Hydrated peroxide of iron.

Arsenic Acid. Hydrated peroxide of iron.

Arsenious Acid. Calcined magnesia; hydrated peroxide of iron.

Bee Sting. Ammonia.

Birthwort. Calcined magnesia; carbonate of magnesia.

Bitter Almonds. Inhalations of ammonia; chlorine; chloroform.

Bittersweet. Charcoal.

Bitter Vetch. Charcoal.

Black Cherry. Dashes of cold water, ammonia, chlorine or chloroform inhaled.

Black Hellebore. Charcoal.

Black Henbane. Bromine; chlorine; iodine; vinegar; ammonia.

Blue Mass. Gluten; gold; iodine.

Bromine. Albumen; starch; magnesia.

Buckeye. Ammonia; alcohol.

Calomel. Gluten; gold; iodine.

Camphor. Emetic.

Carbonic-Acid Gas. Ammonia inhaled, cautiously; dashes of cold water.

Cheese. Charcoal; emetics.

Cherry Laurel. Dashes of cold water; ammonia inhaled; chlorine or chloroform inhaled.

Chloric Ether. Ammonia by inhalation.

Chlorine Gas. Ammonia; ether by inhalation.

Chloroform. Ammonia by inhalation; galvanic shocks.

Chrome. Carbonate of potassa; carbonate of lime.

Citric Acid. Magnesia; chalk; carbonate of soda; carbonate of potassa; carbonate of lime.

Crabs. Milk; mucilage.

Crawfish. Charcoal.

Creosote. Albumen; milk; flour.

Cissus. Emetics.

Crowfoot tribe. Charcoal.

Cyanide of Potassium. Sulphate of iron in solution.

Deadly Nightshade. Bromide; chlorine; iodine; emetic of sulphate of zinc.

Dogbane. Charcoal.

Elixir of Vitriol. Magnesia; lime; chalk; soda.

Emetic Tartar. Tannic acid; astringent infusion; yellow bark; green tea.

Fool's Parsley. Tannic acid; green tea; bromide; chlorine; iodine.

Foxglove. Infusion of yellow bark; stimulants; galls; tannic acid; green tea.

Fusil Oil. Emetic.

Fungi. Emetics of tartarized antimony.

Gad-Fly. Solution of ammonia.

Gnat. Solution of ammonia.

Gold. Sulphate of iron; mucilage.

Hartshorn. Vinegar; lemon juice; demulcents.

Hedge Hyssop. Charcoal.

Hemlock, Poison. Emetics.

Hornet. Ammonia in solution.

Hornet Sting. Ammonia.

Hydrophobia. Nitrate of silver; ammonia.

Indian War Poison. Common salt; sugar.

Iodine. Gluten; wheat flour; starch.

Ipecacuanha. Bromide; chlorine; iodine.

Iron and its Salts. Carbonate of soda; carbonate of magnesia.

Jimson-weed. Bromine; iodine; vinegar; lemon juice.

Land Crab. Milk; charcoal.

Lead and its Salts. Dilute sulphuric acid; iodide of potassium; sulphate of soda; sulphate of magnesia.

London Purple. Hydrated peroxide of iron.

Meadow Pimpernel. Charcoal; tannic acid; green tea.

Mercury, and all its Oxides and Salts. Albumen; gluten; iodine; charcoal; coffee; ammonia.

Mountain Ash. Charcoal.

Muriate of Antimony. Tannic acid; green tea: astringent infusions; alkalies.

Muriatic Acid. Carbonate of soda; carbonate of lime; carbonate of potassa; carbonate of magnesia.

Mushrooms. Sulphate zinc emetic; common table salt; charcoal; chlorine.

Narcotina. Astringents; coffee; ammonia.

Nitrate of Silver (lunar caustic). Common table salt.

Nitric Acid. Carbonate of lime; magnesia; chalk; carbonate of soda.

Nitric Ether. Ammonia by inhalation.

Nitrous Acid. Ammonia inhaled cautiously.

Nux Vomica. Bromine; chlorine; iodine; prussic acid; chloroform.

Oil of Turpentine. Ammonia.

Oleander. Charcoal.

Opium and its Preparations. Infusion of galls; astringents; coffee; magnesia; chlorine; iodine; bromine.

Oxalic Acid. Carbonate of magnesia; lime; plaster from the ceiling.

Paris Green. Hydrated peroxide of iron; hydrate magnesia.

Phosphoric Acid. Ammonia; chlorinated water; magnesia; cold water.

Poison Ivy, Oak, Sumac and Vine. Charcoal.

Poppy. Infusion of galls; coffee; charcoal.

Prussic Acid. Ammonia; chlorine; carbonate of potassa in solution, followed by sulphate of iron in solution; chlorinated water; stimulants.

Putrid Animal Matter. Ammonia; tonics.

Quicklime. Mineral soda water; effervescing draughts.

Ratsbane. Chlorine; bromine; iodine.

Rattle-snake. Alcohol; cinchonia; ammonia.

Red Precipitate. Albumen; gluten.

Scour-Grass. Chlorine.

Silver. Common table salt.

Snake-bites. Whisky; ammonia; cinchonia; whorled milkweed

Spanish Fly. Whisky; ammonia.

Spurred Rye. Charcoal.

Squirting Cucumber. Bromine; chlorine; iodine.

Stavesacre. Charcoal.

Sugar of Lead. Sulphate of magnesia; sulphate of soda; phosphate of soda; iodide of potassium.

Sulphuric Acid. Magnesia; carbonate of magnesia; carb. lime; chalk; carb. soda; whiting; milk; oil.

Sulphuric Acid Gas. Ammonia inhaled cautiously.

Sulphuric Ether. Ammonia by inhalation.

Swamp Leatherwood. Chlorine; bromine; iodine.

Tartaric Acid. Carbonate of lime; carb. magnesia; plaster from the ceiling.

Thornapple. Bromine; chlorine; iodine; vinegar; lemon juice.

Tin. Albumen; flour; milk.

Toadstool. Emetic of tartarized antimony.

Verdigris. Albumen (egg); iron; milk.

Viper. Alcohol; ammonia.

Wasp. Ammonia in solution.

White Henbane. Charcoal; vinegar; ammonia.

Wormseed. Emetics.

Yellow Jessamine. Ammonia; charcoal.

Zinc. Salts of carbonate of soda; albumen; astringents.

Poisoning in the horse: see pages 797 and 798.

Poison Ivy and Sumac. There is a common belief that "Poison Ivy" and "Poison Sumac" are the same plant. While their poisonous effects are much alike, the two plants are very different. The Poison Ivy (*Rhus toxicodendron*) is a prostrate or climbing vine. It is also known as "poison oak" and "mercury (often marcury) vine." It presents two very distinct forms; the most common is a low spreading plant, matting itself along the ground, rambling over stone walls, and climbing upon fence-posts. The other form attaches itself to the trunks of trees, clinging closely by its abundant rootlets, and reaching the tops of the highest trees. Though very different in their habit of growth, no botanical difference is to be found in them, and all the many forms are considered as varieties of the same species. This, while its leaves vary much in shape, has always compound leaves of three leaflets; that is, its leaves are divided into three parts; these parts differ somewhat in size, and especially in outline, some having the margins so deeply cut as to suggest the name of "poison oak." As there is no other native vine which has its leaves divided into three parts, that is a very safe guide in deciding whether a suspected plant is poisonous or not. The common Virginia creeper (*Ampelopsis quinquefolia*), is often unjustly suspected of being poisonous. Besides other very marked characters, the leaves of that are five-parted. The ivy is found almost everywhere, in the older States at least,—by the road-sides, along stone walls, in pastures, on trees at the edges of woods,—in fact, it is one of the most generally distributed of all our native plants.

Poison Sumac, on the other hand, does not climb at all, but is always an erect shrub from 6 to 15 feet high, and noticeable for its neat and cleanly habit. It is always found in moist, swampy places, and is distinguished from the several harmless sumacs by having its flowers and its berries in loose spreading clusters and not close upright ones, as in the harmless species. Both the poison ivy and poison sumac are well known for the qualities indicated by their names — their ability to poison. It is probable that a very small minority of persons are affected by this poison. The few are poisoned by coming into direct contact with the plant, while now and then a person is so susceptible to its influence as to be poisoned by going near it, without actually touching it. The shrub called poison sumac, also improperly called "dogwood," and still more inaccurately "poison elder" (the true dogwood being harmless), is much more virulent than the "ivy," and is said to affect persons who are not troubled by the vine, and its results are much more obstinate and difficult to cure. In poisoning the effects vary greatly: some are troubled by only a few pustules on the back of the hand and between the fingers; others have an eruption upon the face, arms, and the insides of the legs, accompanied by the most intolerable itching. In severe cases there is a high fever, and occasionally the poison is so virulent as to cause the face to swell and quite obliterate all the features, leaving just an opening for the mouth and completely closing the eyes. In such severe cases, medical aid should be called, to reduce the fever by proper treatment. The effects are exceedingly variable in different individuals, and in the great majority they amount to only an eruption annoying for its intense itching.

Remedies for Poisoning. The great number of remedies that have been given show that the disease is very variable, and that which is useful in one case is not so in another. Attention to the general health, cooling the system by saline laxatives, such as Epsom or Rochelle salts, is a great help. Among the external applications that have been found useful are lime-water, strong salt and water, or the application of wet salt, a solution of sugar of lead, etc. Various astringent lotions are sometimes useful. In some country places a strong decoction of hemlock boughs, or of oak leaves, have often given relief. A similar astringent effect is given by a solution of sulphate of iron (copperas) in a teacupful of hot water, applied as hot as can be borne. The medical journals have recommended first washing the parts in warm water, without soap, and then applying, with a brush or feather, the tincture of Lobelia. The fluid extract of the yellow jessamine (*Gelsemium*) is said to be very efficacious, applied in a similar manner. Another medical journal highly recommends the application of sweet spirits of niter, first pricking any large pustules that may have formed. The latest remedy is the common "ragweed" or "Roman wormwood," abundant everywhere in fields. It is said that if this be bruised and the juice that is squeezed from it be applied to the poisoned surface, the relief is very marked. From the fact that every neighborhood, in which poisoning is frequent, has several "sure cures," it is probable that there is as much difference in yielding to remedies by poisoned persons as there is in the susceptibility of persons to the effects of the poison. The better way, in case of poisoning, is at once to take some saline purge, with due regard to diet, and apply such remedies as have been found useful in the locality.

Poland China, a breed of Swine. See Swine.

Polecat, a word often used to designate the skunk, but incorrectly so. The polecat is an European animal, never seen in America, and belongs to the weasel genus of the weasel family, while the skunk belongs to another genus of the same family. See Skunk.

Pole Strap, or **Band**, the strap connecting the belly-band with the neck-yoke and passing between the fore-legs, to aid in holding back; also a measure equal to 16½ feet.

Polish. In connection with the respective topics, as Furniture, Harness, Shoes, Blacking, etc., we give the best methods of polishing. We add here a few miscellaneous items. The easiest and most economical wood for polishing is black walnut. In oiling it with linseed oil, mixing in a little gum copal will prevent the oil from entering the wood too much, and the latter will in a short time become as smooth and glossy as a coach body. To polish a roughened place on a piece of mahogany, scrape and sandpaper it, wet it and then rub it down with fine pumice-stone, in the direction of the grain, keeping the surface moist all the while. Let the surface dry and repeat the process the third time. If it is not then smooth enough, repeat the process, with cold-drawn linseed oil instead of water. To polish a varnished surface is a tedious process, although simple. Put 2 ounces powdered Tripoli into an earthen pot or basin, with water enough to cover it; then, with a piece of fine flannel four times doubled, laid over the end of a piece of cork, rub the surface with the powder, regularly and patiently. Rough brass must first be filed as smoothly as possible, then rubbed with Tripoli and linseed oil, as above for varnish, by means of a piece of old hat felt. For ebony or black rosewood, after the foregoing process, apply finely powdered elder coal. To polish marble, rub with fine sandstone and water, then finer stone and sand, then emery powder with a piece of old felt, and finally with putty powder and fine clean rags. As soon as a fair gloss begins to appear, continue to rub with the rags without the addition of more powder.

Politeness: see Etiquette.

Pollard, a tree which has been frequently top-polled or headed down to form a low, brushy top; also the fine bran or inner husk of wheat.

Polled, applied to certain varieties of cattle and denoting hornless. The terms "dodded," "muley" and "humble" have the same signification.

The Polled or hornless cattle is a breed but recently introduced in this country, although many years ago these hornless or muley cattle, as they were known among the Western farmers, were bred in some sections. Among the Polled breeds of cattle there are several. Of these the Polled Angus or Aberdeen, the Suffolk, the Red Polled and the Galloways are being introduced in America. These are bred extensively in England and Scotland, the Galloways constituting one of the most important breeds in Scotland.

Pollen, the organic matter by which impregnation is effected in the vegetable kingdom. Though it appears to the naked eye like a mere powder, yet when examined by the microscope it is found to consist of grains of definite size and shape, which are uniform in the same plant, but often very different in different species or natural families.

Poll-Evil: see page 798.

Pomace: see Apple Pomace.

Pomade, a perfumed composition used in dressing the hair. To make, see page 634.

Pomegranate, a small genus of ornamental plants. The common pomegranate is a native of Southern Europe, is a hardy, deciduous, small tree or tall shrub, and is famous for both the beauty of its flowers and the medicinal properties of its root, flowers and fruit. The juice of the fruit resembles that of the orange, and is pleasantly acid; it quenches thirst, and is agreeably cooling and gently aperient. A kind of orange melon, of a most delicious muskmelon fragrance, growing on an herbaceous vine, is also known

in this country as "pomegranate." It is of the size of a small orange, perfectly globular, smooth, and striped like a citron water-melon, but the colors are alternately orange and yellow. Not much raised north of latitude 40°.

Pommel (pum'l), the hinder portion or rim of a saddle.

Pomology, the scientific management of orchards, or the scientific principles of everything connected with the cultivation of fruit trees.

Pony, small horse; see page 693.

Pop-Corn, a small species of maize, the grains of which when parched burst open and expand into a peculiar, spongy, light mass, and as an edible is a luxury. It is raised in a rich garden soil, on the same general principles as field corn is raised. The most popular varieties are the White, Silver-laced, Nonpareil, Dwarf, Golden and Egyptian. The genuine are the smallest-eared, as its aptness to mix with field corn has caused most pop-corn in the country to become adulterated, and such does not pop well. To pop this corn, it should be dry and well-seasoned; and many prefer to have it popped in closed frying pans wherein is a little butter or salted lard. Ground pop-corn, under the name of "snow-flake corn," is now furnished to the market, in ten-cent packages and in barrels. It will keep good for many months, and is always "ready to be eaten,"—namely, by mixing it cold with rich sweet milk or cream. Pop-corn balls, sweetened and unsweetened, are sold by street peddlers in all public places.

To Make Pop-Corn Balls. Make taffy of sugar or molasses, a pint of either to a gallon of popped corn. Make the taffy in a vessel large enough to stir the corn in it while hot; then let it cool, and make ball of desired shape with the hand; butter the hands a little to keep it from sticking.

Another: Take a three-gallon pan and fill it nearly level full of popped corn, and then take a cupful of molasses and a little piece of butter and boil until it will set, or try it in cold water; just a drop will do in water, and if it sets then pour the molasses all around on the corn. Then take a large iron spoon and stir well; when well mixed butter your hands well and take some corn in both hands, as much as you can press well together, and you will have a large and splendid ball. You can use sugar in the place of molasses if you wish it.

Poplar, trees of the genus *Populus*, of the Willow family. White or Silver-Leaf poplar is a familiar ornamental tree. Its leaves are a brilliant silvery white underneath, and conspicuously exhibit this luster when up-turned by the breeze. The branches of the tree spread like those of an apple-tree, and the roots are so given to scion-sprouting as to constitute a serious objection to the propagation of the tree in the landscape. Lombardy poplar is admired by some for the landscape, but on the windy prairies of the West it fares hard and becomes ungainly. It excels all other trees in running up a tall, steeple-like top. Balsam poplar and the well-known balm of Gilead are two varieties of the same species. Much given to sprouting from the roots. Quaking asp or American aspen, two species, as well as the Necklace poplar or well-known Cottonwood, are also true poplars. But the Tulip-tree is often wrongly called poplar: this belongs to an entirely different order of trees, and is much used as box material and in other ways.

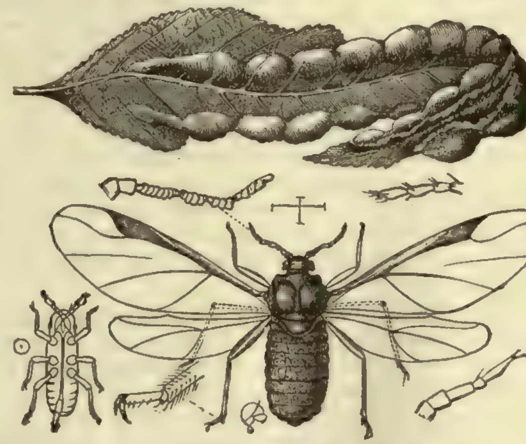


Fig 1.—*Poplar Gall Louse.*

Figs. 1 and 2 illustrate two of the more prominent gall lice which work upon the leaves and leaf-stems of poplars. The character of their work is also

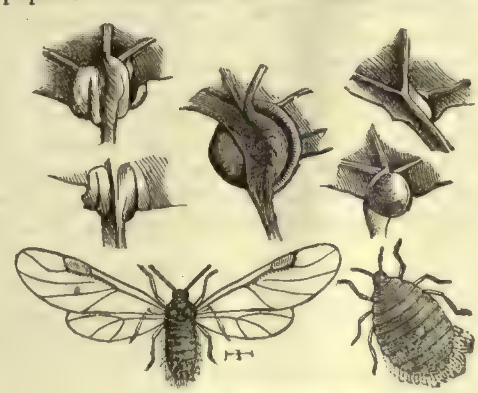


Fig. 2.—*Poplar Gall Louse.*

shown, and the true size of the insects is indicated by crossed hair lines in the cut. The figures are fully explained on pages 858–9.

Poplin, a fabric composed of a warp of silk and woof of worsted. Irish poplins have long been celebrated as dress goods.

Poppy, a showy flower which has been in cultivation for many generations. The form, color and size are similar to the rose, but they are annuals, and are hardy in the Northern States. There are several species and many varieties. Opium is obtained from one species, and of course characterizes all members

of the poppy family. Blood-root is the most common wild plant of this order.

Pork, the flesh of swine after being prepared or cut for use. We refer the reader to page 964, where some general observations are made on this subject under the head of Pork. In the article Swine we treat the different breeds of hogs, their care and management; in the article Meat we give the modes of preserving meat, and in those of Bacon and Ham tell how pork may be pickled and smoked; therefore, we have here to give only the methods of cooking pork before it is cured, or fresh pork. Directions for cooking ham is given in the article on that subject.

ROAST PORK. Pork should be well done. When roasting a loin, cut the skin across with a sharp knife, otherwise the cracking is very bad to manage. A spare-rib should be basted with a little butter, a little flour and sweet herbs, or sage and onions, as best suits the taste. Apple-sauce should be served with this dish.

TO ROAST A LEG OF PORK. The leg to be roasted should not weigh more than six or seven pounds. Score the rind or skin with a sharp knife all around the joint. Baste it well. It will yield sufficient dripping to baste itself without butter. If the crackling and fat are not kept on, the joint will not require so long a time to roast it. Sauce: brown gravy or tomato.

TO BOIL A LEG OF PORK. Procure a nice, small, compact leg of pork, rub it well with salt, and let it remain for a week in pickle, turning and rubbing the pickle into it once a day. Let it lie for half an hour in cold water before it is dressed, to improve the color; then put it into a large pot, or stewpan, and well cover it with water. Let it boil gradually, and skim frequently as the scum rises. On no account let it boil fast, or the meat will be hardened, and the knuckle end will be done before the thick part. When done, serve it on a hot dish with a garnish of turnips or parsnips.

PORK CHOPS. Cut the chops about half an inch thick, and trim them neatly; put a frying pan on the fire, with a bit of butter; as soon as it is hot, put in your chops, turning them often till brown all over; a few minutes before they are done, season with powdered sage, pepper and salt.

CORNED PORK. It should be soaked a few hours before boiling, then washed and scraped, and put into fresh water. It must not be boiled fast, but put into cold water, and gradually warmed through; skim frequently while boiling.

A leg or shoulder, weighing seven or eight pounds, should boil slowly for four hours. When taken up it must be skinned carefully, though some prefer the skin remaining on, as it loses much of the juice by skinning. It is very nice cold.

TO FRICASSEE PORK. Cut a small spare-rib or chine of pork into pieces, cover with water and stew until tender; remove the meat and flavor the gravy with salt and pepper, and thicken with a little flour. Serve in a deep dish in the gravy, and garnish the dish with rice.

TO ROAST A PIG'S HEAD. Boil it tender enough to take the bones out. Then chop some sage fine, mix it with pepper and salt, and rub it over the head. Hang it on the spit, and roast it at a good fire. Baste it well. Make a good gravy and pour over it. Apple sauce is eaten with it.

PIG'S HEAD BOILED. This is the more profitable dish, though not so pleasant to the palate; it should first be salted, which is usually done by the pork butcher; it should be boiled gently. Serve with vegetables.

PIG'S CHEEK. Boil and trim in the shape of ham, and if very fat, carve it as a cockle-shell; glaze it well, or put over it bread crumbs and brown them.

PIG'S TONGUES. Partially boil the tongue in order to remove the skin. Pickle them as you would pickle a ham; lay them on the top of each other under a heavy weight. Cover the pan in which you place them, and let them remain for a week, then dry them and put them into sausage skins. Fasten them up at the ends, and smoke them.

TO ROAST A PIG. It should not be more than a month old; it is better a little less. Clean it thoroughly and sprinkle fine salt over it an hour before it is to be roasted. Cut off the feet at the first joint. Make a dressing of bread crumbs, a little salt, pepper, sage, sweet marjoram, an onion chopped fine, butter, two eggs and a little salt pork, moistened with a little milk; stuff the pig with this and sew it up. When placed on the spit, confine the legs in such a manner as to give it a good shape. Rub it all over with butter or sweet oil to keep it from blistering; flour it at first a little; as soon as it begins to brown, dredge on more flour. Turn the spit every three or four minutes; if the flour falls off, instantly renew it. When it has all become of a dark brown color, scrape it off into a plate and set it aside. Put into the gravy in the roaster a piece of butter, and baste the pig very often till it is done, which it is when the eyes fall out. A pig weighing nine pounds requires four hours to roast. The feet and liver should be boiled an hour or two, and the gravy from the roaster be poured into the water in which they were boiled. The liver should be cut or mashed fine, the brains taken out and added, and the gravy thickened with the browned flour scraped from the pig. A small pig will roast in two hours and a half.

Porridge: see Oatmeal.

Post, a piece of timber, stone or iron set upright as a stay. For fence posts see page 451, under head of Board Fences, and for gate posts see article on Gate.

Potash, a chemical substance which derives its name from the ashes and the pots in which the lixivium from which it is obtained is boiled down. Some of its old names were vegetable alkali, salt of tartar and alkali of niter: see page 904, under the head of Laundry.

Potato, a well-known tuber, popularly, though not with botanical correctness, considered as a root. It belongs to the family *Solanæ* of Jussieu, almost all the species of which are of a poisonous and narcotic nature, as Belladonna (Deadly Nightshade), Henbane, etc. It is the most important vegetable cultivated in this country, as well as in many others. It is a native of South America, but was introduced into England from North America in 1584, and into Ireland, by Sir Walter Raleigh, at the same time, he having procured some on his first visit to America. In Ireland it was more extensively cultivated and more relied upon for food than in any other country, and has consequently been known as the Irish potato. It was introduced into the northern portion of Europe in 1620, but its cultivation was not extensive until during the last century. The potato is easy of cultivation and will grow in almost any cool climate. Humboldt states that the cultivation of the potato in the Andes extends to an elevation of 9,800 to 13,000 feet higher than wheat. In the north of Europe it reaches beyond the limits of barley, and consequently all cereals. In tropical regions, according to Johnson's Physical Atlas, an elevation of 4,000 feet appears to be necessary for its growth. It is successfully cultivated in Australia and New Zealand, which produce no excellent farinaceous root at all—not even the yam.

FIG. 1.—*Colorado Potato Beetle.*
For Explanation of Engraving see page 853.

This most popular of all vegetables requires cool seasons, and therefore the farther North in the United States the better the summer climate is for them. They require rich ground, moist but not wet; standing water injures them as much as any other vegetable. To keep up the quality of the variety, large and sound potatoes should be selected and cut in pieces having from one to three eyes each, according to the necessity of making the most of what seed you have on hand. Plant two or three of these pieces in each hill, the hills three feet apart each way; or plant in drills or rows with the ordinary distance between them, and 12 to 15 inches apart in the row. Lime and plaster are good fertilizers. As soon as they are well up, commence hoeing them, and continue faithful and deep cultivation until the vines pretty thoroughly cover the ground. When they are cultivated by the hill system, the hill should be broad and low, and dishing, to turn the rain in toward the plant. Where high, sharp hills seemed to have been the best, the success was probably owing to more constant and thorough pulverization of the soil, or some other cause.

Early potatoes can be so planted that other crops, as beans, can be started between the rows; and the potatoes will be out of the way in time for the full prosperity of the crop.

From careless propagation, fault in cultivation or some other cause varieties deteriorate in quality, and the necessity arises of introducing new varieties at some expense. While for many years past the two most popular varieties of Irish potatoes have been the Early Rose and the Peach-blow, they are now about to be superseded by the Early Ohio, the Snow-flake, Brownell's Beauty, Compton's Surprise, Burbank's Seedling, Beauty of Hebron, Clark's No. 1, Moore's Seedling, Late Ohio, Dunmore and others.

More than any other vegetable the potato is subject to disease; and it really constitutes an objection to their dietetic character, that the disease is often imperceptible. The only remedy for any and all diseases of the potato consists in careful propagation and cultivation.

The Colorado potato beetle, which formerly threatened to put an end to the cultivation of this article, is now fortunately greatly diminished in its numbers by the lady-bug and other predaceous insects; but when the Colorado beetles attack a crop to such an extent that offensive warfare is necessary, hand-picking for a small piece and the use of Paris green for a large field are the standard methods of treatment. Looking for the eggs on the under side of the young potato leaves as soon as they are up, and mashing them, will thin out the bug crop comparatively well; leaving small piles of inferior potatoes scattered around in the field, will attract the bugs in early spring, and early in the morning they can be caught and killed. Planting on the outside a few rows of such tender-leaved varieties as the Pink-eye, Early Goodrich, Mercer or Shaker Russet, is said to be a protection; also planting in the midst of a corn field is said to be effectual. The result of all our advice is, therefore, to select whichever of the above methods is most practicable. Paris green is a poison. To apply it, mix it with several times its bulk in flour, and sift it over the potatoes when they are wet. Be sure and stand across the wind from it and not permit it to alight upon you. Some persons mix this poison in water, with which they sprinkle the vines. As it is thought that this may poison the tubers, it is

simply a matter of caution that as little be used as will effect the object desired. See Paris Green.

Two other potato beetles are described, and remedies given, on pages 850 and 853.

Scab on potatoes is produced by minute animals which have not yet been thoroughly studied. The scab shows itself first on the surface of the potato, in rough spots, which afterward become raised like blisters. These collapse subsequently, and leave irregular holes or pits of various sizes in the substance of the tuber. They do not seem to be confined to any particular age of the plant, as they make their appearance on very young tubers, and in other cases not before their full development. About the predisposing conditions and prevention of these parasites little definite is known. Ashes and lime do not prevent or destroy them. We have found them plentiful in fields where ashes had never been applied, and also with and without swine, horse or cow manure, and where potatoes had not been planted for several years. In this case like does not produce like, for we have seen scabby potatoes produce splendid scab-free potatoes; on the other hand, some soils which seem to be saturated with scab will produce scabby potatoes no matter what seed is used. Some varieties are more liable to scab than others.

The digging of potatoes where they are cultivated in large quantities becomes a source of great labor, and until quite recently no effective means of performing this labor with machinery had been adopted.

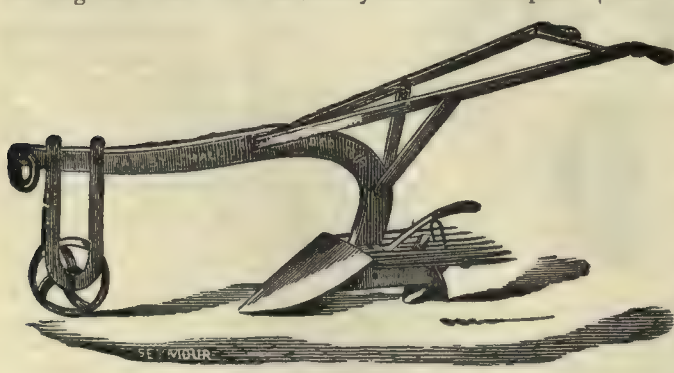


Fig. 2.—*Potato Digger.*

Now there are several made and in the market. In this connection we present the illustration of one made by E. S. Bristol & Co., Chicago, Ill.

The storing of the potato crop is a very important item. Potatoes keep well either in cellars or pits, if they are dry and in good order when dug. It is better not to put too many in a pile or pit. They are then more likely to heat and to sprout in winter or early spring. They must also be entirely excluded from the frost. They will freeze much easier than apples. If they should sprout in the cellar shovel them over into a new box or bin. Potatoes may be buried in pits, as illustrated by Fig. 16, page 29, also described on same page.

Grafting Potatoes. Grafting potatoes is an operation not very well known, and is undertaken as a means of combining the qualities of two known varieties. When varieties are sought by crossing the flowers, the result will partake of the nature of a lottery; but in grafting the result is a combination of the characteristics of both varieties. A potato is selected, and every eye scooped out. A single eye from the variety with which a cross is desired is then inserted. The result is that the eye grows, but in its early days feeds upon the juices of the potato united with it, and the new tubers grown from it partake of the character of both parents. A red potato with white eyes is the result of the union of a red potato with an eye from a white one. From a dark red potato and the eye of a flesh-colored one was obtained a dark potato with light eye. A late variety grafted into the Snowflake, which is early, produced a late potato exactly resembling the Snowflake. The new potatoes from the grafted tubers are small, but by no means as small as those grown the first year from seed. The second year the grafted potatoes will grow to full size, whereas it takes four years to grow new potatoes from the seed to their natural size. This saving of time is a great advantage which is claimed for grafting over hybridization by seed.

To Cook Potatoes. *Simple Boiling*. To boil potatoes properly they should all be of the same sort, and as nearly as possible the same size. Wash off the dirt and scrub them very clean with a hard brush, but neither scoop nor apply a knife to them in any way, even to clean the eyes. Rinse them well and arrange them compactly in a sauce pan so that they may not lie loose in the water, and that a small quantity may be sufficient to cover them. Pour the water in cold and when it boils throw in one large teaspoonful of salt to each quart of water, and simmer the potatoes till they are nearly done, but for the last two or three minutes let them boil rapidly. When they are tender quite through, which may be known by probing them with a fork, pour all the water from them immediately, lift the lid of the sauce pan to allow the steam to escape, and place them by the side of the fire till the moisture is wholly gone; then peel and send them to the table as quickly as possible, in a dish in which the lid is so placed that the steam may pass off. There should be no delay in serving after they have been once taken from the fire. Some kinds will be sufficiently boiled in twenty minutes, others in not less than half an hour. Pour away the water as soon as the potatoes are cooked, and dry them.

Mashed Potatoes. Boil or steam the potatoes half an hour, turn them into a basin, and with a wooden spoon bruise them into flour; to three pounds of potatoes add a teaspoonful of salt, three ounces of fresh butter, and a gill of cream or hot milk. Stand the basin in a sauce pan of boiling water and beat the potatoes for five minutes. Serve on a very hot dish,

either in a rough cone shape or smoothed over with a knife. The potatoes should be well mixed with the butter and cream.

Potatoes and Milk. Have ready some boiled potatoes, and when nearly cold, cut them into slices and cover them with a clean cloth. Take a stew pan and melt 3 ounces of butter with 2 ounces of flour, stir with a wooden spoon, and add gradually a gill of warm milk; season with pepper and salt and a little grated nutmeg. When the sauce comes to the boil put in the sliced potatoes, and let them gently boil for about fifteen minutes; then set the stew pan aside. Mix the yolks of two eggs with a gill of cream and pour into the stew pan, stirring until it becomes thick. Turn it upon a hot dish and serve. Take care to prepare the sauce carefully.

Baked Potatoes. Wash and wipe them; put them into the oven with the skins on, and bake them from three-quarters of an hour to an hour. When about half done prick them all over with a fork; or if that is not done, break them a little as soon as you find they are done; this is to let out the steam and prevent them from getting soggy.

Potato Croquettes. Season cold mashed potatoes with pepper, salt and nutmeg. Beat to a cream with a tablespoonful of melted butter to every cupful of potato. Add 2 or 3 beaten eggs and some minced parsley. Roll into small balls; dip in beaten egg, then in bread crumbs, and fry in hot lard.

Fried Potatoes. Wash, trim and dry some nice large potatoes; have your frying kettle ready with some nice, clean lard, hot, and drop them in it, and cover; let them fry briskly fifteen minutes; take them out and serve.

Lyonnaise Potatoes. Half a pound of cold boiled potatoes; 2 ounces of onion; a heaping teaspoonful of chopped parsley; butter the size of an egg. Slice the cold potatoes, put the butter into a sauce pan, and when hot throw in the onion (minced), and fry to a light color; add the potatoes; stir until hot and light brown; then mix the parsley and serve hot.

Stewed Potatoes. Boil the potatoes till tender; cut them in thick slices; take ½ a teaspoonful of flour, a little salt and butter, and chopped parsley, and a teacupful of milk; put them all together in a sauce pan and let them stew about 20 minutes.

Potato Soup. Pare, slice and boil in 3 pints of water 6 or 8 common-sized potatoes. Crumb fine and brown in butter, 3 large slices of rather dry bread. When the potatoes are done, add to them a quart of rich sweet milk, and the bread crumbs; salt, pepper and butter to suit the taste.

Potatoes, Watery. Put into the pot a piece of lime as large as a hen's egg, and however watery the potatoes may be, when the water is poured off, they will be perfectly dry and mealy. Or, when the water nearly boils, pour it out and put in cold salted water; it makes them mealy without cracking them.

Poudrette, a French preparation of night-soil employed as a manure.

Poultice, a medicinal paste, applied hot and moist, and possessing either emollient, anodyne, stimulating or astringent properties. The emollient poultice is the most common and acts on the same principle as a fomentation, but more intensely. Their curative action principally depends on the liquids with which they are moistened, and the heat retained by the mass. The addition of a little lard, olive oil, or, still better, glycerine, to a poultice, promotes emollient action and retards hardening.

The object of the anodyne poultices is to subdue or kill pain of a local character, as in bruises, sprains, etc. Poultices of this nature are usually made by preparing a strong decoction of camomile flowers and poppy heads, and then filling a small bag of camomile flowers, and after soaking it in the hot decoction, applying it, repeating the application as soon as it becomes cold. Hemlock is an excellent anodyne poultice.

Stimulating poultices are employed to excite a healthier action in the part. They are usually made with a mixture of flour and mustard. Sometimes, to add to its stimulant qualities, a strong infusion of horse-radish is employed instead of water. A blistering poultice is simply a stimulating poultice intensified, and mustard is about the only article employed for this purpose. See Mustard.

Slippery-Elm Poultice. The best poultice for every purpose is the slippery-elm bark; it may be made with warm milk and water, or with soap-lye. If tincture of myrrh be added, it is valuable in boils, ulcers, carbuncles, etc. Take a sufficient quantity of pulverized slippery-elm bark, stir in hot or warm milk and water to the consistence of a poultice.

Bread Poultice. Take stale bread in crumbs, pour boiling water over it, and boil till soft, stirring it well; then take it from the fire, and gradually stir in a little glycerine or sweet oil, so as to render the poultice pliable when applied.

Potato Poultice. Boil the common potato, mash or bruise soft, and then stir in finely pulverized slippery-elm bark. This poultice has been used with success in ophthalmia (inflammation of the eyes) of an acute character, when other means have failed.

Soap Poultice. Dissolve 1 ounce scraped or sliced white soap in ¼ pint boiling water, and mix with sufficient bread to make a poultice. This is good for scalds and burns.

Charcoal Poultices. These are made by mixing charcoal and flour and linseed meal, in nearly equal quantities, in a basin, adding hot water, and stirring till a smooth paste is made, which is to be applied, like the others, on flannel.

Chloride of Lime. May be made in the same way, or by mixing the meal with the solution.

Alum Poultice. Used generally as an astringent in certain chronic inflammations of the eye. This poultice is made by mixing the white of two or more eggs with a drachm of finely powdered alum; put the mixture within a fold of muslin, and apply.

Poultry. The term poultry is used to designate all domesticated fowls, as ducks, geese, fowls, turkeys, Guinea fowls and pea fowls, which are reared or kept for profit or economical use. These have all been treated under their respective heads. In this article we have, therefore, but to treat of poultry in general, referring the reader for more explicit information of any kind to the article on it in its alphabetical place.

Poultry-raising, like any other branch of business, must be well managed in order to be profitable. Success largely depends on having a good location. A farmer who lives a long distance from a large town will derive little profit from sending fowls to market, as the cost of packages, expressage and commissions will be large. He will, however, find fowls profitable to raise for the supply of his own table, as there is difficulty in procuring fresh meat on farms during the warm months in the year. Generally the farmer will do better by using the poultry raised at home and sending more beef and pork to market. The cost of shipping beef and pork is much less, as business is now conducted on railroads and in stock-yards. There is much trouble in keeping meat fresh on farms during hot weather, and in curing that which cannot be consumed within a few days after the animals are slaughtered. Fowls, however, can be killed as they are wanted for the table without loss. Eggs can be produced with profit on almost any farm, as there are now good facilities for sending them to market in carriers that insure their safety during transportation. The improved egg-carrier is of very great value to farmers who live at a distance from market. Improved methods of shipping live and dressed fowls must be devised before it will pay to produce them for market on farms that are distant from towns. In France and Belgium, cars specially designed for carrying poultry are run on most of the railroads. It is reported that poultry-cars are now run once a week on the roads that enter Denver. Some of them contain several stories for the use of large shippers, and others are fitted up to contain a large number of coops belonging to different individuals.

Generally fowls can be produced for market with most profit on farms located quite near large towns. Fowls, to sell well, must present a fine condition when they are exposed for sale. They should not be dressed long before they are offered to customers. By dressing them at home the feathers may be saved, and they will be quite an object where a large number of fowls are killed on a place. By being near a market the prices can be learned from day to day, and advantage taken of the information received. One can also make arrangements to supply hotels, restaurants, boarding-houses and private families, and thereby obtain retail prices. If one lives near a large town he can generally derive the most profits from young chickens that are ready for the market early in the season. Chickens that are large enough for the gridiron in June will bring more money than the same birds will if they are kept till Christmas, or even till the following spring. By marketing them early many losses are avoided and much feed saved. By being near a large town another advantage can be secured. The waste grains in elevators, the screenings in mills and the corn damaged by fire and water can be procured at low rates. Much refuse meat can also be bought at a nominal price from the butchers and persons engaged in slaughtering animals. Fresh meat is very desirable for feeding fowls during cold weather, and the lack of success of many poultry-raisers is chiefly to be ascribed to their failure to provide meat in some form for their birds at times when they cannot procure a supply of some substitute for it. Fowls do not require to be supplied with meat during warm weather, as they can, if they have a good range, procure all the insects they desire.

Turkeys and geese are more profitable to raise to supply a distant market than chickens. The former are more in demand during cold weather, when poultry can be shipped to the best advantage and at the least cost. Turkeys are not in good condition to eat in the summer, and geese are most desirable during quite cold weather, as they contain much oil. Chickens are harder to transport than turkeys and geese, and are preferred for eating during warm weather. On this account it is desirable to raise them near where they are to be marketed. If geese and ducks are raised for the market, only the best varieties should be used. It costs no more to feed them, and they will sell for twice as much to persons who know their value. Geese are not desired by many persons, except by foreigners, chiefly for the reason that poor varieties are kept, and kept so long that their flesh is very tough. Most farmers raise geese for their feathers, and do not fatten them till there is danger of death from old age. In European countries, where geese and ducks are more generally eaten than here, they are fed liberally during the summer and fattened before they are old. When managed in this way, their flesh is ranked among the luxuries, and commands a ready sale. Poultry-raising is a profitable branch of business for persons of small capital, and especially so for farmers who have help that cannot perform very hard work. Much of the food consumed by fowls can be raised at very small cost. Geese will live several months in the year on grass and clover, and all kinds of fowls will eat buckwheat, sunflower seed, as well as the seed of millet, Hungarian and broom-corn. Turkeys can be profitably kept in the vicinity of beech woods, as they are very fond of the nuts, which are produced without cost. They want a wider range than chickens, and cannot be kept in confinement.

Feeding Poultry. If proper food has been given to poultry, at regular intervals, in sufficient quantity, profit is the natural result of poultry raising, while haphazard management results disastrously. In the feeding and management of poultry there is more lax discipline observed among farmers than with any other kind of stock. There is far too much corn, in different forms, fed to breeding poultry, and to layers to secure the best results; for corn has a great ten-

dency to produce fat, which is not desirable where plenty of eggs are expected, the fat forming so thickly on and around the ovaries and other organs as to effectually prevent the fowls from laying. In cold weather, warmth and heat are necessary, and feeding corn moderately to the laying hens is not so objectionable as it is during the warm summer months, while over-fat fowls are more liable to disease and ailments than those only in good condition. For the laying fowls no better food can be given for a principal diet than sound, whole wheat, though it must not be given in the same quantities as corn. Screenings are not all objectionable, provided they are not musty or spoiled, though the price at which they are usually sold makes them more expensive than good wheat, for the simple reason that scarcely one-half the screenings is wheat or will be consumed by the poultry, the greater part being cheat, cockle, weed seeds, etc. For the fattening of poultry corn is the very best and cheapest food which can be given to accomplish it. To secure the greatest profit from the poultry it is economy in the end to keep the birds growing rapidly from the start, and a couple of weeks before they are to be marketed have them penned up and fed principally on soft food, such as scalded corn meal, well boiled mush, oatmeal mush (if the meal can be gotten cheaply), etc., feeding twice a day at first and toward the last three times, only what they will eat up with an appetite, and confining the birds in a darkened room, giving them light only at feeding time.

Killing Poultry. The process of killing and dressing poultry for market is quite an art and if nicely performed will prove very renumerative. First, fatten them well, and allow them to remain in the pens twenty-four hours without food previous to being killed. Then, when you kill them, instead of wringing their necks, cut their heads off at a single blow with a sharp axe or cleaver, and then hang them up by their legs and allow them to bleed freely, and pick them immediately, while warm. Some, however, prefer to run a small pen-knife into the jugular vein by the side of the neck, just under the joles. In this case, let the heads remain on. The fowl should be bandaged, to prevent struggling; and indeed, this ought to be done in all cases where the knife is employed, afterward hanging up by the feet to bleed freely. When the head is cut off, the skin should afterward be drawn neatly over the stump and tied. Poultry should be plucked or picked whilst still warm, when the feathers will be removed with much less difficulty. Fowls are generally picked quite clean, but it looks better in the case of young chickens to leave a few feathers about the tail. They will eat best if nothing further is done to them; but it improves the appearance greatly for market to plunge the carcass, immediately after plucking, into a vessel of boiling water for a few moments, which will "plump" it a great deal and make the skin look bright and clean. After scalding, turkeys and fowls should be hung by the legs, and water-fowl by the neck. For sending to city market they should not be drawn, as they will keep much better without, and bring a better price; but in selling for home consumption, the birds should be properly prepared for table. If after drawing, the cavity be filled with charcoal broken in small pieces, the fowl may be kept sweet a considerable time. After removing the intestines, wipe out the blood with a dry cloth, but no water should be used to cleanse them. With a moist cloth take off the blood that may be found upon the carcass, and hang them in a cool, dry room until ready to carry to market, or otherwise to be used. Do not remove the gizzard from its place; but, if the fowl be very fat, make a larger hole, turn the leaves out, and fasten them with a small skewer. When prepared in this way, your poultry will be much nicer, and entitled to a better price than when butchered and dressed in the ordinary way. There is scarcely any other product of the farm which pays so well to be nicely prepared as poultry. Much of the poultry exposed for sale has been through the process of scalding to facilitate picking; this practice should never be resorted to. It turns the rich yellow of the fat into a tallowy hue, and oftentimes starts the skin, so that it peels off unless very carefully handled. They may be plucked with equal facility and with better effect in preserving the flesh immediately after death and before they have had time to cool. Much care and attention is required after the poultry is dressed and cool. It should be carefully packed in baskets or boxes, and, above all, it should be kept from the frost.

Pound. 5,760 grains, or 12 ounces make a Troy pound, while 7,000 Troy grains, or 16 ounces, make a pound avoirdupois.

Power: see Horse-Power.

Power of Attorney, a written instrument, under seal, by which one or more persons authorize one or more persons to do some lawful act by the latter, for, or instead of, and in the place of the former. This authority, given in the written instrument, is either general or special. If special, it authorizes the transaction of some particular business. If general, it authorizes the attorney to transact all the business of the maker or constituent. The death of either party destroys the authority to act further.

Powers of attorney require, in addition to acknowledgment, two witnesses.

Prairie, an extensive tract of land destitute of trees, covered with coarse grass. They are usually gently undulating or rolling lands but sometimes are quite level. The prairies of the West are noted for the tall, luxuriant grass, being, in wet, swampy places, several feet high. On the prairies of Illinois, before cultivated, it often grew to the height of from six to eight feet.

Prairie Chicken, the pinnated grouse; see page 611.

Pregnancy, the state of being with young. See

Generation, Gestation, and the respective principal domestic animals.

Premium, in insurance, the sum paid an insurance company for assuming a risk.

Preserves. This mode of keeping fruit was much more generally practiced prior to the introduction of the present system of canning fruits than at present. The process is very simple and can be performed by almost any one. It consists in cooking equal quantities of fruit and sugar together until the former is done. In making preserves, observe the following:

1. The fruit must be fresh. 2. Fruit and syrup must be cooked in separate kettles. 3. Use only copper, granite or porcelain-lined kettles: never tin or iron; do not allow fruit to stand in other than glass, porcelain or earthen-ware, otherwise poison is generated. 4. Never use wire sieves or iron pots, as they mar flavor and color. 5. Stir fruit with either wooden or silver spoon, never iron. 6. Preserve jars, when filled, should be carefully covered. 7. Store in a cool, dry place. 8. Examine occasionally the first two months after making to see that fermentation is not taking place; whenever it is discovered, boil it over, scald the jar and return the fruit. 9. Label, giving name and variety of fruit and date of preserving.

The preparation of the fruit is similar to that for canning. Plums may be skinned the same as peaches. Remove the cores from crab-apples and the stones from cherries. Boil the peach and plum pits and use the water in making the syrup.

Preserves may be put in any kind of vessel, almost, to keep. Cans, jars or bottles may be used. To cover tightly, which should be done, apply the white of an egg, with a brush, to a single thickness of white tissue paper, with which to cover the jars, lapping over an inch or two. It will require no tying, as it will become, when dry, very tight and strong and impervious to the air.

The process of preserving is simply as follows: Put the prepared fruit into the syrup while quietly boiling and boil until just soft, without breaking the pieces. When done, place carefully in jars, pour the syrup over it and seal as above directed. A few drops of lemon-juice improves pear, plum and crab-apple preserves. Peaches will be firmer by allowing the uncooked pieces to lie in the syrup over night. Fruit is hardened at the expense of flavor by letting it soak 10 or 15 minutes in alum-water before cooking. Preserves should be boiled in a kettle without a cover.

APPLE PRESERVES. Same as quince. Select from good fruit; a few slices of quince or the juice of 2 lemons to 3 pounds of fruit improves them much.

CHERRY PRESERVES. Sweet cherries will not do. Remove the pits, preserving every drop of juice. Use pound for pound of sugar; place in the preserving kettle a layer of fruit, then of sugar, until both are used up; pour on the juice, and boil gently until the sirup begins to thicken, then place in jars.

CITRON PRESERVES. Pare, core and slice, or cut into fancy pieces; take 6 pounds citron, 6 pounds sugar, 4 lemons and ¼ pound of ginger-root. Slice lemons into preserving kettle, boil half an hour in a little clear water, then strain. Put slices into another dish with a little cold water; cover, and allow them to stand over night. In the morning wrap the ginger-root, after bruising it, in a thin muslin cloth, and boil in three pints clear water until the water is highly flavored; remove the bag; place the sugar and ginger-water in the preserving-kettle, boil and skim as long as scum rises. Put in the citron and juice of the lemons prepared the day before; boil until the fruit is transparent, but not broken, then place in jars and seal. The ginger and lemons may be omitted, but they add materially to the flavor of the preserves.

CRAB-APPLE PRESERVES. Select perfect fruit, leaving the stems in. The old Siberian is the best variety. Put in a kettle with enough warm water to cover them; simmer until the skins break; drain and skin. Remove the cores with a pen-knife through the blossom end. Take one pound of sugar and one gill of water to each pound of fruit for sirup. When purified, and still hot, put in the fruit, cover the kettle, and simmer until the apples are a clear red, and tender. Then take out with a skimmer and spread upon dishes to cool and harden. Now add to the sirup the juice of one lemon to three pounds of fruit, and boil until clear and rich. Fill jars three-quarters full with apples; pour in sirup, and, when cool, seal.

GRAPE PRESERVES. Squeeze the pulp from each grape, and boil them until tender; press through a cullender, add the skins to the pulp and juice, with a cup of sugar to each pound of fruit, and boil till thick; then jar.

MUSK-MELON PRESERVES. Take ripe, sound melons; remove the seeds, peel, and cut in pieces. Put in a stone jar and cover with scalding-hot vinegar. Let it stand until next day, then pour off the vinegar, heat, and pour on again. Repeat daily until fourth day, when the fruit should be weighed. For each five pounds add three pounds sugar, one quart sirup, and spices to suit. Put all together, and simmer until tender. The second day after pour off the sirup, boil it down until there is just enough to cover the fruit, then jar.

PEACH PRESERVES. Prepare as indicated in the remarks on the process of making preserves, extracting the pits to use in the sirup.

QUINCE PRESERVES. Prepare fruit as for canning. Take three-quarters pound sugar to one pound fruit, with one pint water to two pounds sugar for sirup; boil the quinces until they are easily pierced with a broom-straw, and no longer; place the hot fruit in the boiling sirup, then in jars, and seal.

RASPBERRY PRESERVES. Take raspberries that are not too ripe, and put them to their weight in sugar, with a little water. Boil softly, and do not break them; when they are clear, take them up, and boil the sirup till it be thick enough; then put them in

again, and when they are cold, put them in glasses or jars.

To Preserve Strawberries Whole. Take equal weights of the fruit and refined sugar, lay the former in a large dish, and sprinkle half the sugar in fine powder over; give a gentle shake to the dish that the sugar may touch the whole of the fruit; next day make a thin sirup with the remainder of the sugar, and instead of water allow one pint of red currant juice to every pound of strawberries; in this simmer them until sufficiently jellied. Choose the largest scarlets, or others when not dead ripe.

Tomato Preserves. Small tomatoes are best. Red make red preserves; yellow ones make yellow. Peel and prick with a needle; boil slowly in preserving sirup for half an hour, with the juice of one lemon to each two pounds of tomatoes, and the bag of ginger-root, if desired. Sirup should be three-quarters pound sugar to one pound fruit. Skim out tomatoes and place in the sun two or three hours to dry and and harden. Purify the sirup with the white of an egg and skimming. Then pour over the tomatoes after placing them in jars.

Water-Melon Preserves. Same as citron, for which they are an excellent substitute, and less expensive.

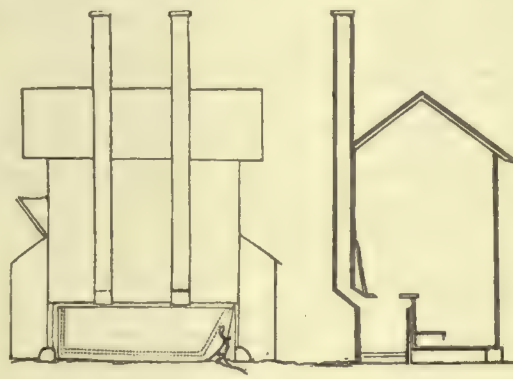
Prickly Pear. There are two species of the prickly pear growing native in the United States, besides a number of other species in house cultivation. The kind prevailing in the Western States is different from that of the Atlantic States. They all grow in sand, bear large, yellow, lily-like flowers, and a fruit which is sometimes pickled and used as sauce. This is the most familiar cactus in this country.

Prince's Feather, the name of two widely different ornamental but coarse herbs. One is a red-topped amaranth and the other a crimson-flowered knotweed. The former grows about five feet high and the latter often seven or eight feet in height. Their name is derived from the similarity of the flower spikes to red feathers.

Prionus, a large beetle burrowing into the roots of poplars, fruit-trees, grape-vines, etc.: see page 863.

Privy. For the preservation of health, of garden manure and for convenience, more attention should be given to the construction and care of the privy than is generally done. Many of them are so carelessly constructed and illy kept as to actually become a nuisance and detrimental to the health of the members of the household. This is all unnecessary. A few dollars' expenditure, a little extra labor and some attention will construct a tasteful, clean and easily kept and purified closet. It should be accessible, indeed, very conveniently located, and sheltered from the storms and hidden from the road by a high fence, lattice work or evergreens. Of course, where running water can be introduced into a house and the facilities for complete drainage provided, closets may be constructed in a country residence without great trouble or expense. Unless, however, all the arrangements connected with them can be made perfectly effective, we would not advise their introduction, as they sometimes become intolerable nuisances.

The accompanying illustrations show the rear elevation and transverse section of a form of dry-earth closet, particularly adapted to the country. It entirely dispenses with the dangerous and offensive vault, and substitutes in its place a sled box, say 8 by 2½ by 2 feet, inserted under the seat through an



Sections of a Dry-Earth Closet.

opening in the rear. It should be of strong plank, covered inside with a good coating of tar. At either side of the building are attached boxes closing tightly with lids, and communicating with the exterior by means of convenient openings. The boxes are to be filled with dry muck, road dust or ashes, and from two to four quarts of either of these deodorizers should be thrown down every day. If any odor is noticed increase the amount. When it is nearly full, hitch to it and draw it away to the compost heap. Its contents will be found entirely inoffensive. It might be located in any outbuilding if found more convenient.

Unslacked lime sprinkled in the vault will be found an excellent deodorizer. Carbolic acid is also effective as a disinfectant, but copperas water or road dust are very effective deodorizers; especially is the latter good in a dry closet. The former is used in vaults filled with water, by dissolving copperas in water in proportion of a pound to the gallon of water, and sprinkling in the vault.

Promissory Note: see Note.

Propagation, the reproduction and reproductive diffusion of organized beings. The propagation of all the higher and middle orders of animals is effected only by generation, and that of cultivated plants is effected, according to the particular constitution of classes and species, by one or more of several methods,—from seeds, cuttings, buds, grafts, suckers, layers, stolons, bulbs, tubers, germs and divisions of the roots: see Varieties.

Protest, in business transactions, is the official written declaration of a notary that a bill or note was

presented by him for payment, and that such payment was refused, for reasons specified in the protest.

Proud Flesh, a popular name given to a fungous growth in wounds that do not heal by the first intention. This prevents the wound from healing. They are red, flabby elevations that spring up, sometimes round the edge of the ulcerated surface, or in its center, in circumscribed patches, or separate cones or elevations, and are indicative of a rapid but weak action in the part; they are in themselves perfectly harmless, though, according to popular belief, their presence is regarded as indicative of serious mischief, if not of danger. A lotion of sulphate of zinc, or bluestone, in the proportion of 2 or 3 grains to the ounce of water, if applied on lint once or twice will generally reduce such exuberant growths, at the same time that it stimulates the vessels of the parts to a more equal and steady action. Should the lotions above not answer the purpose, a small quantity of burnt alum may be scattered over the granulations.

Provender, dry food for stock.

Prunes, dried plums.

Pruning, the act of trimming or removing the superfluous branches or twigs of plants. See the respective article to be pruned and the articles Nursery and Orchard.

Prussic Acid. This, in modern chemistry, is called hydrocyanic acid; but it is still popularly known by its former name, which was derived from its being a constituent of the pigment Prussian blue. It is one of the most virulent poisons known, a drop or two laid on the tongue being sufficient to occasion death. It is a sedative poison, and one which no one has any use for except when prescribed as a medicine by a physician. The person who has been poisoned by it experiences nausea, giddiness, debility, hurried pulse, weight and pain in the head, eructations having the flavor of the acid (that of peach kernels), spasm, tetanus, convulsions and death. Ammonia is an antidote, but it should be employed in a very concentrated form. Liquid chlorine has also been found efficacious.

Pudding. For boiled puddings you will require either a mold, a basin or a pudding cloth; the former should have a close-fitting cover, and be rubbed over the inside with butter before putting the pudding in it, that it may not stick to the side; the cloth should be dipped in boiling water, and then well floured on the inside. A pudding cloth must be kept very clean, and in a dry place. Bread puddings should be tied very loosely, as they swell very much in boiling.

The water must be boiling when the pudding is put in, and continue to boil until it is done. If a pudding is boiled in a cloth it must be moved frequently while boiling, otherwise it will stick to the sauce pan.

There must always be enough water to cover the pudding if it is boiled in a cloth; but if boiled in a tin mold, do not let the water quite reach the top. A pudding boiler, recently invented, is the best for boiled puddings.

To boil a pudding in a basin, dip a cloth in hot water, dredge it with flour and tie it closely over the basin. When the pudding is done take it from the water, plunge whatever it is boiling in, whether cloth or basin, suddenly into cold water, then turn it out immediately; this will prevent its sticking. If there is any delay in serving the pudding, cover it with a napkin, or the cloth in which it was boiled; but it is better to serve it as soon as removed from the cloth, basin or mold.

Always leave a little space in the pudding basin for the pudding to swell; or tie the pudding cloth loosely for the same reason.

Bread or rice puddings require a moderate heat for baking; batter or custard requires a quick oven.

Eggs for puddings are beaten enough when a spoonful can be taken up clear from the strings.

Souffles require a quick oven. These should be made so as to be done the moment for serving, otherwise they will fall in and flatten.

Suet Crust for Puddings. One pound of flour, 6 ounces of beef suet, a cupful of cold water. Strip the skin from the suet, chop it as fine as possible, rub it well into the flour, mix it with a knife, work it to a very smooth paste with a cupful of water, and roll it out for use.

Sauce. For a good or easily made pudding sauce take 1 tablespoonful of butter, 2 tablespoonfuls of flour, ⅔ of a cup of sugar. Pour hot water over these, stir well and boil until thick; flavor with lemon or nutmeg and a teaspoonful of vinegar.

Apple Pudding. Peel the apples and put them in a kettle in halves, with a pint of water, a small lump of butter, a little salt, nutmeg, and a handful of sugar; make a soda biscuit crust about one-third inch thick, and put it on the top of the apples; make a hole in the center of the crust; boil until the apples are thoroughly cooked. Serve with a hot sauce. A plate turned upside down in a kettle will prevent it from burning.

Apple Dumpling. Three-quarters of a pound of flour, 3 ounces of suet chopped fine, 2 teaspoonfuls of baking powder, 1 teaspoonful of salt; mix with milk enough to knead; roll it, but not as thin as for pie crust. Pare 7 large apples; core and quarter them, keeping each apple by itself, and place the quarters together again; cut the paste in squares to cover each apple; tie them in pieces of cloth, leaving a very little room to swell. Boil an hour, putting them into a steamer; cover the steamer with a piece of cotton-flannel, cut round; this will absorb the steam that rises to the cover, and the dumplings will be drier. Serve them with sweet sauce.

Apple and Tapioca Pudding. Peel and core 6 large apples, pack them closely in the baking dish you intend serving your pudding in; fill the cored parts tightly with sugar and a short stick of cinnamon; put a gill of hot water on your apples, cover

closely and bake for an hour; be careful the apples do not brown on the bottom; turn them two or three times. Take a teacupful of French tapioca, which is finer and more delicate than any other, and soak in 3 cupfuls of water for three or four hours, keeping it in a warm place, but not where it will boil; pour the dissolved tapioca over the baked apples and bake for another hour in a moderate oven. The pudding can be eaten either with pulverized sugar or a hard sauce made with an ounce of butter and 2 ounces of sugar well creamed together and the beaten yolk of an egg thoroughly stirred in; put a teaspoonful of salt in the water you soak your tapioca in.

Batter Pudding. One quart of milk, 4 eggs, 6 spoonfuls of flour, a little salt. Bake 20 minutes.

Bread Pudding. Soak the bread in cold water, then squeeze it very dry, take out the lumps and add boiling milk, about ½ a pint to 1 pound of soaked bread, beat up 2 eggs, sweeten, add a little nutmeg, and bake the pudding slowly until firm. If desired a few raisins may he added.

Butter Pudding. One cup raisins, 1 of molasses, 1 of sweet milk, ½ cup butter, 3 cups flour, 1 spoonful soda; steam two hours; cream and sugar for sauce.

Children's Pudding. To make a nice pudding for the children's dinner, take 3 eggs, 3 tablespoonfuls of flour, 1 quart of milk and a little salt; make into a batter, then have some apples nicely peeled and cored, place them in a well buttered pie dish, then pour the batter over them. Let it bake one hour and a half and make a nice sweet sauce for it.

Cocoanut Pudding. Grate cocoanut, then stew it slowly in 1 quart of milk; pour this on a half loaf of baker's bread; when cold add 1 pound sugar, and ½ pound of butter, beaten to a cream; then add 6 eggs and bake.

Corn-Starch Pudding. Boil 1 quart of milk, then beat the yolks of 4 eggs, with 4 tablespoonfuls of corn starch and a little milk; stir into the boiling milk, let it boil up once and turn into a pudding dish; then beat the whites of the eggs to a froth and add 4 spoonfuls of white powdered sugar; cover the pudding with the mixture, and set in the oven and brown lightly. Flavor with vanilla, lemon, etc.

Cottage Pudding. One pint bowl flour, 1 teacup milk, 1 egg, ½ teacup sugar, 1 spoon soda in the milk, 2 spoons cream tartar in the flour; bake half an hour.

Plain Cracker Pudding. Four crackers, pounded and sifted; a small piece of butter; 1½ pints of milk, scalded, and poured on the crackers and butter; 4 eggs; sugar to sweeten; nutmeg.

Another. Cracker pudding that can be made in twenty minutes. Take 2 quarts of sweet milk, sweeten to taste, put into a pan over a kettle of boiling water, and when hot stir in 5 well-beaten eggs, then have ready a dozen crackers, split and buttered; drop in with a handful of raisins; flavor with lemon; do not stir the pudding after putting in the crackers.

Cream Pudding. Five eggs beaten light, 2 cups of nice sour cream, and 1 spoonful soda; stir in flour to make it as stiff as cake. For sauce, make 1 quart of flour starch, add a lump of butter, put in sugar, and flavor with lemon. It will bake while your potatoes are boiling for dinner.

English Pudding. Mix 1 tablespoon of melted butter in 1 pint of sweet milk; beat very light the yolks of 7 eggs, then beat the yolks in the milk, with flour sufficient to make a thin paste (say 16 tablespoonfuls); beat whites of eggs very light; stir in whites, and bake immediately in a hot oven ¾ of an hour, in a pound-cake or pudding dish. Eat with sauce.

Fig Pudding. Half a pound of bread crumbs, ½ pound figs, 6 ounces of suet, 6 ounces brown sugar; mince the figs and suet nicely, a little salt, 2 eggs, well beaten, nutmeg to taste, boil in a mold 4 hours. Serve with wine sauce.

Boiled Fruit Pudding. One quart crushed wheat, 1 teaspoonful cinnamon, ½ teaspoonful cloves, 2 cups sugar, 2 eggs, ½ a pound of suet, chopped fine, 1 teaspoonful cream tartar, ½ a teaspoonful of soda, ½ cup of molasses, ½ pound of raisins chopped fine, citron or lemon peel if desired. Boil 2 hours.

Hard-Times Pudding. Half a pint of molasses, half a pint of water, two teaspoonfuls of soda, one teaspoonful of salt; thicken with sifted flour, to a batter, thick as cup cake, put into pudding boiler, half full, to allow for swelling; boil steadily for three hours; eat with or without sauce.

Indian Pudding. Take one quart of sweet milk; put it over the fire, and let it come to a boil. Just as quick as it boils stir in three-fourths of a teacup of Indian meal and one level teaspoonful of salt. Take off from the fire immediately, as it burns quickly, and that would spoil the pudding. Beat one egg with one cup of sugar; add one tablespoonful of molasses; stir this into one quart of cold sweet milk; next add this to the hot mush, and stir it real well to beat out the lumps, should there be any; next put it in a bake-pan. Grate a little nutmeg on the top, and drop a few lumps of butter on the top, just as you put it in the oven; bake nearly three hours. This is good without fruit, but is better with two or three handfuls of raisins or currants.

Old-Fashioned Baked Indian Pudding. Take a large cup of meal and a teacupful of molasses and beat them well together, then add to them a quart of boiling milk, some salt, and a small piece of butter; let it stand a while in the dish you are going to bake it in until it thickens, and when you put it into the oven pour over it from half to a pint of milk, but do not stir it in, as this makes it pasty. Bake two or three hours.

Lemon Pudding. Five ounces of coffee sugar, one of butter, one quart of milk, one pint of stale bread crumbs, one lemon, four eggs. Grate the lemon rind, and crumble the bread; beat the yolks of the eggs in the pudding dish; add, gradually, the sugar,

lemon rind, and butter rubbed to a cream; then the milk and bread alternately. Bake in a slow oven until firm. Beat the whites to a stiff froth with four tablespoonfuls powdered sugar, and enough of the lemon juice to flavor; spread this over the top and brown in the upper part of the oven. To be eaten hot or cold.

Marlborough Pudding. Grate apples enough to make eight ounces, add to this eight ounces of white, fine sugar which has been well rubbed on the rind of a large lemon, six well beaten eggs, three tablespoonfuls of cream, the strained juice of three lemons, eight ounces of butter, add quantity at pleasure of orange flower or rose-water. Line a pie dish with rich puff paste, put in the mixture and let it bake in a quick oven.

Oatmeal Pudding. Stir half a cupful of oatmeal into three cupfuls of boiling milk. Cook for half an hour. When partly cool add a cupful of sugar, two cupfuls of apple sauce, three beaten eggs and a teaspoonful of extract of vanilla. Bake half an hour in a moderate oven and serve when cold or partly cooled with sweetened cream.

Orange Pudding. Four sweet oranges peeled and picked to pieces, and put in a deep pudding dish, with two cups of sugar. Put a quart of milk, the yolks of three eggs, and two dessertspoonfuls of corn starch on to boil. Take off, cool it, and pour it on the oranges. Then beat the whites to a stiff froth, put it over the pudding, and place it in the oven until it is of a light brown color.

Peach Roll-Up. One quart of flour, a lump of butter the size of a walnut, a pinch of salt, enough milk or water to make a soft dough. Roll out half an inch thick, put on a layer of nice ripe peaches. Begin at one side and roll up nicely, then lay in buttered basin, and steam an hour or longer; or boil in tin pail set in a kettle of boiling water. Cut in slices, eat with sweetened cream or butter and sugar.

Pie-Plant Pudding. Take slices of stale bread, butter them, put a layer in the bottom of a pudding-dish, next a layer of pie-plant, plenty of sugar, and a little nutmeg; do so until the dish is full, having bread on the top; don't be too sparing of the butter; put in about two cups of water, more or less, according to the size of your pudding-dish; it must not be too dry nor too juicy; cover with an earthen plate, and bake three-quarters of an hour in a brisk oven.

Cheap Plum Pudding. One cup suet, one cup raisins, one cup currants and citron mixed, one egg, one cup sweet milk, half a teacup molasses, one teaspoonful soda, three and a half cups flour, a little salt. Boil three hours. Serve with hard or liquid sauce.

Plum Pudding. A pint of bread crumbs; pour over them one-half pint boiling milk and let it cool thoroughly. Then add one pound stoned raisins, one-half pound currants, one tablespoonful of butter minced fine, one tablespoonful of flour, one tablespoonful of sugar, one small teaspoonful cloves, nutmeg, and cinnamon, each; five eggs, beaten light. Flour your fruit before mixing, and boil three hours. Eat with hot brandy sauce.

Another. One pound of raisins, one-half pound currants, one-half cup of suet, two cups sugar, one cup of milk, one cup of flour, one pound of bread crumbs, four eggs. Mix raisins, currants, suet, sugar and bread crumbs in a large pan. Then beat the whites and yolks of eggs together and mix with milk and pour over the ingredients in the pan; then add spice to suit the taste. Flour the pudding bag and leave plenty of room to swell. Boil three or four hours.

Mock Plum Pudding. One cup finely cut suet, one of dried currants, one-third cup of molasses, two-thirds cup of milk or water, one teaspoonful allspice, cloves and cinnamon mixed, three cups of flour; mix well and steam three hours.

Pumpkin Pudding. Pare the pumpkin and put it down to stew, strain it through a colander; two pounds of pumpkin to one pound of butter, one pound of sugar, and eight eggs; beat to a froth; one wine-glass of brandy, half wine-glass of rose-water, one teaspoonful mace, cinnamon, and nutmeg all together.

Queen of Puddings. One pint of fine bread crumbs, a piece of butter the size of an egg rubbed in, a teacupful of fine sifted loaf sugar, the rind of one lemon grated, yolks of four eggs, and a pint of milk. Mix these ingredients together in a pie-dish, and bake in a quick oven until well set, but be careful not to let the pudding get leathery; it will take only a short time. When cool, spread a layer of apricot or strawberry jam over the top. Whip the whites of the four eggs with a teacupful of sifted sugar and either the juice of the lemon or a small teaspoonful of essence of lemon, into a very stiff froth, and throw lightly over, making it as rocky as possible, and piling it up higher in the center. Very slightly brown it by putting it into the oven for a few minutes, or passing a salamander over it.

Quick Pudding. One pint milk, one pint flour, three eggs and a little salt.

Rice Pudding. For a six-o clock dinner the rice and milk should be put on early in the forenoon. The best thing to cook it in is a double kettle. Let it simmer on the back of the stove—it must never boil—until a couple of hours before dinner. It will then be a thick, creamy substance. Then salt and sweeten it to taste, put it into a pudding dish, and bake it in a moderate oven, until it is of a jelly-like thickness and the top is slightly browned. It can be eaten either hot or cold. If the latter is preferred, the pudding may be made the day before, if that is most convenient. If desired a flavoring may be added. This is emphatically the perfect pudding of its kind.

Snow Pudding. One ounce of gelatine; pour on it a pint and a half of boiling water; add two teacups of white sugar, the grated peel and juice of two lem-

ons; strain into a deep dish to cool; when it commences to jelly, add to it the whites of four well beaten eggs, beat until the dish is full, put in molds and set in a cool place.

Steamed Pudding. Two eggs, two cups buttermilk, and half cup of butter, or one cup of cream and one of buttermilk, one cup of currants, half teaspoon of soda, a little salt; to be eaten with sweetened cream.

Suet Pudding. Mix one pound of flour very dry with half a pound of finely chopped suet, add eggs and a pinch of salt; make it into a paste with the water, beating it all rapidly together with a wooden spoon. Flour a pudding cloth, put the paste into it, tie the cloth tightly, and plunge it into boiling water. The shape may be either a roll, or a round ball. When it is done, untie the cloth, turn the pudding out, and serve very hot.

Tapioca Pudding. Soak over night, or melt on the back of the stove, in water sufficient to cover it, a small teacup of tapioca; add a quart of milk, let come slowly to boil, beat two eggs, add a little salt, sugar, and flavoring to taste. This is quickly made and is wholesome. Or, after the tapioca is melted, add milk, sugar, eggs, salt, and flavoring, and bake in a moderate oven. A very little butter may be added whether boiled or baked.

Wash-Day Pudding. One pint of flour, three eggs, one teacupful of pounded sugar, one cupful of milk, half a teaspoonful of soda, one teaspoonful cream of tartar, one full tablespoonful of butter; rub the soda through the flour, dissolve the cream of tartar in the milk and stir all together quickly, just before dinner is served; bake in a quick oven, and eat with sauce, either hard or soft. Bake in small tins or open pans. This forms nice tea cakes.

Pullet. The term chicken is applied to the young female fowl till she is four months old, after which she is a pullet till she begins to lay, when she is a hen. The male is a chicken until he is three months old, after which he is a cockerel until he is one year old, when he is known as a cock. When deprived of the faculty of procreation he becomes a capon.

Pulse. Pulse is the impulse given to the blood by the heart, and is usually felt by pressing on the "radial artery" at the wrist. The rapidity, regularity, and force of the circulation are thus judged.

The range of the pulse, as to frequency, in a healthy adult, is usually 60 to 80 beats; but there are persons whose pulses rarely beat 60 times a minute; while there are others not out of health in whom the frequency exceeds 80. The pulse, it will thus be seen, is extremely capricious. Before any correct inferences can be drawn from it the peculiarities of each individual must be carefully considered. Thus, slight mental affections, indigestion, irritability, and many other causes producing modification of the pulse, do not admit of any general description. The terms hard, full, soft, and wiry pulse are used to indicate other obvious modifications independent of the number of pulsations. The average pulse of a healthy infant is, for the first year, from about 120 to 108; for the second, from 108 to 90; for the third, from 100 to 80; from the seventh to the twelfth year, the pulsations are about 70. When the pulse exceeds 140 beats in a minute it is not easy to count it precisely. But to this it attains in some febrile diseases. When it is above 90 it is called febrile. The pulse of the adult female usually exceeds that of the adult male of the same age by ten to fourteen beats a minute. The pulse is less frequent as the stature is greater, about four beats for a half a foot in height. Muscular exertion increases its frequency. It is slower during sound sleep. The difference between standing and lying, in the former is one-fifth of the whole, in the latter one-eighth. In actively breathing birds the pulse beats 100 in a minute.

See page 220 for pulse of lower animals.

Pumice Foot: see page 800.

Pumice Stone, a substance frequently ejected from volcanoes, of various colors, as gray, white, reddish, brown or black. It is used for polishing varnished surfaces, highly varnished wood and other delicate work. It is used both in powder and the lump. It is capable of putting the highest polish upon materials of any known substance.

Pump, a contrivance for raising fluids through pipes. The simplest and most common form or style is that of the ordinary lift or suction pump. It is of great antiquity, being invented in 120 B. C. The force pump differs from the common sucking pump in having a solid piston-head without a valve, and the spout attached below the piston. By suction the water cannot be brought from a depth of more than 33 feet below the piston, but it can afterwards be sent up to any height desired in a pipe. These two contrivances are sometimes combined.

We wish to make the following practical suggestions in buying pumps and keeping them in order: The value of a pump is determined by its durability, simplicity, the ease with which it operates and its protection from frost.

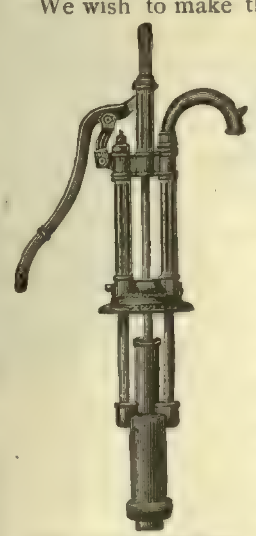


Fig. 1.—*Cistern Pump.*

Before buying a pump find the exact distance from the top of the platform to the bottom of the well. Also learn the depth of water in the well during dry seasons. Do this that you may be able to tell what kind of pump to get and its length. Never put a pump in a well of greater depth than it is designed for. Should you do this it will be an expense and annoyance to you, and will never work easily. The cylinder should never be over 20 feet from end

of suction pipe, for the pump to work easy; therefore, after ascertaining the depth of the well, select the pump suited for that depth, of such size of cylinder as may be desired.

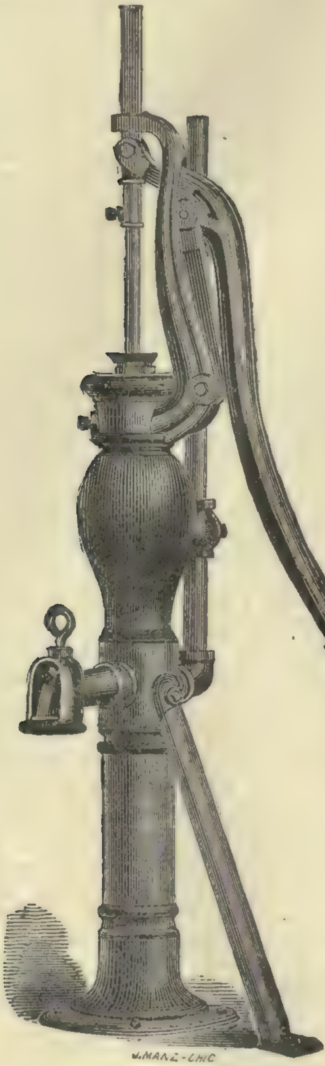


FIG. 2.—*Force Pump.*

See that the small waste hole is open to prevent freezing.

Always allow at least 6 inches between the bottom of well and strainer. Never let the cylinder or end of suction pipe or strainer rest on the bottom of the well, as sand, dirt or gravel are liable to be drawn into the cylinder and destroy the valves.

It is advisable to use a foot valve on the bottom of the suction pipe when the pump is required to draw water a long distance.

The platform should be made of 1½-inch lumber and firmly secured to top of well.

If the pump loses its priming and the water runs down, the trouble is always below the plunger. Either the check-valve in the bottom of the cylinder is worn out or something has lodged under it preventing its closing down on the seat perfectly, or the bottom of the cylinder is not screwed on tight. Either of these causes, although not the fault of the pump, will prevent its working perfectly. If, on examination, you find that a piece of gravel or dirt has lodged under the check-valve, the suction pipe is probably set too close to the bottom of the well. The valve should wear for years, but if after long service it becomes worn out it should be replaced with new, solid leather.

FIG. 3.—*Windmill Force Pump.*

If the pump works hard, and the handle on being pushed down is inclined to jerk back, the suction pipe or strainer is stopped up and will not allow the water to enter the cylinder freely; in such cases it will usually be found that the lower end of the suction pipe or strainer is embedded in the sand or mud at the bottom of the well, or that something floating in the water has stopped up the entrance to the pipe.

If the pump does not throw a full stream, and the water comes out of the spout foamy, some of the joints are not screwed up tight and they leak air.

Fig. 1 represents a short cistern pump, with 3-inch cylinder, 2 feet below the platform. It is well adapted to be set upon a sink or stand in the house, and is very convenient by the use of hose for filling reservoirs on the stove, or tubs at a distance from the pump, as well as a means of protection against fire.

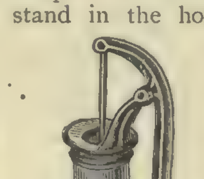


FIG. 4.—*House Pump.*

Fig. 2 represents a force pump suitable to wells from 10 to 200 feet in depth. It is made by the Stover Wind Engine Co., Freeport, Ill.

Fig. 3 represents a force pump with cylinder several feet below the platform. It may be attached to a windmill. This and the one represented by Fig. 1 are made by Mast, Foos & Co., Springfield, O.

Fig. 4 illustrates a good iron pump, suitable for household purposes. It is made by the Sandwich Enterprise Co., Sandwich, Ill.

Pumpkin, large, coarse edible fruit of the gourd family. Both the vine and fruit are the heaviest of all the gourd order. In the early settlement of this country, and especially of the Northwest, the pumpkin was extensively cultivated for culinary purposes, but of late has been very largely supplanted by the squash for this purpose. It is, however, very generally raised, usually among corn, as food for stock. The cultivation is the same as that of the squash, which see. The principal varieties are as follows:

SWEET. Small, but best for stewing and for pies.

LARGE CHEESE. Like the crook-neck squash; fine for cooking.

CONNECTICUT OR LARGE FIELD. Best for stock.

MICHIGAN MAMMOTH. A heavy cropper; soft-shelled; good for stock.

NEGRO, or NIGGER. Small, dark-skinned; the pumpkin from which New England grandmothers made their famous pumpkin pies.

TREE. Grows in bush form and bears its fruit in a cluster near the base; good for pies.

Pupa, an insect in the state intermediate between the larva state and the fully developed.

Purging, free and excessive alvine discharge: see Cathartics.

Purslane, often called "pursley," is perhaps the most common weed in rich, cultivated grounds. It is a member of the Portulaca family, has fleshy, mucilaginous stems and leaves and yellow flowers, and grows almost prostrate on the ground, forming a heavy mat. Pigs are very fond of it, and it is doubtless good, nutritious food for them. It is sometimes used as greens, being boiled with meat and vegetables, especially with mustard, to give the mess some degree of piquancy. Medically it is reputed to be a cooling diuretic.

Purulent Matter: see Pus.

Pus, foul matter which collects in a diseased part; as in a common boil. It varies in appearance and consistency and chemical composition according to the nature of the sore which forms it. In bad and refractory sores it is thin, transparent, acrid and fetid; and in a healing or well-conditioned one, it is yellowish-white, creamy, opaque, bland and inodorous. Healthy pus, as the latter kind is called, is insoluble in water, is thickened but not dissolved by alcohol and has a specific gravity of 103. It forms a soapy whitish fluid with soda or potash, a transparent jelly with ammonia, and seems to be more nearly allied to albumen than the other animal principles. The distinguishing of pus from catarrhal mucus is important in diagnosis of chest diseases, and may be effected by means of the following tests: when the two are mixed with water, the pus sinks and the mucus floats; when the two are separately dissolved in potash, the pus is precipitated by water, and the mucus is not; and when they are dissolved in sulphuric acid and water is afterwards added, the pus subsides to the bottom, and the mucus continues in suspension.

Putrefaction, the spontaneous and ultimate decomposition of organic substances. The more nitrogen there is in the substance the more rank and repulsive is the odor.

Pyrometer, an instrument for the measurement of temperatures above those which we are able to estimate by the mercurial thermometer. Mercury boils at 660°, above which point it is incapable of measuring heat, although many temperatures connected with the most common processes are greatly above this point; as, for example, the heat of a common fire, the melting of iron, silver, copper and gold.

Q

QUAIL, a most excellent bird of the Partridge family and of the same order as the domestic cock, prairie-chicken and other grouse, turkey, etc. There are several species, but the most important is known as the quail in the North and partridge in the South, and scientifically as *Ortyx Virginianus*. It is also known in many sections as "Bob White," deriving this name from the note which the male gives utterance to. Its clear whistle is composed of three notes, the last being the loudest. In the summer when his mate is sitting and in the early fall, the male bird sits on the fence or on a low tree and whistles "Bob White" for an hour at a time. They have quite a variety of notes, which they utter when several of them meet, as if in social converse. It is ten inches in length; the prevailing color above is a brownish red, the under part white, tinged with brown before, and marked with obtusely V-shaped spots of black; the head is beautifully marked with pure white and black. The female has the white markings of the head replaced by brownish yellow, and the black wanting. They build their nest near a tuft of grass, and lay from 10 to 18 pure white eggs.

The Mountain quail of California is the largest and perhaps the most beautiful of all the varieties. Besides these are the Texas quail, Arizona quail or Gambel's partridge, and the Valley or Meadow quail.

In fair weather, the favorite feeding ground of the quail is on the wheat stubble, and generally not far from a brook or slough, if there be one in the field. It is protected, in certain seasons, in almost every State by law.

Quarter, the fourth part of anything, or the division of a carcass comprising one of the limbs; or, 25 or 28 pounds weight, according as the "hundredweight" is reckoned at 100 or 112 pounds; or a measure of grain equal to eight bushels.

Quicksilver, mercury. See Mercury.

Quidding, throwing out of half masticated food from the mouth by horses, as illustrated by Fig. 54, on page 758. It is caused by some disease, or soreness of the mouth.

Quills, the hard and strong feathers of geese, swans, turkeys, crows, ostriches and some other birds. In former times the quill was in general use for writing and drawing, and consequently much more sought than at present.

Quince. This fruit in its raw state is not fit to eat, but is excellent when cooked, made into marmalade, preserved or served with other fruits; dried quince is a good article of diet. The tree seldom grows higher than 15 feet, and when properly grown and laden in the fall with its golden fruit, is very ornamental. It has large white and pale pink blossoms, which appear rather later than those of other fruit trees.

Propagation and Cultivation. The quince is easily propagated from seeds, layers or cuttings. From the seeds, however, it is somewhat liable to vary in its fruit, sometimes yielding the apple-shaped and sometimes the pear-shaped variety. Budding upon free-growing sorts, as the Angers, is often practiced, but perhaps the best method is to prepare cuttings in autumn, heel them in for the winter, and plant them in a shaded situation in very early spring. Quince stocks are extensively used in engrafting or budding the pear when it is wished to render that tree dwarf in its habit. Moist but well-drained ground is the best for the quince. High land is better than low, and it should be kept rich and mellow. As to aspect, a northern exposure is said to be best. For a fertilizer, salt, iron cinders or coal dust, or perhaps better all three, are recommended. Look about the roots and trunk of the tree two or three times a year for the borer, probing for him and destroying with a wire.

Varieties. The three best varieties of quince seem to be the following:

Angers. A strong, rapid-growing sort, an abundant bearer; fruit large, of fine quality, but does not cook quite as tender as the Apple quince; will keep longer; flesh a little harsher and more acid.

Orange, Apple, or Apple-Shaped. Large, roundish, with a short neck; bright, golden yellow; fair and smooth; ripe in October. Tree has rather slender shoots and oval leaves; very productive. This is the variety most extensively cultivated for the fruit.

Rea's Mammoth, a very large variety of the Orange Quince; a strong grower, healthy and productive.

Quinine, an alkaline, uncrystallizable, whitish substance, the active principle of cinchona or Peruvian bark. It is the greatest remedy known for intermittent diseases, and is taken quite successfully as a tonic. A full dose for an adult is from 10 to 15 grains, but as a tonic from 1 to 2 grains is sufficient. The dose for a horse is from 20 to 40 grains three times a day. It is good in influenza, lung fever, etc., but is too costly for general veterinary purposes.

Quittor: see page 800.

R

RABBET, a rectangular cut made upon the edge of a board, iron or wheel, so that it may be kept from sliding off in one direction; also, a sloping cut made in the edge of a board to form a joint with another board similarly cut. The word is also used to denote the action of making such a cut.

Rabbit, a species of gnawing quadruped of the hare genus. It nestles in brush and in the trunks of trees, and often ascends their hollow as far as their branches. The Gray rabbit is common throughout a large part of the United states, is fifteen to sixteen inches in length, the general color yellowish-brown with a tinge of reddish, the lower parts pure white. It does not turn white in winter. When first started, the Gray rabbit runs with great swiftness, but soon stops to listen. It is well known to hunters that they can stop it when first startled, by whistling. If pursued, and if the woods be open, it enters the first hole it can find. It often falls a prey to the weasel, as well as to other larger enemies. Its flesh is excellent food.

Domestic Rabbits. While the name rabbit is applied to several species of this animal in this country, it is probable that there is no genuine North American rabbit, but our species of this genus are hares. They do not construct burrows, as does the true rabbit, and are mainly solitary in their habits. All of our domesticated rabbits are therefore imported.

Dutch Rabbit. The most hardy of all the domestic rabbits is the common white and black or Dutch rabbit. This is the smallest variety but its flesh is more delicate and palatable than the larger kinds. It is occasionally gray, slate color, yellowish or brindle, mixed with white. The white is in a ring around the neck, a streak up the face, and on the tip of each foot. The does of this variety are excellent mothers, and will foster and rear young ones not their own without the least objection, and being good feeders, can take care of a large litter without any trouble. They produce from five to seven young at a litter, and when full grown will weigh from three to five pounds.

The *Lop-Eared Rabbit* is the most popular of all varieties; it is remarkable for the length of its ear, which sometimes reaches 21 or 22 inches. In color this variety differs greatly; in fact it may be said to be of all colors, but the tortoise shell is a favorite and somewhat rare color. It weighs, when in good condition, from 10 to 12 pounds.

Silver-Gray Rabbit. This is an Asiatic variety, being a native of Siam. They are plump and solid and weigh from six to nine pounds. When young they are black, but as they grow older white hairs appear mingled with the black, and at maturity they are a solid silver-gray, except at the tip of the nose.

The *Belgian Hare Rabbit*, which is of a solid reddish color, is the largest variety known; it reaches a weight of 10 or 12 pounds when fattened. They are easily kept, are excellent feeders, are docile and not pugnacious although timid, and are alarmed even by a mouse.

The *Himalayan* or *Chinese Rabbit* is a beautiful little animal, being mostly pure white, excepting on the ears, the tip of the nose and the feet, which are black. They weigh about five pounds when fully grown and fat. They are not difficult to rear if caution is taken to protect them from the sudden changes, and provide them with warm pens and nests.

There are several other varieties known to fanciers. The so-called Patagonian, a cream-colored rabbit from Savoy, is very large. The Angora, like the goat of that country, has long, silky fur, which has to be combed to keep it in good order.

The *Common rabbit*, which is of all sizes, shapes and colors, is the most frequently met with. It is a cross breed in which the most common varieties have mingled until it has no distinctive mark. But although common in every respect, it is far from useless, because it is the best kind for a person who wishes to raise rabbits to begin with, and a pair may often be procured for such a moderate sum as to be within the means of almost any country boy who has the most meager supply of pocket money.

Care and Management. In beginning to keep rabbits, one should avoid the mistake of attempting to rear the rarer and more expensive, as well as the less hardy varieties. The common gray or black and white rabbits can be procured cheaply, and a hutch made of a few boards and laths will be a cheap and yet sufficient lodging. When these can be kept successfully, all the difficulties conquered, and a good stock of experience has been gained, then the stock may be increased, and the more desirable varieties kept.

In selecting rabbits, those about six months old should be procured, and kept for three or four months before they are paired. Young rabbits are to be known by the short claws, which do not project beyond the fur of the foot, and by the small teeth. A healthy animal is known by the clearness and the

pure white color of the eye. The appearance of a yellow tinge to the white portion, with a swollen or pot belly, are signs of bilious disorder and deranged liver, which is the most frequent and dreaded disease. This is caused by over-feeding on soft, wet food. In good health the droppings are in round balls, having no disagreeable odor when fresh, and the animal is lively and sprightly. Three does and one buck are a safe number to begin with, although six or eight does may be mated with a single buck.

The essentials in rearing and keeping rabbits are warmth, dryness, good food in moderation, and perfect cleanliness of the lodging.

The general management of rabbits varies with the manner in which they are kept. The most hardy kind may be kept out of doors the whole year, and indeed any variety may be kept in open courts in mild weather, if warm shelter is provided during storms.

Soft, short oat straw or chaff, or pine sawdust is the best bed. Clean oat straw will be eaten very readily, and the refuse will serve for litter. The feed should consist of some sliced ruta-baga, carrot or cabbage in the morning; whole oats or crushed corn will make the evening meal for full-grown animals. Young rabbits require crushed oats and bran, or ground oats and bran as usually used for horse feed. Sweet, fine meadow hay, dried lawn clippings, or clover, may also be provided for them. Peas or corn steeped in water and the water poured off are good food for fattening, and two tablespoonfuls a day will be sufficient for a full-grown rabbit. In cold weather a supper of thick corn-meal mush, given warm, but not hot, will be beneficial; barley and cut potatoes boiled dry and mixed with corn meal or linseed meal, may be given for a change. The feed should be given three times a day, and only so much as will be eaten clean. A pinch of sulphur and salt should be given once a week. A bed of chiccory may be grown for them, and dandelions are also useful. Very little water is needed, but if some is offered once a week, a sip or two may be taken. A little warm, sweet milk is very acceptable to them, but the dish should be removed as soon as they have taken what they wish.

Rabbits should be paired first in February or March. The does should not be bred until five or six months old, and four litters in a year are as much as should be raised. The buck should not be left with the doe at coupling for more than a few minutes. When the doe is about to litter, she will begin to make a nest by carrying hay and straw to a corner of the pen. When this is seen, the pen should be at once thoroughly cleaned and disinfected with a little chloride of lime or diluted carbolic acid, and then sprinkled with fine sawdust. The dates of littering may be known by adding thirty days to the record of coupling. The day before littering a dish of fresh water should be given to the doe, and this will prevent the killing of the young, which is said to be caused by the intense thirst experienced at this time.

No dogs or strangers should be permitted near the pens, and every movement should be so quiet as not to startle the doe, which is now very excitable. The young rabbits should never be touched. If any die, the doe will bring them to the door of the pen. Nursing does should have warm milk and bread given liberally morning and evening for the first three weeks; after that, carrots cut into slices, and thick corn mush, and soaked—but drained—peas may be given. After fifteen days the young rabbits may be seen peeping out of the nest, and in three weeks should be removed to a clean, warm pen. When a month old the young will leave the nest and will begin to feed with the dam. After two to four weeks more they may be removed, one at a time, so as to dry up the milk gradually. A little salt may be given to help dry the milk. After they are four months old, the young rabbits will begin to quarrel and fight, and should be separated, the bucks being put into separate pens, and the does left four or six weeks together, until ready for breeding.

At eight weeks old the young rabbits molt, and then require a little extra care. Some crushed oats, fresh carrots, and plenty of fresh, but not cold, air should be given at this time. Young growing rabbits will eat constantly, and should be provided for liberally. By carefully observing them, their habits will soon be learned, and all their necessities soon discovered. Prompt attention should then be given.

To Prepare and Cook Rabbits. Skin the rabbit. First cut off the feet and the tail; cut the skin down the belly and around the neck; begin at the head and draw the skin off whole; open it and take out the entrails; be sure and get them perfectly clean; put them into cold water and let them soak until the blood is all washed out; then have a dressing made as for chicken, fill the bodies and sew them up. Roast or bake them the same as other game, basting often with butter. They require about an hour to cook. Make the gravy of the drippings with a little butter, salt, flour, and some currant jelly if you choose.

Baked or Pot-Pie. The same as for pigeons or chicken.

Rabies: see Hydrophobia; for rabies in the horse, see page 801.

Race, a variety or breed of horses or cattle or other domestic animals; also, a trial of speed between two or more animals, particularly between two or more horses.

Racing. This term is understood to mean a trial of speed under stringent conditions or rules, and in the way of public amusement and gaming, between two or more trained race-horses. We refer to the speed made by the fastest horses on this continent since racing has received any considerable attention, in the article Speed; and in that of Horse, have treated the breeds of horses generally used for racing, and therefore have little to say here. The general spirit of the race-course, however, certainly has a demoralizing and immoral tendency upon the young. It is this feature in the State and county fairs that has

caused so much discussion in every State and county and has been a detriment to the farmer. Traveling jockeys have taken the money that should have been distributed among the home producers. Not only that, but they have taken the money of the young men (and many older ones, too, that should have known better) in the way of bets. Never permit yourself to wager money on race horses; for though you may be a judge capable of selecting the best horse, you must remember that it is but seldom that the race is really a test of the speed of the respective animals. It is almost always arranged beforehand which horse shall win the respective heats and the race. Knowing this, the jockeys send out men to make bets in their behalf. Thus not only are the large purses captured but hundreds of dollars are carried away through the medium of bets. Therefore, never risk your money on horse-racing, especially of this character; for if you do it is rarely ever you win.

We are aware that horse-racing is very popular with many; and none can deny that it is a grand and exciting scene to witness several magnificent specimens of this noble animal flying through the air, as it were, exerting every muscle and straining every nerve, and seeming to enjoy the contest as much as the enthusiastic spectators. Certainly such a scene will attract the attention of almost every lover of the horse; but what is it all for? We do not require fleet, long-winded horses as they do on the deserts of Arabia, or the dashing speed needed on the plains of South America; and therefore these contests are not to develop any useful merit in the animal, but simply to gratify an abnormal desire of merciless men and women. As above remarked, the moral tendency of the race-course is evil, and one of the most demoralizing outgrowths is that of learning young men to be reckless with their money. The habit of betting once contracted the train of evil that follows it will often prove disastrous, morally and financially. On this basis, more than any other, is the race-course to be condemned.

Rack, a frame for holding articles like a box, or large chamber: see page 215.

Radish, a plant of the mustard family. The radish is supposed to be a native of China, but has long been cultivated here. They contain little else than water, woody fiber and acrid matter, which resides in the external part; they cannot, therefore, be very nutritive, and are very hard to digest. For summer use sow in early spring, either broadcast or in drills, taking care not to sow too thick and sow in soil which is well pulverized to a good depth; cover the seed a half an inch deep; water frequently in dry weather: the more rapid the growth the better the quality; for a succession, sow every two weeks. The olive-shaped varieties are more tender, sweet and early than the long kinds, and not so apt to be worm-eaten. As soon as the plants are up commence sprinkling freely with ashes, to keep away the little black fly.

Fig. 1.—*Extra Early Red Turnip Radish.*

Fig. 2.—*Golden Globe Radish.*

Varieties. *Red Turnip-Rooted.* A standard early variety.

White Turnip-Rooted. For summer and winter use. Sow in summer.

Yellow Turnip. Rich color; early.

Olive Scarlet. Early, quick growth, tender, handsome.

French Breakfast. A beautiful variety of the Olive Scarlet, white at the extremity.

Wood's Frame. Excellent for cultivation under glass; in shape between Olive and Long.

Chinese Rose Winter. Best for winter use.

Black Spanish Long, and also the *Round.* Good for winter use.

White Russian Winter. Largest of all for winter use.

Figs. 1, 2 and 3 illustrate the best new varieties.

Fig. 3.—*Long Scarlet Strap-Leaved Radish.*

Rag-bolt, an iron pin with barbs on its shank to retain it in its place.

Ragout (ra-goo′), a dish made of fragments of meat, sometimes of more than one kind, mixed, stewed and highly seasoned. Differs from hash only in not having vegetables cooked up with it.

Ragout of Cold Beef. Slice rare cold beef thinly; put a piece of butter the size of an egg into a frying pan; lay in the slices of meat and brown it slightly; add to it a blade of mace, or a little nutmeg, Cayenne pepper and salt, a wine-glassful of mushroom catsup and a tablespoonful of browned flour; stir all together over the fire, and add ½ pint of the broth made of the trimmings of beef, and simmer 5 minutes.

Ragouts of other meats may be made in a similar manner, and those who are not prepared to add all the ingredients above mentioned can make the dish palatable enough in a simpler style. Some go so far as to add Port wine and a little browning to their ragouts.

Rail, a piece of timber or metal extending from one post or fastening to another, as in fences, balustrades, staircases, etc. Also, several species of water-

fowl, of the order of Waders. The most common species in this country is of a greenish-brown color above, and ashy blue with white markings below. Next are the Virginia rail, the Clapper rail or mud-hen, the King rail or marsh hen, and the Little Black rail, most of which range near the ocean.

Rain: see Climate and Weather.

Rain Gauge, a graduated vessel for measuring the amount of rain which falls during each storm. Sufficient exactness can be attained by setting out into an open place, uninfluenced by objects on the ground (on the top of a building is a good place) a cylindrical vessel. After the rain is over the number of inches (and fraction) of depth of water in the vessel will indicate the average amount of rain for that section.

Raisins (ra'zns), dried grapes, especially certain kinds of grapes dried in a particular manner, so as to produce a highly flavored sugar. Raisins are used in so many culinary preparations and in so many ways that we cannot even enumerate them here. The skins and seeds are indigestible and yet innoxious. The fresher this fruit is the better. Old raisins become sour and wormy. Raisins stewed with other fruits make a very good sauce.

Rake, a toothed implement for gathering hay, cleaning stubble, pulverizing small beds of soil, covering small garden seeds, etc. This implement as used in making hay is described in that article. The sharp-edged lawn rake has been replaced, since the introduction of the lawn mower, by one similar to the old hay rake, only with teeth much closer. Likewise six and eight inch rakes in company with wheel hoes have displaced the common rake for gardening purposes.

In purchasing a garden rake it is false economy to select a cheap cast-iron one, instead of the lighter and stronger steel implement. See that the handle is long, tough and flexible, for in manipulating the soil, the backward movement is of greater importance than the forward one. In wooden rakes the handle, and especially the teeth, should be of tough, second-growth wood.

Rake Head, the cross bar of a rake, which holds the teeth.

Ram. A hydraulic or water ram is an apparatus for raising water several times higher than its source by the momentum of the current, in successive beats or strokes. A battering ram is a heavy beam which is thrust endwise against an object. The word also means a male sheep, known also as a tup and buck. This word however, and that of doe for the female, are incorrect, as they only refer to the deer. See Sheep.

Ramie (ra-mee'), or **Grass-Cloth Plant,** is a member of the Nettle family from China, valuable for its textile fibers. It is a perennial and grows three to four feet high, with ovate leaves, which are white-downy beneath. Within the last 20 years it has been extensively planted in the South. The chief objection to its manufacture lies in the difficulty of economically separating the fiber. In India and China, where labor is so wonderfully cheap, the cost of separating the fiber is said to be about $150 a ton, and the product in England is valued at $375 a ton. Ramie fiber differs from that of other members of its family, in that it cannot be separated from the stalks by the usual rotting process; and the English have succeeded in inventing machinery, which they keep secret, that cuts off the fiber by a complication of knives, and they are therefore monopolizing the trade in Europe and in this country. Almost all the dress goods, mixed with brilliant materials and imitating silk fabrics, are made in part of ramie.

Cultivation. The soil must be deep, rich, light, moist and well drained; and it must also be thoroughly cleared of weeds, plowed eight or ten inches deep, twice if possible, and thoroughly harrowed. Plant, in winter, the roots, "ratoons" or rooted layers, which have been carefully cut, and not torn, from the mother plant. Furrows five or six inches deep and five feet apart are opened with the plow, and the roots are laid lengthwise in them, in close succession if the fiber is the object; for nursery purposes they are given much more room. These are covered with a hoe, and during the spring and summer are cultivated like corn. The stands are thickened by layering, so that after the first cutting the stems grow smooth and straight.

Rancid (ran'sid), having a rank smell; strong-scented; sour; musty; as, old oil or butter. To prevent and rectify rancidity, see the respective articles.

Range, a word of considerable "range" of signification. Following are those coming within the scope of this volume:

1. A Cooking Apparatus. This is a large cooking stove, with reservoirs for heated water. More strictly, a kitchen range is an extended cooking apparatus of cast iron, set in brick work, and containing pots, oven, etc. They are needed only in establishments where a great amount of cooking is done, as hotels, boarding-houses, etc.

2. Distance of Shot; the horizontal distance to which a shot or other projectile is carried; sometimes, though less properly, the path of the shot, or the line it follows from the gun to its final lodgment.

3. Pasture; the extent of land over which live stock usually wander; as, cattle range.

4. Direction from a Given Meridian. In the land system of the United States, the term is applied to a row or line of townships lying between two successive meridian lines six miles apart, and numbered in order east and west from the "principal meridian" of each great survey, the townships in the range being numbered north and south from the "base line," which runs east and west; as, township No. 6 N., range 7 W., from the fifth principal meridian. See Township.

Rape, or **Colewort,** a plant resembling the brown

mustard and used for greens. The seed, which also resembles that of the mustard, yields oil, and is fed to caged birds.

Rash, or **Nettle Rash:** see Hives.

Rasp, a kind of coarse file, on which the cutting prominences are distinct, being raised by the oblique stroke of a sharp punch, instead of a chisel, as is the case with a file. Every farmer needs one for rasping iron and another for rasping wood.

Raspberry. This most excellent fruit is fast becoming a favorite, both as a delicious edible fruit and as a profitable and easily cultivated variety. The cultivation is simple, the yield generally large and the market price sufficiently high to make its culture generally profitable.

Propagation and Cultivation. The raspberry is propagated by suckers or new plants from the tips of the canes, some varieties mainly by one process and some by the other. The black-caps, yellow-caps and purple cane varieties are generally propagated by lightly burying the tips of the canes in the latter part of August or the beginning of September. If unmolested, however, they generally succeed in reaching the ground spontaneously, but in the garden the process can be advantageously aided by the hoe. The red varieties, not counting the purple cane, propagate themselves mainly by suckers, that is, plants from the roots. Some of the red varieties indeed are so given to sprouting in this way that the tendency is considered a serious objection to their cultivation. The raspberry can also be propagated by sections of the roots two or three inches in length buried in the spring: this method is virtually that of forcing suckers.

Transplanting is generally done in the fall, and in the spring it is almost impossible to get at them before vital activity commences and the plants are somewhat sensitive or tender. If the two fields are near together, however, the young plants can be taken up early in the spring, with as much earth attached to the roots as possible, and transplanted with as great success as in the fall; but some horticulturists wait in the spring until the young shoots are about six inches high before setting them out.

The best soil is a deep, rich loam, kept tolerably moist. In those sections of the country which are subject to drouths it is advised to water the ground by pipes running underneath the surface and supplied by wind-mill pumps. The raspberry is very dependent upon an abundance of water. The better varieties are said to yield the best and most fruit if grown on the north side of a tight board fence, in the latitude of Iowa, while the poorer varieties do better on the south side of the fence.

The distance between rows, and especially of the plants in the row, depend a great deal upon the kind of plants and style of cultivation contemplated. Western gardeners generally adopt the "hedge" method, making every row a hedge as compact as possible, one to two feet wide, to keep down the weeds and grass and for mutual support of the branches in fruit. Large and bushy varieties should be set about three feet apart in the row in rows eight or nine feet apart, while the lighter-growing kinds may be set 18 inches apart in the row, in rows about six feet distant; but in each case every rod or so there should be left a space wide enough for a wagon-track. It is the practice of some to put several plants in each place, thus making a broad and heavy stool. As soon as the plants are set mulch heavily with straw, stable manure or litter, which has no grass seed. Some gardeners think it is better to put it on from 6 to 12 inches deep after the first season, for winter protection, keeping the ground moist and preventing the spattering of loose earth up upon the ripe fruit by rains. They take pains to press this mulching in between the canes. The second season the mulching is either left on the ground and the weeds pulled by hand as they appear, or it is removed somewhat and clean cultivation given. This cultivation should always be shallow, and with the strong-suckering kinds so managed as to cut off the suckers as much as possible. Deep plowing injures the roots. Some give clean cultivation from the start. In all cases level cultivation is advisable.

As to pruning, there is a great difference of doctrine as well as of practice among Western horticulturists. Amateur cultivation, of course, contemplates a great deal more care than can be expected in ordinary field culture, which is followed only for profit. It is generally advised, however, to give the plants at least two pinchings or clippings a season,—the first in June, to keep the principal canes shortened back, and the second later, to shorten back both the principal canes and the branches. The smaller kinds are kept back to about 2 or 2½ feet, and the larger kinds to 3 to 4 feet, while the branches are shortened back to 10 or 20 inches respectively. The second pinching of the branches leave them 3 to 6 inches longer than the first had. This plan, of course, is more necessary with the large-cane varieties. The Antwerps, Black-caps and Purple Canes are often neglected until the March following, when the scythe or shears or knife is very liberally used. Directly after the fruiting season is over all the old and useless wood should be cut out, leaving, among the strong-growing kinds, the canes 10 to 15 inches apart. By tying the Black-caps to stakes and careful pruning and adjustment, the branches will be more evenly distributed, an advantage in respect to both the appearance of the hedge and the amount and quality of fruit. Bear in mind always that the main point in training is to bring the foliage into the direct sunlight as much as possible.

As the raspberry field should be renewed every few years, a good general plan is the following: Plant the Black-caps in rows about 9 feet apart and about 2½ feet apart in the row; raise the first season cabbage, beets or some other early vegetable between the rows; the second season plant strawberries midway between the rows, keep them clean and let the runners run as they please; after that cultivate only

with the scythe. In this way full crops of both raspberries and strawberries may be realized for five or six years, when all may be plowed under and the ground planted to something else. In this method summer pruning is superseded, the old wood being broken down in the spring. They are left standing through the winter, to protect the younger plants.

Continuous cold east winds in the spring are thought to blast the raspberries.

VARIETIES. It is a good plan to have a trial bed for new varieties, and not plant extensively of any of them until they are fully tried.

Brandywine. Large, bright red, firm, beautiful; good for shipping a long distance, and is one of the most profitable varieties in Central and Southern Illinois; prolific, but not a strong grower.

Bristol. A variety by this name does well in some places.

Burns' Seedling. This is a new variety which promises well for the West. It originated at Manhattan, Kansas.

Clarke. Large, conical, rather soft, juicy, sweet; grains large, quite hairy, bright crimson; canes very strong, vigorous, upright; spines purplish, rather long and stiff; foliage large, flat, thick, and endures heat and cold better than any European kind we have; better suited to light, sandy soil, not entirely hardy, yet a good variety for Northern Illinois. It is one of the Antwerps.

Cuthbert, Queen of the Market. Fruit hardly as rich as that of the Turner, but is large, of a bright red color, very firm, and the variety is immensely productive; foliage thick and leathery and holds on well in autumn.

Davison's Thornless. This is a well-tested variety of the Black-Cap, being very profitable in the hands of some, but entirely abandoned by others. It is subject to an insect which causes a rust or blast on both leaf and stalk.

Doolittle's Improved Black-Cap is the best known cultivated black raspberry, and in the hands of many is still one of the most profitable.

Florence. This variety is hardy and productive, but is not yet very extensively planted.

Franconia. Large, obtuse conical, dark purplish red, of a rich and fine flavor; canes hardy, spreading, yellowish brown, with scattered, rather stout purple spines; leaves rather large, very deep green; suckers badly.

Ganargua. Very large, round oblong, very productive, fair to very good dessert and cooking and canning, but poor for market on account of its dirty looking color, having a thick bloom; does not sucker.

Gregg. Very large, round, black-cap, pulpy, good flavor, enormously productive, and one of the most profitable varieties for the West, if not altogether the most profitable.

Highland Hardy. This is scarcely distinguishable from the Kirtland, and is a profitable kind for Central and Southern Illinois.

Hudson River Antwerp. Large, conical, firm, rather dull red, with slight bloom, not very juicy but of a pleasant, sweet flavor; canes short but of sturdy growth, almost spineless, of a peculiar gray or mouse color; an old variety, not much planted at the present day.

Kirtland. Medium size, grains small, light crimson, slight bloom, tender, not very juicy or high flavored; separates freely; a vigorous, upright grower, not much branched; spines whitish, not very stout or numerous; the earliest to ripen; suckers freely; a most valuable early variety in Southern Illinois.

Mammoth Cluster, McCormick, Miami Black-Cap, Large Miami Black-Cap. Medium to large, obtuse conical, fair dessert, very good cooking and market; canes strong, vigorous, immensely productive, bearing large clusters outside of the leaves, on which account one can gather them more rapidly than any other variety; its grayish bloom hinders its sale among strangers, as it looks like mildew; somewhat late; subject to blight in some situations; under the management of some horticulturists it is the most profitable variety they can raise. Some think the Miami is a distinct variety, not quite so large as the Mammoth Cluster, but it may be confounded with the Little Miami Black-Cap, which is indeed of a more brownish red, not quite as sweet and not quite as late in ripening.

Miller's Daily. Large, juicy, and of excellent flavor; plant hardy, productive; and said to produce a few berries for several months after the fruiting season.

New Rochelle. Large to very large, juicy, subacid, blackish, with a clay-colored bloom, good dessert, best cooking, but poor for the market on account of its color.

Ohio Ever-Bearing. A black-cap variety, bearing fruit until very late in the season, on which account it is esteemed by some, but when not productive the picking is too tedious. It should therefore be very highly cultivated. The fruit is of very good quality.

Orange, Brinckle's Orange. Large, beautiful orange, a little soft, sweet, and of excellent flavor; canes strong, branched; spines white and strong; very productive.

Philadelphia. Medium to large, dark crimson or purplish red, rather soft, moderately juicy, mild subacid, but of a peculiar, unsatisfying flavor; separates freely, indeed, too freely, and is yielding its place to better varieties; canes vigorous, tall, branching, almost free from spines, and suckers most vigorously; subject to insects and in some places is winter-killed; its liability to the last calamity is thought to be due to the work of small insects which destroy the leaves in summer and prevents the ripening of the canes. With all these draw-backs some extensive growers make more money out of this variety than any other. It is very good for canning.

Purple Cane. Medium size, purplish maroon, slight bloom, soft, juicy and rich, good dessert, best cooking, but poor market on account of its softness.

Reliance. Good, moderately firm, hardy, and prolific.

Seneca, Seneca Black-Cap. Medium to large, purplish black, light brown, juicy, the sweetest and best of the Black-Caps; showy; canes vigorous and productive; spines reddish, strong and numerous.

Sweet Home. Same as the Mammoth Cluster except that the berry is a little longer, according to some.

Thwack. Very hardy, productive, canes short, not exceeding four feet; requires no pruning, but suckers extensively; fruit large, firm and good.

Turner. A red variety of the Antwerp class, and one of the most profitable varieties in Central and Southern Illinois. Should be planted in rows five or six feet apart, with very few canes to the hill and the hills about eighteen inches apart in the row; give clean cultivation and keep free from suckers, to which it is very subject. It is comparatively free from insects and the red rust; it ripens its fruit rather gradually,—too gradually when the crop is not heavy, as it makes the picking too tedious. This variety also fails in the hands of some gardeners.

Winant. A hardy and good berry.

The three best Black-Cap varieties for the latitude of Northern Illinois and Iowa are the Mammoth Cluster, Gregg and Seneca, and the three best red varieties are the Cuthbert, Turner and Kirtland. The Miami and Doolittle are among the best in the estimation of some; but so much is due to situation, season, and cultivation that no general classification of the "best" can be regarded as infallible.

Rat. The rat family comprises rats, mice, and their immediate allies, in all more than 300 species, some of which are found in every country on the globe. None are of large size, the muskrat being the largest, and some are the smallest quadrupeds known, except the shrews. There are four species of the genus *Mus*, or rats and mice, in the United States. These are the Norway or brown rat, the black rat, the roof rat and the house mouse.

Norway or Brown Rat. The common brown or Norway rat, now so extensively diffused over this country, was conveyed to England about 1750 in the timber-ships from Norway; and hence it has received one of its common names. Many years subsequently it was brought to this country in European ships, and has been gradually propagated from the seaports over the greater part of our continent.

The brown rat takes up its residence about wharfs, store-houses, cellars, granaries etc., and destroys the common black rat and mouse, or entirely expels them from the vicinities it frequents. To chickens, rabbits, young pigeons, ducks, and various other domestic animals it is equally destructive, when urged by hunger and opportunity. Eggs are also a favorite article of food with this species, and are sought with great avidity; in fact, everything that is edible falls a prey to their voracity, and can scarcely be secured from their persevering and audacious inroads. When attacked, and not allowed an opportunity of escaping, he becomes a dangerous antagonist, leaping at his enemy and inflicting severe and dangerous wounds with his teeth. The most eager cat becomes immediately intimidated in the presence of one of these rats thus penned up, and is very willing to escape the dangers of an encounter. The brown rat is amazingly prolific, and, but for its numerous enemies and its own rapacious disposition, would become an intolerable pest. Happily for the world, in addition to man, to the weasel, the cat and some species of dog etc., rats frequently find destructive enemies in each other, both in the adult and young state. The strongest of the species prey upon the weaker, and are the most merciless destroyers of their own kind. The cunning of these rats is not less than their impudence; it is almost impossible to take them in traps, after one or two have been thus caught, as the rest avoid it with scrupulous care, however tempting may be the bait it contains.

Black Rat. The black rat was much more common previous to the introduction of the brown rat than at present. It is now found only in situations to which the brown rat has not extended, and is almost as injurious and destructive, resembling it closely in manners and habits. It is of a deep iron-gray, and indeed nearly of a black color above, and of an ash color on the lower part of its body. Its legs are nearly naked, and on its fore feet, instead of the rudimental thumb, it has a claw. The length, from the nose to the root of the tail, is seven inches; the tail itself is almost eight inches long. The black rat was also carried from Europe to this country.

Roof Rat. The roof rat, or white-bellied rat of the Southern States, is smaller than the brown rat. It was originally from Egypt, where it frequented the thatched roofs of houses; hence its name.

Mouse. The house mouse, originally from Europe and Asia, is grayish-brown, finely lined with darker, passing into ashy lead, with reddish tinge on the belly; the feet are ashy brown.

To Destroy and Drive Away Rats and Mice. The preparations for driving away and destroying these pests are numbered by hundreds, so that it would be quite out of place to attempt to give all of them. We therefore will give a few of the effective. As above referred to, it is often very difficult to catch any considerable number in traps, however good the trap may be, for they are so cunning as to avoid them after two or three have been caught. The surest way to get rid of them, perhaps, is by some special poison, or by means of peculiarly scenting the traps. Arsenic has been extensively used for this purpose, but the fatal accidents which frequently occur when this poison is kept about the house render it a very objectionable resource. Whatever poison is prepared for rats or mice, it is well to place close beside it a shallow vessel of water. If the animal can obtain water it will drink as soon as it has swallowed the poison, and die directly on the spot instead of running to its hole, perishing there, and so causing a disagreeable smell.

Gum camphor placed about the haunts of mice will

drive them away: so will most odoriferous drugs.

Recent experiments have shown that squills is an excellent poison for rats. The powder should be mixed with some fatty substance and spread upon slices of bread. The pulp of onions is also good. Rats are very fond of either.

TO DRIVE RATS AWAY FROM A BUILDING. Dissolve 2 ounces glue, 2 ounces tincture assafœtida and 2 ounces potash in water, and add ½ ounce phosphorus to the mixture. Then, in a wire cage trap, baited with corn meal scented with oil of anise, catch two or three rats; if they are very numerous, more rats will probably be necessary; singe the hair partly off these in such a way as to hurt them as little as possible, then give them a slight coating with the above mixture, heated warm; let them loose into their holes, and there will be no more trouble with the rats for months to come. This mixture will last two years. Or, take chloride of lime, and scatter it dry all around and into their holes, and wherever they haunt, and they will leave at once.

Ferrets are very successful exterminators of rats.

As prevention is better than cure, it is wise to make all buildings rat-proof, which we show how to do in the article on Residence and elsewhere in this volume.

Ratafia (rat-a-fe′a), a fine spirituous liquor, flavored with cherries, apricots, peaches or other fruit and sweetened with sugar. It is made chiefly for the purpose of flavoring pies, puddings and other dishes.

Ratchet, a bar or mechanism turning upon a pivot while the other end falls into the teeth of a wheel or rack, allowing the latter to move in one direction only,—used for preventing backward movement, or for converting reciprocating into forward motion. A ratchet wheel is one with slanting teeth, which catch a ratchet, and is thus prevented from turning back.

Ratchet Wheel, a wheel cut with teeth like those of a saw, against which a click or ratchet presses, admitting free motion to the wheel in one direction, but insuring it against reverse motion.

Ratoon (ra-toon′), a sprout from the root of the sugar cane, ramie, etc., raised in the Southern States.

Rat-tail, like a rat's tail in form; as, a rat-tail file, which is round, rasped or roughened and tapering. The term rat-tail is also a name for an excrescence growing from the pastern to the middle of the shank of a horse. See page 801.

Rattlesnake, a snake with a series of horny buttons on the end of the tail, which rattle. More strictly, it is a snake of the genus *Crotalus*, of yaellowish-brown color, and having rattles, with which they make a noise on the approach of danger.

The common rattlesnake is three to four feet long, sulphur-brown above, with two rows of confluent, lozenge-shaped brown spots; tail black; it has but few teeth, and in the place of a couple it has a pair of sharp-pointed, movable fangs, so arranged as to convey poison from a gland at their base into the wound which they inflict upon an animal. It has a deep pit between the eye and the nostril. The snake is generally sluggish and never attacks animals unless disturbed or hungry; but the slightest noise will arouse it, when it will immediately coil, rattle violently and strike at whatever comes within reach. It never pursues the object of its anger, as some people imagine, but strikes on the spot, recoils and repeats the blow as often as it can until it ascertains that its enemy, real or imagined, is gone. Its food is young rabbits, squirrels, birds and toads, which it secures by lying in wait for them. The number of rattles do not indicate the number of years of age of this snake, as has been supposed.

The Diamond rattlesnake of the Southern Atlantic States is eight feet long.

The Prairie rattlesnake, or Massasauga, is of another genus than the foregoing, growing to the length of 20 or 30 inches.

The Copperhead and Water Moccasin are members of the rattlesnake family, but are of different genera from all the foregoing. The latter flourishes in the Southern States only and is more dangerous than the Common rattlesnake, as it hangs on low branches of trees over the water and attacks everything that comes along without giving the slightest warning.

As the country becomes more densely populated, all these venomous reptiles are gradually killed off, until they will finally disappear altogether. For the treatment of their bites, see page 101.

Razor. For instructions to hone, strap and keep razor in order, see Shaving.

Reach: see Coupling Pole.

Ready Reckoner, a book which contains extended mathematical tables, to supersede tedious arithmetical calculations. Many kinds have been published, but they are generally found to be more tedious to operate than the ordinary common-school method. To the farmer they are therefore of no practical value.

Reaper, a machine for cutting cereal grains, by means of horse labor. It is one of the grandest agricultural inventions of modern times. While as far back as 2,000 years ago there were machines used for cutting grain driven by oxen, yet it is only within the past quarter of a century that the modern machine has been considered a success. Inventors, however, have been triumphant in overcoming all obstacles and objections, and now the American reaper has a world-wide reputation.

The successful introduction of these machines was an immeasurable step in advance upon the old methods of cutting grass. They come in at a season when the work of a farm is peculiarly laborious, when labor is held at higher than the usual high rate of wages, when the weather is often fickle, either oppressively hot and trying to the physical system, or catchy and lowering, and they relieve the severest strain upon the muscles at the time of harvest. Our reapers are at the same time self-rakers. We can reap and gather

from 15 to 20 acres a day in the most satisfactory manner.

In 1870 inventive talent was earnestly directed to self-binding machines. The first successful attempt in this direction was the Marsh harvester, which cut the grain and carried it to tables at which two expert binders would tie the bands as fast as delivered, working from 8 to 12 acres per day according to the heft and standing of the grain. It will not be necessary to follow inventive talent further in the perfection of reaping machines: suffice it to say, the earlier inventions have been improved on and elaborated. Lightness of draft combined with great strength; the avoidance of undue friction, and last, motion; the power of starting with a clean cut in heavy, and, indeed, green and tangled bottom; automatic raking, and later automatic binding, and the delivery of the bound sheaves in piles ready for shocking,—all these points have been successfully elaborated within the last decade. Besides this, machines do not now easily get out of order.

Rear, to raise up the fore part of the body and stand on the hind feet only: said generally of horses.

Rearing, of horse: see page 712.

Receipts and Bills. One of the simplest transactions of business is that of taking a receipt for the payment of money. As a general rule, receipts should be taken for the payment of money, and a receipted bill in payment of all things purchased. A bill receipted is especially important when one is in the habit of buying on credit, for the most careful merchant may present you a bill you have already paid, and a careless merchant is more liable to do it. See that the bills are dated and signed. Examine the extensions and footings.

Red-bud, or Judas Tree, a low tree common in the eastern portion of the United States from latitude 41° southward. Its principal merit is in yielding a showy head of crimson flowers in early spring before the leaves appear. Its seed is produced in pods like peas. A European species has larger flowers, and is barely hardy in the Northern States except as a shrub, where it is sometimes set in the landscape. Still another variety flourishes in California and Texas.

Red Clover: see Clover.

Red Lead, the red oxide of lead; used principally in painting, plumbing and the manufacture of flint glass.

Red Pepper: see Pepper.

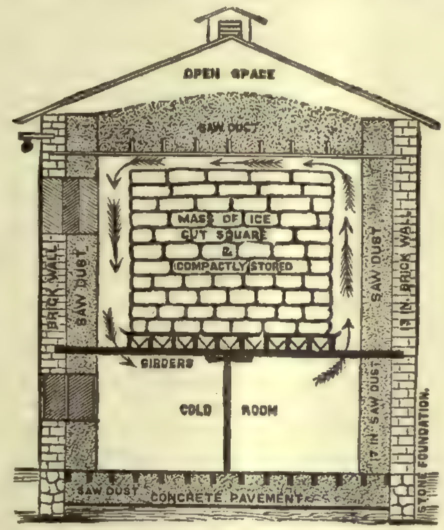
Red-top, a well-known grass raised for hay,—probably next in value to timothy: see page 598.

Red Water, a common and severe disease in cattle and sheep. For Sheep see that article, for Cattle see page 238.

Reel, the revolving frame of a reaping machine, to throw the standing grain against the knives; also the instrument attached to the but of an angling or fishing-rod for winding in the line: see page 479.

Refrigerant (re-frij′er-ant), cooling, freezing.

Refrigerator, a box for keeping articles cool in summer by means of ice. In the articles Ice and Ice House we spoke of the value of ice during the summer season, and gave instructions for building ice-houses, putting up and preserving ice. In connection with the plans illustrated in the latter article we wish to give a most excellent design for a large refrigerator, one which requires but one filling during the year. The plan represents a building 25 feet square, inside measure, and 22 feet from the floor of



A Large Refrigerator.

the cold room to the ceiling over the ice. The ice room is 12 feet high and the cold room nine feet. Pillars are required under the center of the ice. The opening for putting in the ice, shown just under the pulley in the illustration, has two doors, with a space between. Each door is a foot in thickness. The window in the cold room has three set of sash. The walls are 13 inches thick, of brick, lined with 17 inches sawdust. Thirty-six inches of sawdust are put on the floor over the ice.

The drainage of the ice is carried off by a series of V-shaped tin or iron troughs, which run between the joists, all of which carry the water to one point, where it is conveyed outside by a trap pipe. These troughs reach over to the center of the top of the joists, and are soldered together, so that no water will drip on the floor below. It will be seen that in this plan there is no sawdust or other preservative in contact with the ice, and the air of the room circulates around and over the ice. As long as the temperature of the goods stored is above the temperature of the room, there will be a gentle draft around the mass of ice, and of course all the moisture in the air, vapors and odors from the goods, will condense on the ice and pass off, so that you can keep milk, cream, butter,

fruits and meats all in the same chamber without danger of injuring the flavor of either. The atmosphere of the room is always dry, sweet and pure, and the temperature will range from 34° in winter to 36° in summer, and will preserve fruit perfectly from season to season. The ice does not rest directly on the joists; but there is a bed of oak lath, about 1½ by 3 inches, laid across the joists, about 4 or 5 inches apart, on which the ice is laid.

Rein, the guiding strap of a bridle,—generally used in the plural, as "the reins."

Remittent or **Bilious Fever.** This form of periodical fever is scarcely less common than the intermittent fever or fever and ague. It differs from it in being more violent in its attack, as well as in having its first and last stages less distinct, and its middle or hot stage of much longer continuance, so that the intermission is very short, and in some cases scarcely observable.

Marsh miasma is considered the general remote cause of remittent as well as intermittent fever. Thus it is mostly confined to low grounds or marshy districts, and places bordering on sluggish streams. The disease is more common in Southern latitudes and occurs mostly in autumn.

Symptoms. A sense of languor or debility, and relaxation, attended with lassitude and peevishness, or irritableness of temper. Generally there is a remarkably increased sensitiveness to cold, and shortly before the febrile paroxysms set in, there is a distressing tenderness of the skin, so that the slightest touch causes pain. At times, transient chills, alternated with slight flashes of heat, are experienced at this stage. These symptoms continue, longer or shorter, until finally the fever is fully established. The sufferings of the patient are now much enhanced by intense pains in the head, eyes, back and limbs, particularly in the bones of the legs. There is also an intolerable soreness of the flesh, lasting for many days. The skin is dry, and the mouth and eyes also lack moisture. The tongue is covered with a thick brownish-yellow fur, and the thirst intolerable. These symptoms, accompanied with a high fever, run on for a longer or shorter period, when they moderate down somewhat, or give way entirely, for a short time, to a slight perspiration. This remission generally occurs in the morning, and lasts only an hour or two, when another paroxysm, perhaps much more severe, sets in.

Treatment. If treatment is begun in the heat of a paroxysm, and the pulse is hard, full and quick, the first thing to be done for the comfort of the patient is to cool the surface, either by a cold shower bath, wet sheets, or sponging, as the strength of the patient, or other circumstances, may indicate. The paroxysm is usually broken up by this means, and a free perspiration and refreshing sleep will often ensue. The bathing should be continued until the desired effect is produced. An emetic composed of equal parts of lobelia and sanguinaria may now be given, and its operation promoted by liberal draughts of boneset tea.

If, after the operation of the emetic, the pulse be soft and, in the adult age, not over 75 or 80 to the minute, and the skin is moist, it may only be necessary to follow up the use of some diaphoretic drink, as the infusion of boneset, or the acetate of ammonia.

On the following day, a cathartic should be given.

The bowels must be kept free. As soon as an intermission is produced, and in cases where there is no delirium or tendency to congestion in the head, the best anti-intermittent tonics, as quinine, should be employed. When there is much headache or delirium, a mustard plaster applied to the ankles and nape of the neck, will be serviceable.

Rennet, a liquid preparation for coagulating milk. See page 246.

Renting. The renting of a farm is very fully discussed on page 430; the directions of renting or leasing is in article Lease, and the manner of keeping books where a farm is rented on the shares is shown on page 129.

Reservoir (rez-er-voir′), a place where anything is kept in store; especially, a place where water is collected and kept for use when wanted, as to supply a fountain, a canal, or a city, by means of aqueducts, or to drive a mill-wheel, and the like; a tank for holding hot water on a stove or furnace; a cistern; a mill-pond; a basin. See Stove.

Residence. The erection of a residence, the building of a house which one expects to call home, is certainly a matter of vital importance. Especially is this true to the farmer, who spends a much larger share of his time at home than do men in villages and cities, who are following other vocations. All of the conveniences, comforts and attractions possible should be provided for his family. There is no other place where the expenditure of money and labor will be so greatly appreciated and enjoyed as in the home. The lives of the farmer and his family are whiled away in their rural homes, and therefore every exertion should be made to please and accommodate every member of the household. With the proper care and due amount of attention, and perhaps with the expenditure of a little extra money, all the necessary conveniences and comforts may be provided, even for a small cottage.

A farmer should not begin the erection of even the smallest building without having previously prepared or adopted a well digested plan. He should not be satisfied with merely a general idea of the size and style of the building he wishes to erect. The style and plan of the exterior should be fully matured and every detail of internal arrangement should be determined before the ground is broken. The size and location of the various rooms, halls, closets, pantry, etc., and the exact place of doors, windows, stairway and chimneys should all be settled upon before commencing, or serious delay and much extra expense will be occasioned.

LOCATION. After having determined to build, one

of the first things, and a most important thing, to determine, is the location. We have discussed the location of farms in the article upon that subject, but there are several items to consider in locating a residence on any particular spot upon the farm. First among these is that of healthfulness. Very often the most attractive location, with reference to the surrounding landscape, is not the most desirable for the health of the family. This feature should not be overlooked by any means. Other things being equal, the site should be the most beautiful on the farm. If the luxury of a clear running stream, or a sheet of water in repose, present itself, it should be enjoyed if possible. The vicinity of stagnant swamps and marshes, the borders of sluggish streams, and situations where the soil is too retentive of moisture and cannot be easily drained, should be avoided. Elevated places in the immediate vicinity of marshes or swamps are liable to be quite as much affected by the malaria as the low grounds themselves.

The site of the dwelling should be dry and slightly declining, if possible, on every side. The north side of a high hill or ridge, where the direct rays of the sun are excluded during a greater portion of the time, is entirely unfit for a location of a residence. In a northern climate, a southern or a southeastern exposure with sheltering hills on the north is generally preferred. The house should be situated so as to present an agreeable appearance from the road by which it is approached or from the main points from which it is viewed. It should be so located that all the outbuildings may be easy of access. A grove or belt of well grown forest trees or evergreens to serve as a shelter, adds greatly to the value of the location. What the surroundings or landscape should be after the residence is built, is very fully shown in the article on Landscape Gardening, and that of planting trees for protection, in Forestry.

A good supply of water is essential, and should be one of the first things inquired about in choosing a spot to build upon. The supply should not only be abundant, but the water should be of the best quality.

Style of the Plan. The site selected, and the character of the scenery surrounding it, have very much to do with the general style of the residence. It should harmonize with the surroundings as much as it should be symmetrical in itself. A plan may be admirable in itself, yet unsuited to a particular spot. The amount desired to be expended in the erection of the house of course is the ruling point in deciding the style, for a large house must necessarily be different in general architectural outline from a small one. After having selected the location and decided on the amount of money desired to be invested, the plan should be decided upon and well studied. Do not be too hasty in accepting any plan. Look it over carefully. Remember this is to be your home. See that every room, door, window, etc., is in the most convenient and suitable place.

There is no national style of rural architecture in this country, nor is there any style properly adapted to every section. Every locality and every farmer may have a style particularly adapted to its or his wants and tastes without infringing on any established rules of architecture. The materials to be used in construction will necessarily have an influence in selecting the style. A given style may perhaps be executed in either stone, brick, or wood, but will not be equally adapted to each. Whatever size or style may be decided upon, proper attention should be given to neatness, symmetry and architectural taste in the construction of the residence. Costly ornament is not recommended, but rather a tasteful simplicity.

It is hardly necessary to speak of the great advantages which a dwelling with beautiful surroundings possesses over one that is unattractive or positively repulsive. But it may be well to remark that an agreeable home must have three essential requisites, and these are a neat, well-arranged and pleasing interior: a symmetrical, architectural and home-like expression of the house outside (not necessarily ornate or elaborate, but rather the reverse); and handsomely planted and well kept grounds around it. Men often put too much money in ambitious buildings and costly structures, when a twentieth part of the difference between these and more modest dwellings, would secure infinitely more beauty in the grounds. You can see in almost any neighborhood a striking contrast between homes. Here you may see a large, showy and expensive dwelling with an unplanted and bleak exterior, and with nothing to make it really attractive; and another house, costing much less, converted into a rural paradise, by blooming shrubbery, brilliant flower-beds, a green velvet of grass, and ornamental trees nearer the boundary. It was once not very unusual to see the contrast between the cheaper class of cottages—the one marked with neglect, with dilapidated walls—hats and rags thrust into broken windows, obsolete barrels, broken boxes, heaps of rubbish, and slop puddles about the premises, as shown by Fig. 1; and the other a gem of neatness—a white-walled, vine-embowered home, with its glad surroundings as aptly illustrated by Fig. 2. We need not ask which would have the best educating influence on the young members of the families who occupied them, and whether it is possible to make a better investment of time and labor than in the few minutes expended daily morning and evening in brushing up and improving such a home.

Fig. 1.

Fig. 2.

Materials. The material most universally used in this country for the construction of farm buildings is wood. This is the result of its abundance and cheapness, and its suitableness for the kind and style of buildings generally desired. Where permanence, however, is desired, and the style of architecture will admit, stone or brick is the better material. Stone is more durable than wood, requires no paint, its color is a natural and agreeable one, be it what it may, although some shades are more agreeable than others, and some more durable than others. As the farmer will generally be controlled in his selection by the abundance and cheapness of the various materials in his locality, we cannot urge upon him the adoption of either in preference to the others; but never use any false materials. Never try to imitate stone or brick with stucco or plaster. It never pays. When brick is used see that they are well burnt and of uniform color, especially those placed on the outside. The walls of such dwellings should be hollow, thus preventing dampness, affording better ventilation and a saving of materials. When not hollow, however, they, as well as stone walls, should be "furred off." This is a method of leaving a space of from one to two inches between the walls and plastering, by means of perpendicular strips nailed to pieces of wood laid in the walls, and upon which strips the lathing is nailed.

Foundation. To secure the stability of a house the foundation must be laid in a sound and substantial manner. This point is too often neglected and the result of settling are cracks in the walls and plastering, unevenness of the floor, etc.,—defects generally incurable except at great expense. No general rule for the depth of foundation can apply to every case. This must be regulated by local circumstances,—only caution should be always used and sound, hard earth reached upon which to begin the foundation. Should there be soft places arches should be turned over them. The thickness of the foundation walls, which should always be of stone or well burned brick, must be regulated according to the height and size of the building and the material used, but always be sure to have them sufficiently heavy. The lowest part of the wall or footing should be considerably thicker than the wall above.

Cellar. This is certainly an important department of the farm residence, yet often they are so poorly constructed as to be wholly unfit for the purposes intended, and frequently are the means of breeding foul air, which finds its way throughout the house. See pages 849–850, under sub-head of Air. A cellar should be cool in summer, free from frost in winter and dry at all times. It should be well drained and thoroughly ventilated. Unless these points are observed the cellar will be a detriment instead of the useful and valuable feature of the farm house it is intended to be. The cellar wall, if of brick, should be hollow, which will make it dry and keep the frost from going through it; and if of stone it should be at least 18 inches thick, well laid in good mortar. It should rise two or three feet above the surface of the ground, be provided with double windows and outside door, with stairway convenient and well protected.

To render a house rat and mouse proof, first lay bricks tightly in over the sills between the base-board and siding; secondly, poison the lower edge and seems of the base-board with corrosive sublimate or arsenic just before it is nailed in, so that a mouse or rat will not undertake to gnaw through without getting poisoned; thirdly, have all the furniture in the house out far enough from the wall, so that when a rat or mouse takes refuge behind them he can be easily attacked with a stick or a cat.

Ventilation. Perhaps there is no subject of such vital importance so much neglected as ventilation. Poor ventilation is the cause of many headaches and ills. The farmer and his family, however, have many advantages over those residing in cities, in that the surrounding atmosphere is generally sweet and pure and their calling takes them much into the open air. It is not our purpose to go into all the details of this subject, it being admitted by all that pure air is essential to health. We will therefore only give the most simple means for securing the proper amount of such air. Ventilation includes the removal of foul air and the introduction of pure air, and this process must be carried on without producing injurious currents, for a blast of cold air direct upon a person is far more detrimental to him than foul air.

Ventilation is not always easily, cheaply and satisfactorily secured. Much has been written upon this subject and yet there is a variety of opinion as to the most effective methods of securing a proper amount of pure air in each room of a residence. Where there is an open fire-place in a room no other means for ventilation is required, as this forms one of the very best of ventilators. But these are not in every room, nor even in every house. To secure perfect ventilation every room in the house, even closets, and especially sleeping rooms, should be so arranged that a current of out-door air may pass through them. During much of the year windows that may be easily lowered from the top, together with the opening and closing of outside doors, afford ample ventilation for a residence; but this does not answer in cold weather.

Where buildings are heated with hot-air furnaces ventilation may be effected by means of large air-pipes with suitable ducts for the discharge of the air of the room. If sufficient water is evaporated to prevent dryness they afford good means for both heating and ventilating a house. Many advocate, as a simple means of ventilation, the arrangement of an opening near the ceiling for the escape of the foul air, while others contend it is better to be placed near the floor, the latter claiming that the air, being colder near the floor and warmer toward the ceiling, the colder is sent out and the warmer retained. They further claim that no material difference exists in the purity near the floor and near the ceiling, as they soon become intimately intermixed. They further advocate that if the escape is made near the ceiling, as is sometimes

done, the hot air rushes to the top and passes out without heating the rest of the room, which remains cold, as well as impure, at the bottom,—which, as Dr. Kedzie remarks, "is like the housewife throwing away the cream that rises to the top, while carefully preserving the skim-milk that remains at the bottom." The occupants of the room, therefore, while they may have the head warm will inevitably suffer from cold feet.

Air may be admitted through a perforated zinc plate, or fine wire gauze inserted in a window instead of a pain of glass. But a perfect system of ventilation, effective at all seasons and operating in all the apartments of the house, requires a series of ventilating flues, provided with necessary valves, and all leading into a larger flue or shaft in which a current is constantly kept up, both winter and summer. This may be done through the medium of the kitchen fire, which may be applied in various ways according to the circumstances and the ingenuity of the builder.

CHIMNEY. This is certainly an important item in house building, and though it would seem simple and easy to construct a good chimney, yet many of them are so badly made as to be a continual source of annoyance and even danger. In building chimneys, the joints between bricks should be well filled with mortar, and they should be smoothly plastered up on the inside. They may be carried to one side or the other without damage if it is done evenly and the inside well rounded. No timber should rest on the chimney or extend into it. The opening at the top should be contracted so as to break the force of any downward currents of air which may be thrown into it. In windy or exposed situations the top should be contracted to one-third less than the area of the flue.

Much taste should be shown in the construction of the chimney top, for nothing adds more to the beauty of the exterior of a house than the style of its chimney tops. They should be of proper height and proportion so as to look tasteful as well as draw properly.

The shape of a chimney as well as its size has much to do with its efficiency to draw. A chimney with flue four by eight will take five brick to the layer. This will not answer for more than one stove. A chimney with flue eight inches square will only require six bricks to the layer or 30 to the foot, and will accommodate three stoves. The same number of bricks to the layer will also build a flue four by 12 inches, if made 20 inches wide and 12 deep instead of square. In this, however, the capacity is not so great, as may easily be seen, although the quantity of brick used is the same. In the square chimney there are 64 square inches in the flue while in the other there are but 48. Not only this but the square flue will never fill up so easily and will always draw better.

COLOR. The color used in painting a residence may add much to its beauty, or, on the other hand, detract from it. Light, cheerful but unobtrusive colors, harmonizing with the prevailing hues of the country, are most suitable. The various shades of fawn, drab, gray and brown are very tasteful, and if the cornices, door and window frames, etc., are nicely trimmed with a darker or lighter shade, much will be added to its beauty. All the positive colors, such as red, yellow, blue, green, black and white should never be used. It is poor taste to use white, although it is very frequently done. For small cottages deeply embowered in evergreens white may be used, as the foliage greatly relieves the harshness of this color.

A very large house should have a somewhat somber hue; one of moderate size, a light and pleasant shade; and a small cottage a still lighter tint. A residence exposed to view should have a darker hue than one hidden by dense foliage. If the main walls be a dark color the trimming should be light, but if the prevailing color of the structure be light the trimmings should be of a darker shade.

INTERIOR ARRANGEMENTS. Much of the comfort of a house depends upon the judicious arrangement of the several apartments, and this should receive the especial attention of the one who expects to build. The convenience of the ladies of the household should be consulted on this point. Do not sacrifice the convenience of the entire house to promote the comfort of a single apartment, but try to so arrange that the convenience of all will be observed. In presenting the plans of many styles and sizes of houses in this article, we have ever borne in mind comfort and convenience of the entire family. The saving of labor is an item well to be considered and one that should receive the careful attention of every person who wishes to construct a house. It will be noticed that in the designs presented in this connection this feature and that of providing the most room in each residence have been studiously kept in view.

It may be that the designs we present will not exactly suit the taste and wants of all, as scarcely two families will require the same accommodations; however, but little difficulty will be experienced in modifying or changing any of these to suit the fancy of any one.

The modes and styles of finishing the inside are so varied and withal so changeable that it is quite impossible to lay down any rules for this. Let it be well and neatly done, and the wood-work painted a suitable color, agreeable neutral tints, perhaps, being the most desirable. The ceilings should be lightest, the side walls a little darker and the wood-work a darker shade still, and the carpet darkest of all. The halls and staircases sould be of a cool, sober tone of color and simple in decoration.

DESIGNS OF RESIDENCES.

In presenting the following designs for rural residences, much care has been exercised in their preparation to make every arrangement, as above indicated, convenient and pleasing. They may be modified in any way to suit the wants and tastes of any person. Any competent carpenter or builder can construct a house according to the designs and specifications

given. Of course, it is quite impossible to give the exact cost of the construction for every locality, as that will be controlled largely by local circumstances and the time. The estimates, however, are given, that a general idea of their cost may be had. In every case liberal allowances are made both in price of labor and cost of material, so that but rarely will the cost exceed the estimate given.

A MODERN FARM RESIDENCE. The principal features of a farm house are comfort and convenience, but architectural beauty and symmetry should not be ignored. The farmer should have as handsome and tasty a residence as the village lawyer or doctor, and in its general features it need not differ widely from that of either. It is mainly its adjuncts, its barns, stables, piggery, poultry house and other out-buildings, that give the residence of the agriculturist its peculiar appearance.

FIG. 3.—*A Modern Farm Residence.*

In the design represented by Fig. 3 we have attempted to furnish the farmer with the plan of a tasty residence. The exterior is planned principally for architectural beauty, having an observatory, higher gables than are really necessary for any thing but appearance, but which gives a high and well lighted garret. The roof is of tin, the cornices wide, and the house set three feet above the ground. A large tank is provided in the garret, from which is carried water, hot and cold, wherever wanted in the house, for all purposes except drinking and cooking. For these purposes a cistern should be built under the room used for fuel.

FIG. 4.—*Main Floor.*

This building may be built of wood or brick, as the relative cheapness of the material in different locations, or the taste of the farmer, may select.

The house is warmed by a furnace of full capacity to give pure air from outside the house, heating and sending it wherever wanted on both floors. Ventilation is secured by having flues in the walls, extending from the base boards to the top of the house, and in the family living room a grate is provided.

Drainage of the house and cellar is secured by tiles that go around the outside of the cellar walls, some inches below their foundations. Under the cellar bottom, drains of 2-inch tile concentrate any water that might rise, and by proper descent carry it all far away from the house.

There are two cess-pools—one for the drainage of the kitchen refuse, the other for the water-closets. The cellar is eight feet between joists. Its floor is covered by cement; its ceiling is matched boards, nailed on the joists; and several inches of mortar on this ceiling, between the joists, not only deaden the floor of the rooms above, but cut off any possible exhalations from the cellar. Division walls of bricks divide the cellar into convenient rooms, and windows hung on hinges light and ventilate it.

The side entrance is under a veranda, and is used for a waiting and business room, at the same time furnishing conveniences for washing, for umbrellas, overcoats, over-shoes, etc. The adjoining closets, for robes, brooms, etc., are readily accessible from this entrance. These closets, taken from the space otherwise allotted to the pantry, without abridging the space for pantry shelves, actually improve them by bringing them nearer the center, and making them therefore more convenient for use.

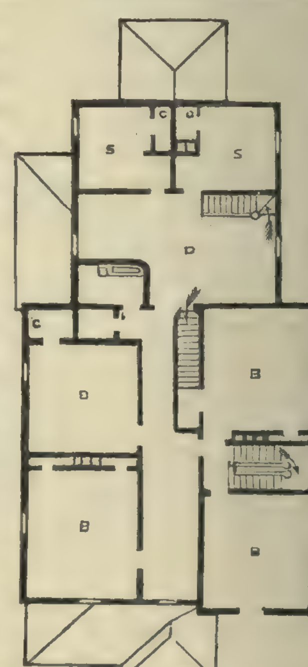


FIG. 5.—*Second Floor.*

There are no winding stairs, but when corners are to be turned, they are turned on square platforms. The main flight, standing in a recess between the front room and the dining-room, rises about eight feet, which, at 8 inches to the step, would make about twelve steps; then a platform

about eight feet long by three and a half feet wide makes the half turn to the remainder of the flight. Over this platform is an oriel window that lights the stair, as well as the back end of the lower hall and the upper hall, and gives facilities for admitting air and sunshine. Under this main flight are stairs that lead to the cellar, and under the stair platform is the store-room opening into the dining-room.

The following is the arrangement of the main floor (Fig. 4): P represents the parlor, H the hall, S the sitting-room, V vestibule, and M a large panel mirror. D indicates the dining-room, B bed-room, K kitchen, L laundry, P pantry, E entry from side, W wardrobe, C closets, L (just to the rear of bed-room) lavatory, S T store-room and S shed.

On the second floor B indicates bed-rooms, of which there are four large, well-lighted ones, D drying-room, S servants' rooms, and C closets.

Any competent mechanic can make out a bill of specifications from these illustrations.

By Fig. 6 we give the prespective of a fine two-story frame dwelling; one that will please the eye of almost any one. Not only has beauty of exterior received attention, but the house is commended for its convenience of interior arrangements.

In the ground plan shown by Fig. 7, P represents parlor 14 x 14 ft.; S, to the rear of this room, shows a sitting-room or back parlor 10 x 14, S, to the right, a sitting-room 13 x 15, H hall 6 x 15, D dining-room 10 x 18, K kitchen 9 x 18.

FIG. 7.—*Ground Plan of Fig. 6.*

In second story (Fig. 8) C, at front, indicates bed-room 14 x 14, C, to the right, a bed-room 13 x 15 and C in the rear one 10 x 14. B shows bath-room 10 x 14 and G girl's room 9 x 15.

Specifications. The bay-windows are 2 feet 6 inches by 6 feet. The windows in first story are single, 3 feet 6 inches by 7 feet; the second story windows are double, 2 feet 6 inches by 6 feet each; attic windows 2 feet 6 inches by 3 feet 6 inches. Front door of two panels, with moulding around each, 4 x 8 feet, with plate glass; closet doors 2 feet 10 inches by 6 feet; all other doors 3 feet 2 inches by 7 feet, with common mortise locks. Foundation walls 12 inches wide. Piers 8 x 8 inches. First story 12 feet high; second story 11 feet; attic 7 feet. All chimneys of two 6-inch flues. Interior finish of pine, with moulding to base, door and window jamb. Attic window, glass of single strength; all other glass to be double strength American.

FIG. 8.—*Second Story of Fig. 6*


FIG. 6.—*Perspective View of a Handsome Dwelling.*

Amount of Material.

42 joists 10 feet long, 2 x 10 inches.
84 joists 11 feet long, 2 x 10 inches.
36 joists 15 feet long, 2 x 10 inches.
48 joists 14 feet long, 2 x 10 inches.
354 studs 12 feet long, 2 x 6 inches.
600 feet of plates, girts and braces, 2 x 6 inches, convenient lengths.
164 feet sills 6 x 6 inches, convenient length.

Estimate of Cost. The following estimate of cost of material and labor will vary much according to location and condition of the times, but the farmer can form a good idea of the cost of a residence by these figures. He can easily find out the average value of material in his locality and then add or deduct, as required, from the estimate:

Excavation, 160 yards at 20 cents....	$ 30 00
Brick work, 23,800 at $8............	190 40
Joists..............................	114 00
Flooring, 3,200 feet................	160 00
Rafters.............................	69 00
Studding and framing...............	228 00
Weather boarding, 4,500 feet.........	215 00
Shingles, 23,000, at $5..............	115 00
Sheathing, 6,600 feet..............	165 00
Gutters and cornices, 180 feet at 38 cts.	68 40
Doors, including hardware, 22 at $10..	220 00
Windows, complete, 33 at $8.........	297 00
Bases, 600 feet at 6 cents...........	36 00
Porches, stairs, etc.................	160 00
Painting and glazing...............	156 00
Plumbing and gas..................	98 00
Galvanized iron and tin work.........	89 00
Iron crestings......................	15 00
Lathing & plastering, 1,314 yds at 20 c.	262 80
Grates and mantels................	140 00
Sundries...........................	50 00
Total........................	$2,878 60
In brick, with stone foundation...	$3,670 00

Gothic Farm Residence. A substantial farm-house of the Gothic style is represented by Fig. 9. It is built of stone. The cellar is constructed only under the main building, as shown in the cellar plan. However, if the demand for room of this kind requires it, the cellar may be constructed under the entire building.

Fig. 9.—*Gothic Farm Residence.*

As a preventive of dampness the first courses of stone above ground should be laid in cement. Between the stonework and the plastering is an air space, produced by furring out with two-by-four studding, to which the laths are nailed. This space prevents dampness and should always be done in houses built of stone, and also those constructed of brick when the walls are made solid.

In the general arrangement of rooms, closets, etc., it will be observed that convenience has been a ruling feature. The house is large and admits of ample accommodations for a large family. The main part is 42 feet wide by 33 in depth, while the rear portion is 18 x 29. The rooms are commodious, the stairways and halls large and the stories high. The arrangement of the first-floor plan might be altered to suit the tastes and demands of any one who desires a large dwelling. For instance, folding-doors could be put between the parlor and library, thus making two elegant parlors. A large dining-room could be provided where the bed-room and pantry are. Other modifications and changes may be made in all stories as one may desire.

The size and names of all rooms are indicated on each floor plan; it is therefore unnecessary to refer to them by any special remarks. The interior finish or trimming should be plainly and neatly executed. Elaborate moldings, carvings and panelings are not required to make a tasty, comfortable home. The style of finish should be in keeping with the character of the house and position of the owner.

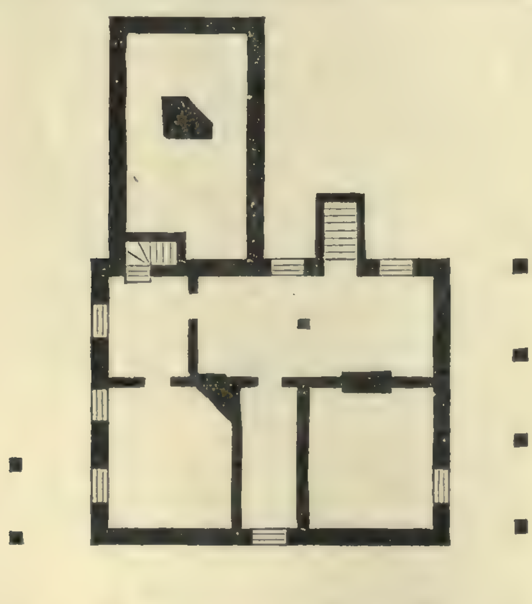


Fig. 10.—*Cellar Plan for Fig. 9.*

Fig. 11.—*First-Floor Plan for Fig. 9.*

Residence Erected in Parts. It often happens

that a man who may reasonably expect to be able, in the course of a few years, to build a larger house, is obliged to commence with a very limited amount of

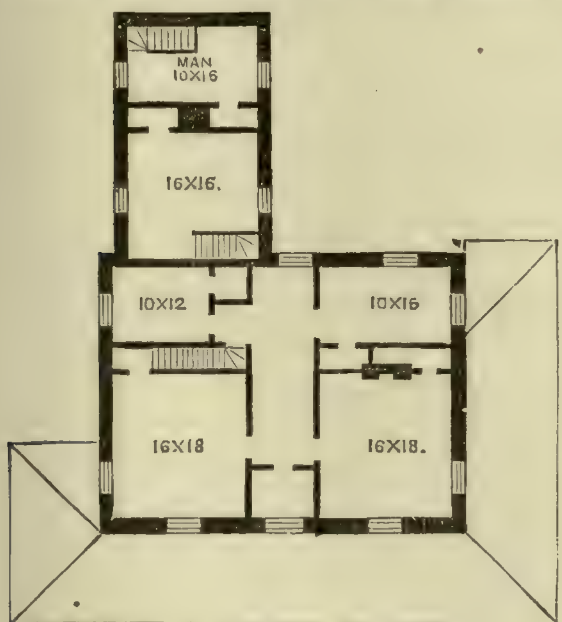


Fig. 12.—*Second-Floor Plan for Fig.* 9.

means. Fig. 13 is suggested and designed to meet the requirements of such a case. At first, the kitchen (designated by K on the ground plan), with the veranda (V), in front was built. At the end of one or two years he added the portion represented by W, P and B. He prospers and wishes to enlarge, builds what is shown as the main part of the house in the perspective. This will make a very convenient and comfortable house, and by no means devoid of architectural beauty and symmetry.

Fig. 13.—*Perspective of a House with Successive Addition.*

Below we give an explanation of the ground plan, specifications, estimate of the amount of material, etc.

L, in the plan, represents the living-room, 12 x 13 feet; K, kitchen, 12 x 14 feet; D, dining-room, 9½ x 12 feet; B B B, bed-rooms, 9 x 8 feet and 8 x 8 feet; P, pantry, 8 x 8 feet; SP, summer pantry; W, wood-shed; V V, veranda. The summer pantry can be used in winter as a place to keep meat; and being

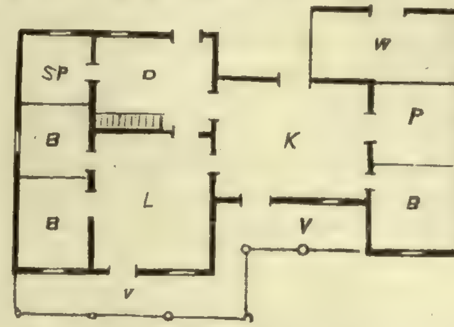


Fig. 14.—*Ground Plan for Fig.* 13.

away from the kitchen fire it will keep it a long time.

Specifications. Use good single-strength glass for all windows; size, 2.6 x 4 feet, 12 panes to the sash. Front door to be of 3 raised panels, with moldings; inside doors to have 3 raised panels, without moldings; all doors to be 2 feet 10 inches wide by 7 feet high, except pantry door, which is 2 feet 6 inches; all doors to be supplied with good, plain locks, with plain knobs; outside doors to have bolts. Flues to be 6 inches. First story, 11 feet 6 inches high; attic, 9 feet.

To erect a house in this way advantageously, the whole building must be planned at the commencement. For if this is not done, it will be found quite impossible to have everything in its construction work harmoniously. It should be known beforehand where each door, window, room, closet, etc., of the expected addition belongs, that those in the portion under course of construction may be properly arranged. It is the same in this respect in building this kind of a house as with every other kind. No one should be so foolish as to attempt to build a residence without having previously settled upon a plan, and then thoroughly studied it in every detail. If this is not done invariably, the result will be delay, extra expense and dissatisfaction. Every feature of the plan should be carefully weighed and thoughtfully considered, so that every arrangement may be the most convenient and satisfactory.

Quantity of Material.

402 feet of joists, 8 feet long, 2 x 6 inches.
117 feet of joists, 12 feet long, 2 x 6 inches.
85 feet of joists, 9½ feet long, 2 x 6 inches.
4 posts, 10 x 10 inches.
100 feet of joists, 6 feet long, 2 x 6 inches.
625 feet of studding, 12 feet long, 2 x 4 inches.
125 feet of studding, 9 feet long, 2 x 4 inches.
100 feet of studding, 8½ feet long, 2 x 4 inches.
160 feet of girders and plates, 4 x 6 inches.
800 feet of sheathing.
1,500 square feet of shingles.

Estimate of Cost.

Excavation, 56 cubic yards, at 20c......	$11 20
Bricks, 13,180, at $10 per 1,000........	131 80
Joists for floors, 1,020 feet, 2 x 8 inches, at $18 per 1,000 feet..............	18 36
Ceiling, 900 feet of joists, 2 x 6 inches, at $18 per 1,000 feet................	16 20
Studding, 3,000 feet, $18 per 1,000 feet..	54 00
Studding for roof, 1,300 feet, at $18 per 1,000 feet.....................	23 40
Sheathing and weather-boarding, 1,200 ft.	48 00
Plastering, 426 sq. yds., at 20 c. per yard.	85 20
Pine flooring, 1,400 ft. at $3 per 100 ft...	42 00
Sheathing for roof, 1,507 feet, at $18 per 1,000 feet......................	28 12
Shingles, 15,000, at $5 per 1,000........	75 00
Veranda..............................	60 00
Plain frame doors, complete with hardware, 13, at $10..................	130 00
Windows, complete, 12 panes to sash, 16, at $8..........................	128 00
Flight of stairs to attic................	30 00
Painting and glazing..................	160 00
Roof-rafters, 1,500 feet................	22 50
Sundries............................	85 00
Total, including labor, etc.........	$1,148 78

The above estimate is based upon first-class material and workmanship. It is much higher than both can often be furnished for. The proper reduction or addition may easily be made.

FIG. 15.—*Front Elevation of Frame Cottage.*

SMALL COTTAGE. Design represented by Fig. 15 is a small cheap building, yet neatness, symmetry and architectural taste have been observed in planning it. In such small structures, no attempt should be made for ornament or show alone. A manifest utility should be displayed in everything. The beauty of fitness should be constantly obvious and a tasteful simplicity ever exhibited.

This house is built of frame, story and a half high, four rooms on lower floor, and two above. The house may be cheapened one-third by leaving off the shed kitchen and using the dining-room for a kitchen. There is a neat balconied porch in front—a very pretty design for the money it costs. One peculiarity of a house like this rests in the fact that no matter from what direction you observe it there is a pleasing harmony in its appearance, which is not true of all designs. One looks pretty and pleasing in front, but ugly in the rear, side or end. Being upon the square plan it contains no waste space. Open fire-places may be provided in parlor and sitting-room, or either if desired.

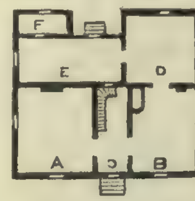


FIG. 16.—*Ground Plan for Fig. 15.*

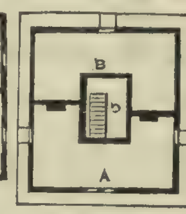


FIG. 17.—*Second Story for Fig. 15.*

In the ground plan, A represents the parlor, 12 x 16 feet; B, sitting-room, 11 x 16; C, hall, 6 feet wide; D, dining-room, 12 x 12; E, kitchen, 8 x 17½, and F, pantry. The second story or attic is divided into two large bed-rooms, each 12 x 17 feet, represented by A and B. C indicates the lobby at the head of the stairway.

Specifications. Pantry windows, 2 x 4 feet; first-story windows, 3 feet by 6 feet 6 inches; second story windows, 2 feet 10 inches by 5 feet. Double front door, 2 x 8 feet each, with bronze lock; 4 raised panels, with molding; pantry and closet doors, 2 feet 10 inches by 6 feet; all other doors, 3 feet 2 inches by 7 feet, with 4 panels, without molding, and common lava or porcelain knob locks. Foundation walls, 12 inches. First story, 12 feet high; second story, 10 feet. Interior finish, of pine, with one molding to door jambs, base boards and windows. Glass to pantry windows, of single strength; all other glass of double strength, American. Chimneys to be of two 8-inch flues.

Bill of Quantity.

24 joists 16 feet 10 inches long, 2 x 10 inches.
9 joists 12 feet 8 inches long, 2 x 8 inches.
13 joists 8 feet 10 inches long, 2 x 8 inches.
24 joists 16 feet 10 inches long, 2 x 10 inches.
9 joists 12 feet 8 inches long, 2 x 8 inches.
13 joists 8 feet 10 inches long, 2 x 8 inches.
205 studs 12 feet long, 2 x 4 inches.
110 feet of plates, 4 x 6 inches, convenient lengths.
45 rafters 17 feet long, 2 x 4 inches.
110 feet of sills, 4 x 6 inches, convenient lengths.
112 feet of girts, 4 x 6 inches.
19 rafters 13 feet long, 2 x 4 inches.

Estimate of Cost.

Excavation, 18 yards at 20 cents......	$3 60
Brick work, 10,600, at $8.............	84 80
Joists..........................	75 00
Flooring, 2,200 feet..................	99 00
Rafters...........................	27 50
Studding and framing..............	96 00
Sheathing, 1,100 feet...............	25 30
Weather-boarding, 2,100 feet.........	94 50
Shingling and shingles, 11,000........	55 00
Gutters and cornices, 280 feet at 20c...	56 00
Doors, including hardware, 10 at $8....	80 00
Windows, complete, 14 at $7.50.......	105 00
Bases, 298 feet at 16 cents..........	17 88
Porches, stairs and steps.............	48 00
Painting and glazing..................	100 00
Lathing and plastering, 670 yds. at 18c..	120 60
Sundries..........................	30 00
Total, labor, etc., included.......	$1,118 18

A Large Country Residence. This building, represented by Fig. 18, differs greatly in many respects from the usual country dwelling. No special reference to any conventional rules of architecture are complied with, but there are many commendable features about it. It is quite large and presents a very pleasing appearance from any point of view. The outer walls of the first story are built of rough stone, and for the windows brick trimmings are used, which very pleasantly relieves the stone work. The second story is constructed of wood, and is surmounted by the somewhat abruptly receding slated roof. The chimneys are a combination of brick and stone.

The L contains a large kitchen with three sleeping rooms above for servants. Should the building be erected on sloping ground, a large basement story might be easily provided. The body of the house is thoroughly protected. The first floor is provided with a spacious parlor, sitting-room, library, dining-

Fig. 18.—*A Large Country Residence.*

room, kitchen, besides pantry, milk-room, cloak-room, etc. The second floor (Fig. 19) contains six chambers, with accompanying dressing and bath rooms. In many of the rooms are alcoves for the beds, as will be noticed in the plan. The third floor may be divided to suit the requirements of the family. Many

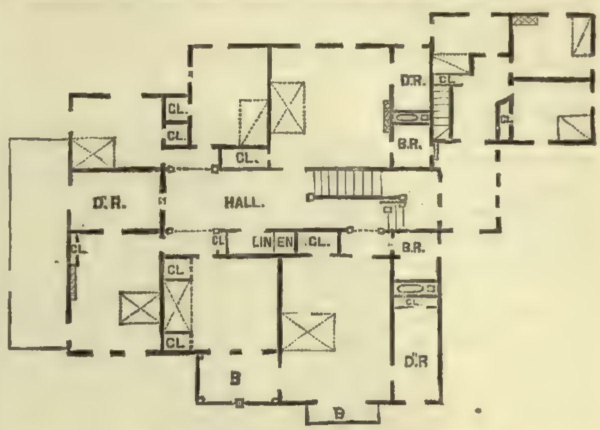


Fig. 19.—*Second-Floor Plan of Fig.* 18.

very pleasant rooms may be provided in this story.

This is a large house and may not please the tastes of many in an architectural point, but may afford some excellent practical suggestions. The plan might be changed to suit many who desire a large house.

Rustic Cottage. A very simple, yet tasty cot-

Fig. 20.—*Rustic Cottage.*

tage is represented by Fig. 20. It is intended for a family of small means and is therefore designed economically, but will nevertheless be attractive. It is built of wood, filled in with soft brick on edge, and covered in the vertical and battened manner, with rough boards and heavy battens, care being taken in nailing on the boards that the splinters of the wood

Fig. 21.—*Interior Arrangement.*

made by the saw in sawing the log point downward instead of upward, to more effectually shed the water. The roof is covered with shingles, and the projections of the gables, which are quite heavy, are relieved by ornamental verge boards sawn from heavy plank. The windows all have bold trimmings, and those on lower story are protected by broad hoods, and glazed with diamond-shaped glass. The veranda, or front stoop, is made with cedar posts and trimmings, but has a plank floor and tight roof. The chimneys represented are terra-cotta chimney tops of large size, resting upon a blue-stone base cut for the purpose.

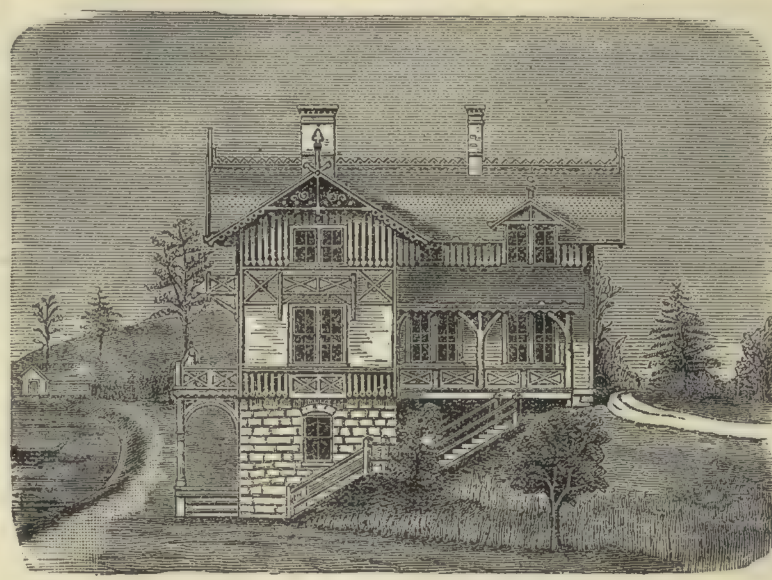


FIG. 22.—*Elevation of a Residence with Basement.*

The interior arrangement is as follows: The hall, No. 1, measures eight feet by eleven, and contains stairs to the chamber and cellar. The principal stairs are three feet wide, and the cellar flight is two feet eight inches, inclosed by a partition with a door at the top. No. 2 is the living room, 14 feet square, provided with an open fire-place for burning wood, and also having on one of its sides a recess or bay, with side lights only, the back being made to serve the purpose of a book-case or cupboard. No. 3 is the kitchen, 12 by 14, well lighted by two large windows, and having a large closet opening out of the side beyond the fire-place.

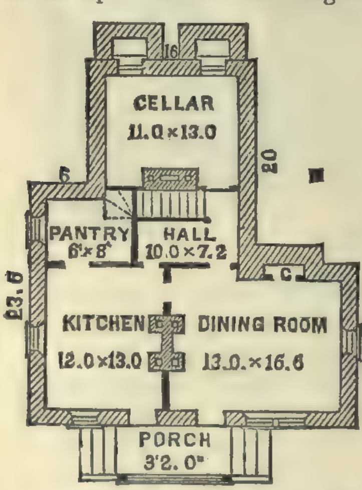


FIG. 23.—*Plan of Basement for Fig. 22.*

No. 4 is a pantry, measuring five by eight, and opening out upon the back stoop. This pantry may have a sink in it, and may be fitted up with shelves and cupboards. Additional room may be got by putting the kitchen in the basement, and using the upper room as a living or dining room, and the front room as a parlor. This would give an opportunity for finishing the parlor in a little more expensive manner, and on that account may be more desirable.

The second floor contains two good-sized chambers and four large closets. There is no attic to the house, but a space of about five feet in height is left above the chamber and below the peak of the roof, which serves a good purpose as a ventilator.

The posts are 14 feet high, and the lower story is finished nine feet high in the clear. The finish of the interior is all of pine, and put up in a simple manner. The walls are all plastered, and finished with a rough white-sand finish, which may afterward be tinted in any desirable shade. The outside should be painted two or three tints.

HOUSE WITH BASEMENT. By Fig. 22 we present one of the neatest and most desirable plans for a rural residence yet designed. It is adapted for a hillside or rolling section, and if the surrounding landscape be picturesque will afford one of the most attractive dwellings to be met with anywhere. The general conformation of this house to the declivity of the grounds, together with its rustic details of finish, give it very much the appearance of a Swiss house. Fig. 22 illustrates the front elevation facing the main road.

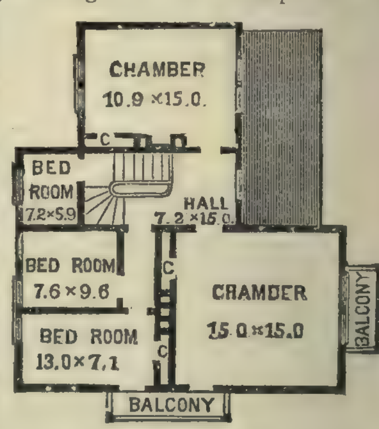


FIG. 24.—*Plan of Second Story for Fig. 22.*

It will be seen that the grounds at the right are one story higher than those on the left. The principal walk or drives are along the higher grounds at the right, contiguous to the veranda, from which the main entrance is conveniently reached.

The walled or basement story appears full height above ground, giving increased prominence to this part of the building. The height of the ceiling in finished parts of basement is 8½ feet; cellars, 7 feet. This story (Fig. 23), contains a dining-room, kitchen, hall, pantry, cellar and closet. The two principal rooms have doors leading directly to the porch, and to the hall, which contains a stair-way leading to the floor above. The kitchen and dining-rooms are well lighted, and have open fire-places. The cellar is cemented on the bottom; all other rooms, in this plan, have wooden flooring.

Fig. 25 shows the main-floor plan. The height of this story is ten feet. The divisions include a hall, parlor, sitting-room, library and bath-room. The sitting-room and library also have a closet each. The main hall has double entrance doors and connects by doors with each of the four apartments. Fig. 24 represents the second story. Height 9 feet. There is a hall, two chambers, three bed-rooms, and three closets on this floor.

Specifications. The foundations should be of broken stone, laid in mortar, 18 inches thick, extending in the earth below the reach of frost, and neatly pointed where exposed to sight. The beams for the basement floor should be of 3-by-8-inch timber, with a 4-by-8-inch girder supporting their centers, and leaving a clear space of from 6 to 20 inches below them for the passage and circulation of air under the porch. The cellar should have a concrete bottom, with two steps of masonry upward from the hall. The upper frame should be of square, sawed timber, thoroughly framed and secured; the horizontal siding of 6-inch clapboards; the vertical of 9½-inch tongued and grooved ceiling boards, belted; all on sheathing felt. The roofs should be of slate, with tin valleys, gutters, and leaders. Windows should have four lights, with 1½-inch sash, hung to weights. Doors should be made of pine, paneled and molded. Stairs, pine, with black walnut, newel and rail, and balusters. Closets shelved and hooped in the usual manner. All wood work usually painted should have two coats of paint. The appended estimate will furnish additional information.

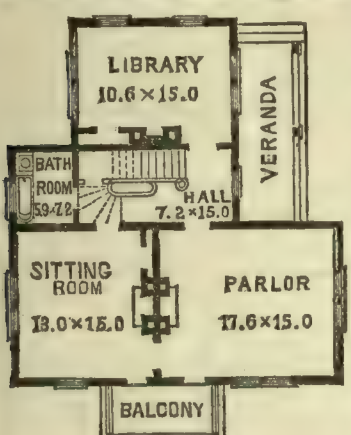


FIG. 25.—*Plan of Main Floor of Fig. 22.*

There are many advantages in a house of this arrangement. The kitchen and dining-room are protected in winter from the cold and in summer from excessive heat by their location in the basement. In most sections of the country this protection is much needed during a portion of both seasons of the year, and in no other way is it so easily obtained as in the basement portion of this kind of a house. There are also other advantages by these to be obtained in this class of houses. The odors arising from cooking may be more easily prevented from pervading other portions of the house, communication with the outside and with the provision store-house or cellar is more convenient, a larger amount of room may be given to the kitchen, dining-room and pantry in a house of any given size, than in the ordinary two-story house, and the convenience of the housewife may be furthered.

Estimated Quantity and Cost of Material and Cost of Labor.

5,000 feet timber, at $20 per M.........	100 00
2 sills 4 x 8 in. 32 ft. long.	
2 sills 4 x 8 in. 20 ft. long.	
1 sill 4 x 8 in. 24 ft. long.	
2 sills 4 x 8 in. 16 ft. long.	
1 sill 4 x 8 in. 6 ft. long.	
9 posts 4 x 7 in. 20 ft. long.	
1 post 4 x 7 in. 16 ft. long.	
1 ridge 3 x 8 in. 68 ft. long.	
2 ties 4 x 6 in. 32 ft. long.	
2 ties 4 x 6 in. 20 ft. long.	
6 ties 4 x 6 in. 16 ft. long.	
2 plates 4 x 6 in. 32 ft. long.	
2 plates 4 x 6 in. 20 ft. long.	
75 beams 3 x 8 in. 16 ft. long.	
56 rafters 3 x 4 in. 13 ft. long.	
1 veranda 3 x 8 in. 60 ft. long.	
142 yards excavation, at 20c. per yard...	$ 28 40
1,800 feet stone work (complete) at 6c. per foot......................	108 00
4,000 brick in chimneys (complete) at $12 per M......................	48 00
759 yards plastering (complete) at 20c. per yard......................	151 80
24 joists, at 15c. each................	3 60
360 wall strips, at 10c................	36 00
130 horizontal siding (6-inch), at 15c....	19 50
150 vertical siding (9-inch), at 27c......	40 50
150 battens, at 4c..................	6 00
Cornice materials..................	30 00
164 hemlock boards, at 15c..........	24 60
16½ square slate, at $8..............	132 00
330 tin gutters, valleys, and leaders, at 8c......................	26 40
480 flooring (4½ inches), at 12c. each..	57 60
5 basement windows (complete), at $5...	25 00
3 cellar windows (complete), at $2 each.	6 00
27 plain windows (complete), at $6 each.	162 00
2 stairs (complete).................	35 00
25 doors (complete), at $7 each.........	175 00
Pantry and closets, finished, complete...	15 00
Carting..........................	25 00
Painting, complete..................	100 00
Carpenters' labor, not included above....	200 00
Incidentals.......................	44 60
Total cost of the building, completed..	$ 1,600 00

Model Farm House. This design (Fig. 26) is presented as a model farm house, suitable for a farmer in easy circumstances and with the taste and culture which should attend such station in life. The kitchen, which as has been said "is the heart of the farm-house," is large, well lighted, well ventilated, provided with large pantry, and convenient of access. Domestic help is not abundant in the farmer's family. Too much labor at best devolves upon the mistress. The plan also provides for a conveniently situated dining room. Then there is a large sitting-room, library and bed-room.

Fig. 26.—*Perspective of a Model Farm House.*

The upper hall is three and a half feet wide and makes a fine appearance with its rounded closets and generous length. It is proposed to supply the principal chambers, the bath-room and the kitchen reservoir with cold water from the second-story tank, and the sink and the bath-room from the reservoir. A bell-pull could be carried into the men's hall to awaken them in the morning, if so desired; also to the girl's room. All inside finish should be of hard wood, oiled and varnished. The different oaks, black walnut, cherry, and locust make excellent finish. Black walnut and cherry should be used sparingly, as bead work, or for contrast, as the first is too dark and somber, and the last lacking in grain. The casings should be heavy—at least eight inches wide.

Fig. 27.—*First-Floor Plan.*

The cost of this dwelling will range between $3,000 and $4,000 according to locality and the man who builds it.

In the first-floor plan (Fig. 27) P represents the parlor, which is 18 x 18 feet; S R, sitting room, 15 x 20; L, library, 12 x 12; B, bed-room, 12 x 13; D R, dining-room 12 x 15; B, bath-room, 5 x 7; C, closets, 5 x 7; K, kitchen, 15 x 16; P, pantry, 6 x 6; S, store-room, 10 x 11; W, wood-room, 10 x 16; V, veranda and H, hall, 7 x 18.

In the second-floor plan (Fig. 28) B, one represents bed-room 15 x 18; B two, B three, B four and B five bed-rooms 12 x 13

Fig. 28.—*Second-Floor Plan.*

feet in size; B six and B seven, bed-rooms 8 x 15; B eight and B nine, bed-rooms 8 x 14; C, closets; T, tank, P R, children's play-room.

Specifications. All windows to be 2 feet 6 inches by 5 feet, 2 panes to the sash, except rear windows to the kitchen, which are 2 feet 6 inches by 3 feet, 4 panes to the sash, glass of single strength; all other glass to be of double strength. The front door is of oak, with three panels, walnut molding, 8 feet high, 3 feet wide; all interior doors to be of pine, 7 feet 6 inches by 2 feet 10 inches, with 3 raised panels, except closet doors, which are 2 x 7 feet, good Berlin bronze-face locks and mineral knobs to all interior doors. Closets to be provided with 20 bronzed coat-hooks; good Berlin bronze catches to closets and pantries. Outside rear doors to be provided with plain locks with bolts. There are also one good tinned bath-tub, one good china-bowl water-closet, one wrought-iron tank 3 feet deep, 5 feet wide. The first story is 12 feet high; second, 11 feet 6 inches. Good pine shutters are used, 1 foot 3 inches wide, hung with cast-iron hinges, with hold-backs and catches. Foundation walls 3 feet deep, 2 feet above ground, and 4 good stone posts 6 inches square, 3 feet 6 inches high.

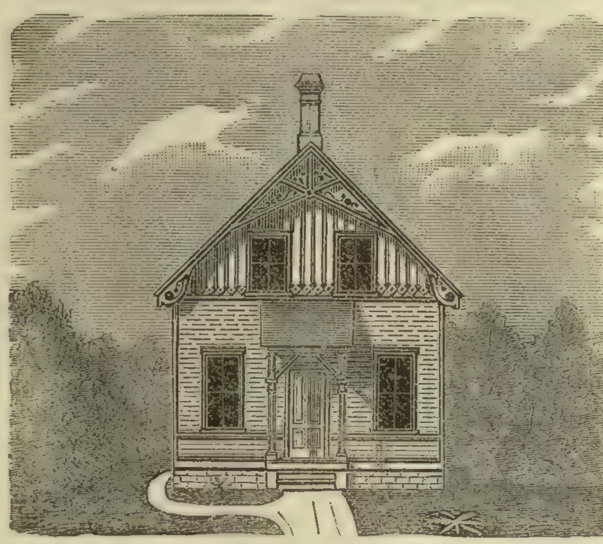


FIG. 29.—*Rural Cottage.*

Bill of Quantity. 2,564 square feet of joists 13 feet long, 2 x 6 inches; 720 square feet joists 8 feet long, 2 x 6 inches; 376 square feet joists 11 feet long, 2 x 6 inches; 400 feet of joists 7 feet long, 2 x 4 inches; 12 posts 4 x 4 inces, 11 feet long; 2,807 square feet of studs, 12 feet long; 44 bunches of pine shingles; 44 shutters, 1 foot 3 inches by 5 feet.

FIG. 30.—*Cellar Plan.*

RURAL COTTAGE. A nice design for a country cottage is shown by Fig. 29. It is 20 feet square and 20 feet high. Square outlines in buildings are the most economical in furnishing space. They not only have this advantage but are more easily warmed, especially if the chimney is near the center, and need less repair. Though in every way complete and thoroughly fitted for a small family, it may be enlarged easily by additions at the side or rear, or a portion of the cellar may be finished as a kitchen. Fig. 29 represents the front elevation, which has considerable variety of finish, and, though not expensive, adds much to its beauty. The sides are quite plain, but the projections are in harmony with the front. The roof may have two belts of diamond-pointed shingles, arranged equal distances apart, which will add much to the appearance. The rear should be finished in harmony with the front. A neat but plain ornament, or projection, may be extended from over the door. Tastefully painted this will be a pleasant little cottage and can be erected for about $600.

The cellar, which is six and one half feet in height, is shown by Fig. 30. It extends two feet above the ground. It is provided with two windows, and an outside area way. An opening is made in the chimney to admit of a stove-pipe. The cellar might be divided along the line of the girder, if desired, and a kitchen made of one part and a cellar of the other. If this is desired the walls should extend one foot higher above ground, and one foot less in depth.

The height of the ceiling in the first story (Fig. 31) is nine feet. The front entrance is from the porch directly to the living room. If in an exposed situation, "storm doors" may be hung in the frame of the outside doors to open outward; or the porch may be inclosed with portable panels of narrow ceiling with a door at the entrance, which may be set up or removed, as required. The rear entrance is through two doors and a lobby. If a rear window is wanted, the upper portions of these doors may have glass sash. The living room is commodious, has an open fire-place, two windows, and inside doors leading to the adjoining rooms, and to the stairway to the second story. The sitting-room is small, but, if neatly finished, will serve as the parlor of a small family.

FIG. 31.—*First Story.*

It has one window opening to the front. Another window may easily be added opposite the chimney, though it would diminish the wall space for furniture, etc. The bed-room is also small, but will admit the

necessary furniture, and a proper adjustment of the window sashes will insure the required ventilation. The space under the stairs is used as a closet, unless needed for stairs to a basement kitchen.

The height of the second story is three and one-half feet at the plates and follows the rafters to the height of eight feet. This may be divided as required.

Estimates of Amount of Material and Cost.

45 yards excavation, at 25 c. per yard	$11 25
780 feet stone work, at 8 cents per foot	62 40
1,500 brick in chimneys at $12 per M	18 00
260 yards plastering at 20 cents per yard	52 00
1,600 feet timber, at $15 per M	24 00
4 sills 4 x 7 inches 20 feet long.	
4 posts 4 x 7 inches 13 feet long.	
1 girt 4 x 6 inches 20 feet long.	
18 beams 3 x 7 inches 20 feet long.	
4 ties 4 x 6 inches 20 feet long.	
2 plates 4 x 6 inches 20 feet long.	
1 beam 3 x 7 inches 28 feet long.	
22 rafters 3 x 4 inches 16 feet long.	
20 joists, at 15 cents each	$ 3 00
200 wall strips, at 12 cents	24 00
100 siding, at 28 cents	28 00
Cornice materials	12 00
130 shingling lath, at 6 cents each	7 80
22 bunches shingles, at $1.25 each	27 50
85 flooring, at 28 cents each	23 80
8 plain windows, at $6 each	48 00
2 cellar windows, at $2 each	4 00
8 doors, at $6 each	48 00
2 stairs	15 00
2 stoops	18 00
Closet finish and shelving	12 00
Nails	9 00
Carting	8 00
Carpenters' labor, not included above	75 00
Painting	50 00
Incidentals	19 25
Total cost of the building, completed	$600 00

Resin (rez'n), or **Rosin** (roz'n), a solid, inflammable substance, of vegetable origin, insoluble in water but soluble in alcohol and the essential oils. It exudes from trees in combination with essential oils, and in a liquid or semi-liquid state. In burning it yields a great amount of smoke, from which lampblack is obtained. Pine resin is most common in this country. The gum oozing from fresh wounds in pine trees consists of resin and turpentine. The uses of resin are too numerous for mention here. Gum resins are of a consistence between gum and resin, as asafœtida, gamboge, myrrh, etc.

RESIN OINTMENT. Gently melt together 8 or 10 ounces of resin, 4 ounces of yellow wax and 1⅓ pounds of lard or simple ointment (lard and wax), strain while hot through a flannel and stir constantly until cool. Valuable for blistered surfaces, indolent ulcers, burns, scalds and chilblains.

RESIN OINTMENT, COMPOUND: more stimulating than the above. Melt together 12 ounces each of resin, suet and yellow wax, 6 ounces turpentine and 7 ounces of linseed oil. Keep it from the air, to prevent its becoming tough. This is known as "Deshler's Salve."

TO REMOVE RESIN SPOTS FROM SILK, rub with alcohol, after soaking the spot a few minutes with this liquor.

RESIN SOAP: see Soap.

Retch, to make an effort to vomit; to strain as in vomiting. Generally caused by nausea. If sips of pure hot water do not immediately stop it, flavor the water with ginger, nutmeg, cinnamon, coffee, tea or other substance that is most palatable.

Retina (ret'i-na), the nervous expansion in the posterior part of the eye-ball which receives the impressions of light. These impressions are communicated by the optic nerve to the "sensorium" in the brain. This organ is subject to several affections, which cannot be treated by "domestic medicine," but strict care of the general health will do good in all cases and never any harm.

Retriever. A land retriever is a cross between a setter and cocker or springer spaniel; a water retriever is a cross between a setter and Newfoundland dog; a dog especially trained or qualified to bring game to hand. See pages 333-4.

Rheumatism. This is an inflammatory affection of the fibrous tissues, and is chiefly confined to the articulations, particularly the large ones, as the knees, ankles, hips, shoulders and elbows. The inflammatory symptoms exhibit various degrees in their violence and duration, and hence the disease has been divided into two varieties, the acute and the chronic.

Symptoms. Acute rheumatism comes on with severe pain, which in a day or two is followed with swelling of the joints. There is usually considerable stiffness, or want of mobility. In the chronic variety the skin is never discolored, but in the acute it is generally a little red. The pain is very apt to shift from one joint to another, and sometimes it runs along the course of the muscles connected with the affected joints.

The disease may arise at any time of the year when there are frequent vicissitudes of the weather from heat to cold, but the spring and autumn are the seasons in which it is most common. Young persons are more subject to the acute variety, while in older people the reverse obtains.

Rheumatism is occasioned by cold, and is brought on most generally by wearing wet or damp clothes, working in cold and wet places, etc.

Treatment. In the first place, clear the stomach and bowels by aperients and emetics. If the skin is hot and dry, sponge the body all over with warm water and carbonate of soda, or common soda. If the skin is not very hot and dry, give a vapor bath.

Dry well, and apply a stimulant liniment. Tincture of aconite given as follows will often prove a specific in chronic cases: Put from 8 to 12 drops in a glass of water. A teaspoonful taken from four to six times a day. When rheumatism becomes chronic, the general health, particularly the diet in connection with the digestive powers, must be attended to with great care. The attacks often arise from pure debility, and will then be best cured by tonics and good food.

A diaphoretic powder is very useful in this disease; also an aperient of senna, manna and cream of tartar in solution.

The following is said to be a good remedy for rheumatism: Kerosene oil 3 ounces, skunk's oil 1 ounce; mix, and shake when applied. Put it on quite freely, and heat it in by the stove, or by means of a hot shovel. Another remedy for acute rheumatism is a dose every hour of 1 to 10 drops of the tincture of macrotys.

Rhubarb or **Pie-Plant.** This is one of the most useful and best of all productions of the garden that are put into pies. The part used is the stalk of the leaves, which, peeled and cut into small pieces, are put into pies and stewed for sauce. It is very generally cultivated throughout the United States.

In cultivating sow the seed in drills 18 inches apart and cover one inch deep; when the plants are up thin them to one foot apart; when one year old prepare the ground for the final bed by trenching two feet deep, mixing a liberal quantity of manure with the soil; set plants five feet apart each way; do not cut until the second year, and give a dressing of manure every fall. When it is desired to increase the bed, the roots may be taken up in the spring and divided. The seed will not always give plants like the parent. To encourage leaf growth cut out the seed stalk when it first appears. The Giant Seedless never produces a seed stalk except from a diseased plant. Forcing the pie-plant can be practiced by putting an old barrel over it, open at both ends, but with a loose head to cover the upper end, as the occasion may require; pile fresh stable manure around it, from a foot thick at the bottom to six inches at the top; put the cover on only in freezing weather; if successful the plants will soon fill the barrel with its huge stems and leaves. The barrel must be removed as soon as you judge that a fair amount of leaf has been taken from the plant, and the operation, which is really a severe taxing process, should not be repeated upon the same plant two years in succession.

The stem should not be cut from the plant, but deftly slipped off by a twisting, sidewise pull.

The leading varieties are Linnæus, Myatt's Victoria, Mammoth and New Emperor.

Rhubarb Curculio (*Lixus conclavus*, S). This beetle has, of late years, taken to the rhubarb, and it may become troublesome. It is often covered with a yellow material like pollen when it first makes its appearance about the first of June, but its color is grayish black. It is thought this beetle originally, and does yet, where the rhubarb is not at hand, breed in burdock. It is easily taken by hand, which is the only remedy now known.

Medicinal Qualities of Rhubarb. Rhubarb is one of our most valuable medicines; in it we find a singular combination of two properties, which in their effects are of an opposite character, the cathartic and the astringent. But when the medicine is taken, these properties do not exhibit their several effects at the same time; the cathartic power is always exhausted before the other takes a permanent effect. This circumstance is what so eminently adapts this medicine to the treatment of dysentery, cholera infantum and cholera morbus. Rhubarb is likewise very good in the diarrhœa that often attends dyspepsia, and the last stages of consumption. It is very mild in its operation as a cathartic, and is not apt to produce watery discharges, but rather such as are of a fæcal character.

Rhubarb is recommended by authors in cases of habitual constipation attending dyspepsia; but as will readily appear to any thinking individual, it certainly is illy adapted to such cases, in view of its astringent qualities, which always leave the bowels in a confined condition.

Rhubarb is a tonic and purgative in dogs and other carnivorous animals, but in horses and cattle it has scarcely any effect whatever, further than improving the appetite. The dose of the spiced rhubarb is from one to two teaspoonfuls, repeating it two to three times a day.

Rice is a native of warm climates and differs in the mode of its cultivation from any other grain that is grown. Those spots where various animal and vegetable substances are washed down by rivers, are most favorable to its growth. The marshy parts of Hindostan and Carolina are among the chief portions of the globe where rice is brought to perfection. But the American rice is generally considered as being much better than that which is grown in the East Indies.

The rice fields of Carolina lie adjacent to the larger rivers which flow toward the sea, and down whose rapid currents the floods of each spring bring a fresh deposit of soil. They are enclosed in some places by neat embankments, through openings in which the water is allowed to run at such times as it is needed. The rice-seed is sown in a rich plot of ground, and allowed to attain the height of a few inches, when the plants are removed into the fields where they are to grow, the ground having been previously prepared by being overflowed with water until it is thoroughly saturated. These plantations require to be kept constantly moist, and as they usually lie below the level of the river, by opening the sluices in the embankments they are readily watered; this operation is repeated several times during its growth.

A field of young rice is a beautiful and interesting sight, but the great amount of decayed vegetation

which the soil contains renders the atmosphere very unhealthy and few persons besides the negroes employed in cultivation can remain in the neighborhood with safety.

BAKED RICE. Boil ½ cup of rice in 1 pint of water 30 minutes, and then add 1 quart of new milk and boil 30 minutes longer; then beat together 1 cup of sugar, 3 eggs, 2 teaspoonfuls of salt and a little lemon or nutmeg; stir this into the rice and turn the mixture into a buttered pudding-dish and bake 30 minutes. To be eaten without sauce.

TO BOIL RICE. First wash the rice by rubbing between the hands in three changes of water; to each cupful of rice add 2 of water, with salt to season; boil slowly in a covered vessel, never stirring nor adding water; when the water is all boiled away the rice is done; take the cover from the vessel and allow the steam to escape for a moment, then shake the dish and turn out the rice. In serving at the table the curry should be put over the rice as you would gravy over potatoes, not mixed in before going to the table, as some do.

FROSTED RICE. Boil 1 cup of rice in milk till very tender; salt or season it; beat the yolks of 3 eggs with the rice in a deep dish; beat 3 whites to a stiff froth with a little sugar and a little lemon; spread over the rice and brown in the oven. Put it on ice and serve cold. This may be made of tapioca and corn starch, is cheap, wholesome and delicious and may be afforded often.

RICE SNOWBALLS. Six ounces of rice, 1 quart of milk, flavoring of essence of almonds; sugar to taste; 1 pint of custard. Boil the rice in the milk with sugar and a flavoring essence of almonds until the former is tender, adding, if necessary, a little more milk should it dry away too much; when the rice is quite soft, put it into teacups or small round jars and let it remain until cold. Then turn the rice out on a deep glass dish, pour over a custard, and on the top of each ball place a small piece of bright-colored jelly. Lemon peel or vanilla may be boiled with the rice instead of the essence of almonds, but the flavoring of the custard must correspond with that of the rice.

See Pudding.

Riddle, a sieve with coarse meshes, usually of wire, for separating coarser materials from finer, as chaff from grain, cinders from ashes, gravel from sand, etc. The sieves of fanning-mills are often called riddles.

Rinderpest (rin'der-pest), the German name of the European cattle-plague, a disease not yet introduced into this country. It seems to have been imported into Europe in ancient times, from Central Asia. Its character is that of violent inflammation of the mucous membranes, and is generally fatal.

Ring-Bone, a bony excrescence around the pastern joint on the horse's foot. See page 802.

Ring-Worm, a disease consisting of red rings, formed by small pimples or blotches, containing a watery, corrosive fluid. It is attended with itching and when scratched produces a discharge of a fluid, which by touching other places, spreads the eruption.

TREATMENT. To 1 part of sulphuric acid add 16 to 20 parts water; use a brush or feather and apply it to the parts night and morning. A few dressings will generally cure. If the solution is too strong, dilute it with more water; and if the irritation is excessive, rub on a little oil or other softening application, but always avoid soap.

Another remedy for ring-worm is to wash the part with soft-soap every morning and apply the following lotion at night: 1 dram sub-carbonate of soda dissolved in ½ pint of vinegar.

Rip-Saw, a hand-saw with the teeth projecting forward, for cutting in the direction of the grain, as a kind of substitute for splitting the timber.

Rive, to split with a frow (pronounced *fro*), which is a heavy knife, with a handle at right-angle to the blade, for splitting staves and clapboards. The frow is driven into one end of the "bolt" (large stick) of timber with a heavy mallet and is waved up and down and toward the end of the bolt until the board comes off. To guide the splitting properly, the bolt is alternately turned first one side up and then the other, as indicated by the progress of the splitting, which must be constantly watched. A heavy fork from a tree is fixed a few inches above the ground, in which to turn the bolt and press upon the frow. This operation is much practiced in pioneer times in a timber country.

Roaches: see Cockroaches.

Roads. Roads and roadmaking are certainly important items to the farmer, for almost all the products of his farm must be transported over them, and the cost and comfort of transportation depends very largely on their quality and their condition. The roads through a farming district must therefore have no little influence upon the value of the land in such locality. Every farmer well knows that good roads means big loads, to and from markets, in quicker time and with a vast deal more pleasure, and less wear and tear on vehicle and team, than rough and poor ones. It will be seen, therefore, that this question is one deserving the attention of the farmers in all sections. In most sections of this country comparatively little outlay has been made in constructing roads, but as the country grows older and richer roads will be made better and more durable. In Europe, for instance, where the nations have had time, experience and wealth, they have roads of very superior character.

In making roads there is one thing to secure, and that is a hard, smooth surface, impervious to water. This may be obtained, practically, by the use of various materials and in various ways, but in general country roads are made of the soil. We will first consider the process of making roads of this material.

EARTH ROADS. The roads of a country must obviously be, as a rule, made of material found in the

vicinity, and that will combine in the greatest degree, cheapness, durability and smoothness of surface. In many sections, however, there is no other material accessible than the common earth, and this must be worked in such a manner as to provide a good highway for both heavy and light vehicles. In constructing an earth road the following rules or suggestions will be of practical value:

The road should be about 40 feet wide from outside to outside of the ditches, and the bed, or the portion between the inside of the ditches should be 25 feet wide. If the road is 40 feet in width the ditches should be seven and one-half feet wide. They should be of gradual slope from the edge of the road-bed to the outside, and at the latter point should be one foot deep. Where the surface is uneven, the ditches should be deeper through the higher spots, for they must have a uniform grade so as to run off the water.

FIG. 1.—*The Proper Form of a Road Surface.*

In making a dirt road of the width indicated above, first stake off the road-bed 25 feet wide, in such a manner as to be a guide in plowing. Then plow the sod on either side seven and one-half feet wide, or the width of the ditches. Scrape all the turf or sod upon the center of the road-bed, striking the furrows endwise with the scraper, and having the team pass around in a circle. When all the sod has been scraped to the center, plow again and remove the earth to the road-bed, rounding up the center, and making the surface uniform. After this has been done plow three or four furrows upon the outside of the ditches, scrape in the dirt leaving the surface highest in the center and curving gradually to the outside of the ditches as represented by Fig. 1. The ditches by this are lowered one foot on each side, the road-bed raised six inches by the dirt from the ditches; hence the drainage is 18 inches in half the width of the road or in 20 feet from the center of the road to the outside. This should make a good, solid road-way, as the mellow soil soon packs and becomes hard upon the original hard earth, and the loose earth, being scraped from the ditch, leaves that free to carry off the water. The road-way is represented by that portion above the dotted lines in Fig. 1.

The general tendency is to make the road-bed too narrow in first making a road, and each time it is repaired to encroach upon it. The ditches are usually deepened abruptly close to the road, thus forcing travel in one place. This soon makes the road narrow, flat and rough or miry, as represented in Fig 2.

In repairing an earth road plow upon the outside of the ditch, always throwing the furrows toward the road. Then begin to scrape from the outside of the new plowing, and you will doubtless have sufficient earth to broaden and round up the road. This will form an oval road-bed, as shown in Fig. 1, so that travel may be effected clear to the bottom of the ditches. The principal feature to be ever borne in mind is to have such ditches as will carry off the water. Any road will become dry that has good ditches, and nothing short of that will make a dry road.

Another method of draining is by tiling. This has been proven a very effective way of draining a road, and that is the important item. Roads may be constructed as above described, and a line of tile placed close to the lower edge of the embankment at a depth of from two and a half to three feet. To do the work thoroughly, a line should be laid on each side of the embankment. These lines should be laid very accurately and upon a true grade. If it is possible the drain should have a grade of at least 2 to 4 inches to 100 feet. The most important thing to look after is the rapid removal of the water. This necessitates the most accurate work in laying the drain, and also larger tiles than would be sufficient to drain the same area of land for farming purposes. If there are small sags communicating with the road ditches, branch lines should extend to them so that they may not overflow and discharge large quantities of water in the road ditches. Should there be a hollow along the line of tile, a catch-basin will facilitate the removal of the water. This is a pit, two feet square, dug as deep as the tiles are laid. After the tiles are laid, the pit is filled with gravel or small stones. The object of this basin is to take the water which gathers so quickly in such places, and give it a rapid ingress to the tile.

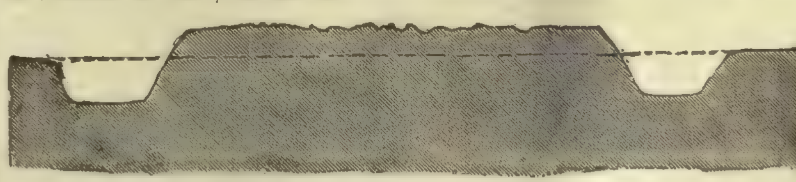


FIG. 2.—*Improper Way of Draining and Ditching Roads.*

Placing three or four inches of coarse sand ten or fifteen inches below the surface of the road, in the original grading, will make an efficient drain.

A road-way 20 feet wide will afford ample room for two teams to pass, even when loaded with unusually bulky articles, as, for instance, hay; but should the side ditches be made as abruptly as is often done, as shown in Fig. 3, there will be danger of tipping over. They should have a gradual slope, as shown by Fig. 4, where a team may travel on any part of it without danger. The principal implements required in mak-

ing a road as described above are a plow and a road-scraper. Perhaps the best of the latter kind are made by the Chicago Scraper & Ditcher Co., Chicago, Illinois.

GRAVEL ROADS. In localities where sharp gravel is obtainable, there is no doubt but that a covering of from 10 to 15 inches upon a perfectly graded and well drained road is one of the best and most economical; at the same time it is easier to keep in repair

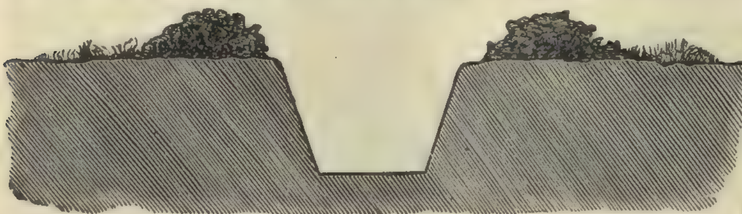


FIG. 3.—*Improper Way of Ditching.*

for county roads, for the reason that it costs merely the digging and hauling. Washed and rounded gravel should never be used, for it will never cement together to form an even surface. It may, indeed, in time become so incorporated with the soil as to increase the solidity of the road-way, but it can never become a really efficient medium over which loaded vehicles can pass at all seasons of the year.

The great cost of hauling material of any kind to form the superstructure of a road, renders it imperative that the most careful calculation be made as to the amount of traffic thereon. If, for instance, the heavy travel be nearly all one way, as in country places, ten feet of ballasted portion will be ample; 14 feet will easily allow for turning out, and for the passage of loaded teams; 18 to 20 feet will allow teams to go in contrary directions continuously; and 24 to 32 feet will admit of the road being thronged in both directions, and yet leave sufficient room for turning out and the passing and repassing of light vehicles, swiftly driven.

PLANK ROADS. These are suited only for a heavily timbered country; at the best they are but temporary affairs, and are the worst roads possible if not kept in the best of repair. As our country grows older they must of necessity be replaced by roads of more permanent character.

BROKEN-STONE ROAD. The best road we can command is the broken-stone or macadamized road. The method of making, in its earlier stages, is very similar to that of the gravel road, viz.: by preparing a well drained and neatly graded road bed slightly convex at the center; to this apply the road metal (which, in this case, consists of angular fragments of stone, not over 1½ inches on any side), in layers of a few inches in thickness, allowing each layer to harden under the traffic before the next is applied. The thickness of the broken stone should vary with the amount of traffic from 8 to 16 inches. Once made, the broken-stone road is the cheapest of all roads. It is a road over which a single horse can easily draw nearly two tons against eight-ninths of one ton on a gravel road.

CULVERTS. One of the most important essentials in road-making is sluice-ways or culverts, at proper intervals, so that the water may readily be conveyed from one side of the road to the other, as the conformation of the surface may demand, to keep up the continuity of the drainage; for, if water be permitted to stand in the ditches at all, the road-way must remain moist and consequently soft.

One of the greatest nuisances is the rough, uncouth wooden culvert. When these ditches receive the accumulated waters of fields, as when the road-way crosses natural water courses, substantial culverts or bridges must be provided; but when the accumulation is simply the drainage of the road, with, perhaps, some addition from the adjacent land, a simple line of tile sunk to the level of the bottom of the ditch, and extending across and under the road, is all that is necessary. These, besides offering no obstruction to travel, are far cheaper than even the simplest culverts formed of wood.

These should always be of vitrified tile and may be ordered in any city. They are made of any size, from six inches to two feet or even larger in caliber. If one is not enough, lay two or more alongside each other, and forever do away with the severe shocks that torture horses, drivers and passengers, whenever the wheels of a vehicle strike those plank water ways.

Roaring of horse: see page 725.

Robin, a familiar bird of the thrush family, the *Turdus migratorius*, so called because he migrates to the South to pass the winter. A few, however, remain North during the winter, in thick swamps and on the sunny sides of woods. They appear in the Northern States in very early spring, "singing their

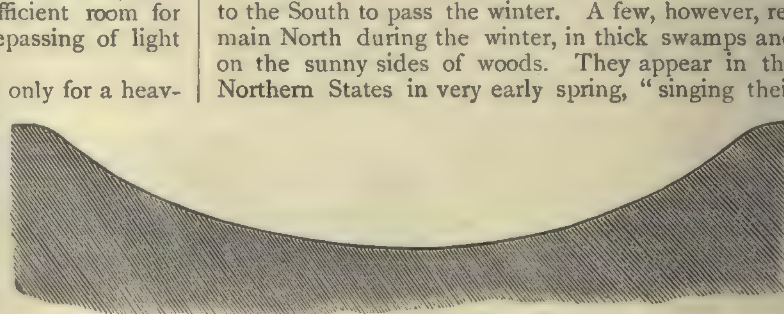


FIG. 4.—*Proper Shape of Ditches.*

sweetest." From an economical point of view, it is still an unsettled question whether they do more harm than good; but from the "esthetical" standpoint, it is evident that their song is far preferable to the everlasting "chip-chip" of the English sparrow, which will eventually drive out our native song-birds. The robin subsists upon worms and larvæ and upon cherries and some other small fruits in their season. This is not the "robin red-breast," of the Old World, which belongs to another genus of this family.

Rochelle Salt (ro-shel′), the tartrate of potassa and soda. This is a colorless, transparent, slightly efflorescent and crystalline substance, with a saline and slightly bitter taste. It is a mild and cooling purgative, well suited to delicate and irritable stomachs and is among the least unpalatable of the neutral salts. It is not incompatible with tartar emetic, and may be given in connection with it when the double effect is desired. It is an ingredient of Seidlitz powders. The dose for a purge is from ½ to 1 ounce. Given in small and repeated doses, it does not purge, but is absorbed and renders the urine alkaline.

Roller, an implement for compressing, smoothing, pulverizing, or otherwise finishing off cultivated land, whether in grass or in tillage, in preparation for sowing or subsequent to sowing. Rollers vary greatly in form and the material of which they are constructed, but those in general use are made of wood. Iron rollers are, however, commonly used in some sections. It has been found that very frequently instead of crushing the clods of hard earth a roller simply presses them into the loose soil. For use on clay land, which has become hard and baked, a heavy iron roller supplied with a large number of teeth upon its outer surface will be found the best. For lighter work as a clod crusher a log drawn over the ground without rolling will answer every purpose. Such an implement can be made for either one or two horses. If for the former a pair of shafts will be required, while for the latter a pole similar to that of the wagon. However, besides the work of smoothing the surface, a roller is a good implement for covering grass seed.

Rolls, light fancy bread in the form of rolls.

COFFEE ROLLS. Take six cups or three pints of flour, half a cup of white sugar, a piece of butter the size of an egg, half a cup of yeast, two eggs, and a little nutmeg. Mix with warm milk, and let it rise over night; if well risen in the morning, knead and set in a cool place until afternoon, then shape into long rolls and let them rise an hour and a half. Bake in a moderate oven. When done, glaze them with a little milk in which some brown sugar has been dissolved, and set them back in the oven for a few minutes. These are for tea.

PARKER-HOUSE ROLLS. Sift two quarts of flour, make a hole in the center. Take one pint of warm milk, half a cup of melted butter in the milk, let it cool, then add two tablespoonfuls of sugar, a gill of yeast and a little salt; pour this into the hole made in the flour; let it stand till morning, then thoroughly mix it, not adding any more flour; let it rise again until noon, then knead it stiff enough to roll out; cut it in rounds and give them a roll with the rolling-pin to make them oval; lap them over, having put a crumb of butter under each before lapping. Let them rise in the pan before going into the oven.

BREAKFAST ROLLS: see page 134.

Rolly-poly(Rolly-po-ly), a kind of pudding made of sheets of paste spread with sweetmeats, etc., rolled up. Make a biscuit dough with a quart of flour, 2 large teaspoonfuls of condensed baking powder, sifted into the flour, 2 tablespoonfuls of chopped suet, and sweet milk enough to make into a dough. Roll into an oblong sheet a little more than a quarter of an inch thick, and spread thickly with fruit, as berries or chopped apples, sliced peaches, etc., or jam preserves, etc. In putting this in, leave an inch at the edges uncovered; roll it up tight, lap the edges over to prevent the escape of the fruit, and sew it up in a bag, having first dipped the bag in hot water and dredged it with flour. Boil the pudding 1½ hours, and when done cut it crosswise in slices ½ inch thick and serve with wine or fruit sauce.

Root, the part of a plant which strikes downward or inward into the soil. It directs its course downward or inward with a tendency apparently as invariable and stubborn as the force of gravitation; it does not carry branches or leaves or scales in the manner of a stem; it never becomes green in its tissue by exposure to the action of air and light; and it comprises all the points of the plant's basal attachment, and also all the bibulous organs of the plant's functions of nourishment.

Root Crops, crops of roots raised to feed to stock. The raising of such crops is of growing importance in this country. In Europe the practice has enabled the people to raise 25 per cent. more cattle, and to raise them better. Of beets nothing is exported but the sugar, while the remaining pulp is a most valuable food for cattle. In this country beets, carrots, turnips and pumpkins afford a healthful variety to break the dull monotony of corn, oats and hay. Indeed, the feeding of these juicy articles are absolutely essential to the greatest degree of perfection and of health in farm animals. Feeding upon these prevents constipation and excessive drinking of water, while it is a general "corrective" of all the digestive processes. Of course, pound for pound, there is theoretically more nutritive matter in grain than in roots; but the point is, there is more *available* (digestible and assimilable) matter in a varying mixture of the two classes of articles than in either alone, while the juices of the roots, pumpkins, etc., are physiologically purer and more welcome to the animal economy than any other water that can be obtained.

In the West the usual drouth of late summer and early fall stand in the way of the successful raising of turnips, but carrots and beets can be raised with profit. Dairymen and stock-breeders, especially, would be justified in raising these on a large scale. The mode of raising these vegetables is given in their places in this volume. For field culture, of course, everything is planted in rows or drills 2½ to 3 feet apart, to allow for horse cultivation, and such large and coarse varieties of the vegetables as will yield the most per acre. These varieties are also indicated in the respective articles in this work. If you have a good piece of land, passably clear from weeds, upon which you wish

to raise roots, sow plenty of carrots, provided you can get good reliable seed. This is quite difficult, but, if possible, try to raise your own seeds of various kinds. Should you fail in your carrots, you can sow to ruta-bagas or Russian turnips; and in case these happen to fail wholly or in part, you can still fall back on the flat turnip. Next in value comes the beet. See pages 95–6.

Preparation of Land. In the month of May, or earlier, plow your land (any good land will do, a stiff sod excepted), a good depth, at the same time applying a good coat of fine stable or compost manure. Harrow and roll it well. The rolling will insure it against drouth, which frequently happens about the seeding time of the varieties, which for ruta-bagas or Russian turnips should be from the 10th to the 25th of June; for carrots or beets, same time in May, or from the 25th of May to the 10th of June will do, other conditions being favorable; and for flat turnips, the last half of July. Having thus prepared your land, some little time before sowing, some of it at least you will need to see to on account of the weeds, and if necessary harrow to keep them down. Just before seeding time, whether it be carrots, beets or turnips, put your land in drills or ridges, about two feet apart,—not to exceed that distance,—on the top of which sow your seed, being sure to put in plenty of it, as it is much easier to thin out than to transplant or fill with later varieties.

Use a large plow, first measuring off from one side of the piece at a given distance, say three rods. Then strike a straight furrow through the piece and back, making one ridge; then set your clevis over so as to make the ridges the desired distance apart by cutting and covering, and so on until you have finished the field, giving the ridges one day to settle before sowing, if the weather is likely to be fair.

After Cultivation. As soon as your plants reach a suitable size, which will be in three or four weeks, use an old-fashioned five-toothed cultivator, taking out the two center teeth and bringing in the sides toward the center as much as you can, which makes a cultivator just the right width. After going twice in a row with this, there will be a strip six to eight inches wide where the plants are, which has to be worked with a hoe. Do not think it will hurt your plants, ruta-bagas and turnips in particular, to handle them a little roughly, cutting away with the hoe. Carrots need more care, and it frequently becomes necessary to use the hand in order not to disturb the plants; and it is a slow job at that, especially if neglected for a few days. If the first weeding is well done, the after culture can nearly all be done with the cultivator. Beets require about the same process in cultivation as ruta-bagas and Russian turnips. The flat turnip is of so much less value for feeding that we do not recommend raising them, except where there may be blanks in your other root crops, or where you may have been prevented from getting your ground ready in season for other varieties.

You may reasonably expect from 500 to 800 bushels to the acre.

Carrots and beets are preferable as food for milch cows, as they do not give the milk that unpleasant taste sometimes noticed when feeding turnips or ruta-bagas. This, however, can be nearly or quite all avoided by feeding cows in the morning immediately after milking; or, in case there should be a little of it still remaining, put one teacupful of hot water to a pail of milk before straining.

Harvesting. Beets and carrots should be gathered before very heavy frosts. A little freezing may cause the top to become hollow and soft. A potato fork is very valuable for loosening the ground, after which the root is readily pulled out with the hand and the top broken off before laying it down. They will keep better and be nicer at time of feeding if allowed to dry a little before pitting. The beet or carrot will withstand a very dry season even in light soil, but the yield will vary, of course, according to the surroundings. With rows 30 inches apart and the beets 18 inches in the row, there would be about 11,500 plants to the acre. These will weigh nearly all the way from 2 pounds to perhaps 15 or 20 each. If the average weight was 5 pounds you would have about 57,500 pounds, or 958 bushels per acre. The cost of production per acre may be figured as follows:

Once plowing	$2 00
Harrowing and cultivating	3 00
Seed	2 50
Drilling	1 00
Eight days' tending	12 00
Pulling and pitting	12 00
Manure	12 50
Total	$45 00

Allowing only 450 bushels per acre the cost is but 10 cents per bushel. A yield of 750 bushels would reduce the cost to 6 cents per bushel.

Fig. 1.—*Tea Rose.*

Rose, the flower which stands at the head of the

floral kingdom. The species are numerous and the number of varieties overwhelming; and new varieties are originated by florists almost every year. The leading species of cultivated roses are Cherokee, Bracted, Evergreen, Musk, Many-flowered, Banksia,

FIG. 2.—*Hybrid Perpetual Rose.*

Tea, Perpetual or Bengal, Bourbon, Bengal Pompon, Noisette, Provence (French or Red), Hundred-leaved (or Cabbage), Damask, White, Cinnamon, Burnet (or Scotch), Yellow Eglantine, Yellow, Dog, Sweet-Brier, etc. The leading wild species in this country are the Prairie (or Climbing), Swamp, Dwarf Wild and Early Wild. Most roses are hardy and easy of cultivation; some are "half-hardy," and a few tender. The rosaceous order of plants comprises nearly all our fruits, as, apple, pear, peach, cherry, plum, blackberry, raspberry, strawberry, nectarine, apricot, quince, almond, etc.

Rot, a disease of the liver and adjacent viscera of sheep. It is one of the oldest and most destructive of sheep maladies, and is supposed to destroy more sheep than all other diseases together. See Sheep.

Rotation. Rotation of crops is one of the best established principles of modern agricultural science, and probably, also, the most important. Every one sees that any given class of plants will exhaust the soil of certain elements; and upon this fact alone you can easily construct a system of constant renewal. (See Manure and Fertilizer.) As exceptions to the principles of constant rotation, onions, and two or three forage plants in rich bottom lands that are sometimes inundated, do better to remain in the same ground for many years.

In a well-planned system of farming, the subject of crop rotations should be carefully considered as one of the essential elements of success in its highest and best sense. It seems to be the prevailing opinion that the alternation of crops, in systematic order, is a modern invention that was gradually developed as a direct result of the applications of science to the art of agriculture. The early writers on agriculture, even from the times of the Greeks and Romans, have, however, quite uniformly urged the advantages of a succession of crops from the teachings of experience. They were satisfied that a variety of crops grown in succession, all other conditions being equal, would give a greater aggregate yield than could otherwise be obtained. The reasons for the success of the system could not, it is true, be given, but practical men were fully agreed in urging its importance, and many systems of rotation, more or less perfect, were planned, some of which became the prevailing rule of farm practice in particular localities. That these practical rules of alternating crops of different habits and modes of growth are based on correct but not fully explained principles, has been shown by direct experiment.

Many theories have been advanced to explain the well-established influence of one crop upon the growth of another; but as the laws of plant growth became better known, and greater exactness in the means of investigation were discovered, they were found insufficient to account for all the observed facts, and even at the present time a complete and satisfactory theory of rotation is wanting. When it was observed that the yield of a grain crop was diminished when grown continuously on the same land for a number of years, and that a marked increase of the crop was obtained after some other crop had been grown, the idea that the soil was "tired" so far as that particular crop was concerned, and needed "resting," became the accepted explanation.

In 1566 Camillo Tarello presented to the Senate of Venice a plan of an improved system of agriculture, in which he urged the importance of better cultivation of the soil; an increase of cattle food for a better supply of manure, and the "resting" of the soil for grain crops by alternating them with the grasses and clover. The next theory worthy of particular notice was presented by De Candolle, who assumed that plants threw off excretions from their roots that poisoned the soil for the same species of plant, but served as nutritive material for other plants. This excretory theory, although for the time a popular one, was finally disproved, and Liebig's mineral theory, as it was called, was quite generally accepted as giving the best explanation of the known facts of crop rotations. According to this theory, plants derived their mineral, or ash constituents, from the soil, and obtained from the atmosphere their supply of carbon and nitrogen. As crops differed in their ash constituents, it was assumed that their demands upon the soil would differ, and that this largely explained the advantages of rotations. The assumed source of nitrogen was, however, a more important factor and crops were classified as exhausting when their mineral constituents predominated, and as restorative

when they contained a larger proportion of nitrogen, which they were supposed to draw from the atmosphere by means of their broader leaves which characterized them. The cereals, including our wheat, oats and barley, were thus placed in the group of exhausting crops; while clover and other leguminous plants were placed in the restorative group.

As a full crop of clover removes from an acre of soil more of the mineral or ash constituents than a full crop of wheat or oats, it is difficult to understand why, in accordance with this theory, the wheat and oats should be classed as exhausting crops, and the clover and its allies as restorative crops, if their mineral constituents are alone considered. Moreover, in regard to the source of the nitrogen of what are called restorative crops, like clover and beans, there seems to be evidence that a smaller proportion is drawn from the atmosphere than was formerly supposed, and that the soil furnishes the most important supply.

An excellent system of rotation is plainly shown in the accompanying illustration. The order of succession in the crops of this system is as follows:

1. Inverted clover and timothy sod for corn. 2. Barley. 3. Wheat. 4. Meadow. 5. Pasture, to be continued one or more years, or changed for meadow. This is well known as the most common rotation in many of the Northern States, and the only peculiarities here pointed out are in the details.

Rotation of Crops.

1. The Corn. When corn follows meadow excellent crops are obtained by applying the manure on the grass the autumn previously, or even soon after the cutting of the previous crop of hay.

2. Barley. It is important that the crop be sowed early in spring, and for this reason is adapted only to dry or well drained fields. On water-soaked land it would prove a failure. If the corn has been properly cultivated and kept clean, weeds will not have gained much hold; and if previously weedy, the good cultivation will have tended to eradicate them. The earliest variety of barley should be sown, in order that it may be harvested early, to admit several weeks of summer-fallowing before sowing the wheat.

3. Wheat. This being an important crop, proper care should be given to the preparation of the soil. The good treatment of previous years for other crops will extend to this also. The effects of the rotting sod for the corn, and the manure it received, will not yet have passed away. If the barley has been cut early, at least six weeks of summer-fallowing may precede the sowing of the wheat, at a time of year when it will accomplish much towards clearing out foul matter, as well as pulverizing the soil into the best condition for the reception of the seed. If the land is not strong enough, a light dressing of manure just before sowing will be of much benefit.

4 and 5. Clover and Grass. Clover and timothy seed are sown early in spring on the wheat, or the timothy may be sown the preceding autumn. As soon as the wheat is cut, the young clover should have a dressing of gypsum, and again another the following spring. The grass should be meadow the first year, as it has not become strong enough for the tread of domestic animals. If continued another year or more as meadow, it should have a light top-dressing of manure applied in autumn, as the removal of the hay tends to reduce the land. If continued several years for meadow, a year of pasturage should be occasionally interposed, the grass never being grazed short, especially on the approach of winter.

The essential elements of the preceding rotation may be retained, with a considerable modification of the details. A portion of the field devoted to corn may be occupied with potatoes, in which case, if the sod is strong, it may be plowed for this crop the previous autumn, and re-plowed in spring. Turnips, carrots, etc., may occupy the same field, care being taken to have the land properly prepared at the same time. Instead of barley the second year, may be peas, spring wheat, or oats, in which latter case it may be necessary to give an additional dressing of manure preceding the wheat. After the field is seeded to grass, it may be kept as meadow and pasture two, three, or more years, according to circumstances, and the number of fields occupied by the rotation.

Round-Up, a term used by herdsmen for gathering together the vast herds of cattle on the plains of the West. See Herding.

Roup, a most common and a very fatal disease of poultry. See page 539.

Rowel (rou′el), in farriery, a roll of hair or silk, passed through the flesh of a horse, to keep open a suppurating wound. The term has also been applied to the little flat ring or wheel of plate or iron on horses' bits.

Rowen: see Aftermath.

Rubble-stone, small stones used for coarse masonry. The wall made of such stone is called a "rubble wall."

Rumen, or **Paunch,** the first of the four stomachs of a ruminating animal.

Ruminants (ru′mi-nants), the family or order of animals which have four stomachs and which masticate their food after it has been once swallowed and taken into the *rumen*. It is the most distinctly defined of all the families of mammals, and is also the most useful to man. Its genera are the ox, the sheep, the goat, the antelope (including the gazelle, chamois, oryx and gnu), the giraffe, the stag, the musk,

the llama and the camel. All the ruminants have a callous pad instead of incisors in the upper jaw, and are cloven-footed, have four stomachs, a very long intestinal canal, and their mammæ between the thighs. The flesh of ruminants furnishes all the principal kinds of meat used by man; their milk, especially that of the cow, supplies all the produce of the dairy; their fat affords all the varieties of tallow, and their hides, their horns and their other parts all possess great economical value. Some of the living animals, also, particularly camels, are very valuable beasts of burden.

Rumination, the re-mastication of food after it has entered the *rumen* (paunch) of the animal. Liquid or attenuated food passes at once into the third and fourth stomachs and is not re-masticated; but all other food, particularly such as consists of comparatively dry and solid vegetable matter, descends into the *rumen*, is there slowly macerated, passes little by little into the second stomach and is there separated by compression into a liquid and solid portion, the liquid to pass on to the third and fourth stomachs, and the solids to be returned in pellets up the gullet for such re-mastication as shall reduce it to a pulp and fit it to pass direct, by re-deglutition, into the third and fourth stomachs. The re-mastication is effected while the animal lies at ease, and constitutes what is popularly called "chewing the cud," and takes place only upon matter which nothing short of tedious labor can reduce to perfect pulpiness or liquidity, and the regorging which attends it differs widely from the belching or vomiting of non-ruminant animals, and is as regularly conducted by a specially constituted organism as deglutition, or absorption, or secretion, or any other ordinary act or function of the animal system.

One important practical lesson suggested by the nature of rumination, is the proper feeding of cows, in order to produce the greatest quantity of milk. If they are fed on very dry food, such as hay, the greater portion of fluids in the blood will be spent in the process of rumination and digestion, and the milk will be scanty; but if they are fed on aliment which abounds in liquid they will ruminate much less, a less quantity of saliva will be wanted for chewing the cud, and a larger proportion will go to the production of milk, though this will be thinner and not so rich in cream as the milk produced from drier food.

Another important practical lesson has reference to the giving of medicines. We may to a very great extent send medicine into what stomach we please. We may give it in a ball, and it will fall into the paunch, and thence go the round of all the stomachs; or it may be exhibited in a fluid form and gently poured down, and the greater part of it pass at once into the third and fourth stomachs. That which is meant to have a speedy action on the constitution or the disease, should be given in fluid form. That, also, which is particularly disagreeable should be thus given, otherwise it will enter the paunch and be returned again in the process of rumination, and disgust the animal, and perhaps cause rumination to cease at once.

Runt, a name applied to a dwarf animal; also the name of a variety of common pigeon.

Rupture, the protrusion of some part of the intestines from their proper cavity. See Hernia.

Rural, pertaining or belonging to the country, as distinguished from a city or town.

Rush, the name of many species of coarse, grass-like or reed-like herbs. Some species are used in bottoming chairs and plaiting mats, and the pith of some species has been used as lamp-wicks in some countries. The "scouring rush" is common throughout the United States. It has a round, fluted and gritty stem, without branches or leaves, and is very good to use in lieu of a scrubbing-brush.

Rusk, a kind of light, soft cake or sweetened biscuit; also, a kind of light, hard cake or bread; also, old, dry bread rasped up or pulverized, to be eaten with meat or sauce. A good way to "economize" old bread of any kind is to heat it in an oven until dry, and grate or pound it up into a powder. It is then very palatable, eaten in any way that bread is.

Rust, the reddish or brownish yellow coating on iron exposed to moist air; it is mainly the oxide of the metal. Secondarily, any metallic oxide; anything that resembles rust of iron, as parasitic or fungous growth on vegetables or trees, or even on any organic substance. As all rust is deleterious to the health, it behooves us to avoid it in every possible way, not only in rejecting rusty grain from our breadstuffs, but also in keeping all the victuals from contact with oxidizable metals. The greatest damage we suffer from rust is caused by eating or drinking those things which have stood or been cooked in iron vessels; but verdigris, the oxide of copper in brass utensils, is the most poisonous of all.

To prevent rust in farming utensils, see page 864. To remove rust from linen, moisten the portion of linen stained in clear, soft water, then lay on a few crystals of oxalic acid, and occasionally add a few drops more of water till the stain is gone; then rinse thoroughly in cold, soft water.

Rustic, pertaining to the country. Rustic work is that which is made of rough limbs of trees fancifully arranged, as in seats, bowers, summer houses, etc. Rustic masonry is that which leaves the surfaces of the stones rough. Rustic work in nearly all its phases is common in city parks, and ought oftener to grace the landscapes of farmers.

Rut, a furrow or track worn in the road by the wheels of vehicles; the copulation of animals, especially of deer.

Ruta-Baga, Swedish turnip; called also Russian turnip and French turnip.

Rutting Season, the period when animals pair or mate.

Rye, a genus of cereal grasses of the wheat tribe.

Great obscurity hangs over the early history of rye. Certain interesting ancient notices of cereal grasses are thought by some commentators to refer to rye and by others not; some plants which the botanists of a former age regarded as species of rye, are now assigned to the genera *Triticum* and *Agropyrum*; and two or three varieties, perhaps species, which continue to be called rye, either hold a doubtful place between rye and wheat, or are not sufficiently known to be spoken of with certainty. Yet a few old facts respecting rye are well authenticated, and at the same time possess considerable interest.

Rye has been variously supposed to be a native of Crete, of the Crimea and of the Levant or of Egypt; but it possesses the constitution of a plant inured to the coldest regions, and grows most abundantly beyond the Yakutsk on the surface of a frozen subsoil, and seems, on the evidence both of its own nature and of some of the earliest records of it, to have been introduced to all other countries where it is found from some northerly part of Asiatic Tartary. The grain mentioned by Moses and Isaiah, which the authorized English translation of the Sacred Scriptures calls rye, and by Herodotus, which some old scholiasts regard as rye, appears to have been the species of wheat formerly called *Zea spelta*, and now called *Triticum spelta*, and popularly spelt. Rye does not seem to have been known to Aristotle or Dioscorides, and is not mentioned by Cato, Virgil, Columella, or Varro, and may therefore be inferred to have held no place among the ancient agricultural crops of Greece or Italy. Pliny, however, describes it as cultivated by the Taurini in the part of Cisalpine Gaul which constitutes Piedmont, and says that they call it Asia, a circumstance which possibly may point to their ancestors having brought it with them remotely from Asiatic Tartary, and immediately from the valley of the Danube.

Rye was known and cultivated in Great Britain at a very early period and is still extensively cultivated as a bread grain throughout Poland, Russia, Switzerland, much of Germany, other parts of Great Britain and our own country.

This grain, among its bread-making properties, has a peculiar, rich aroma, which particularly distinguishes it from all other cereals. It is hardier than wheat, and is often a good substitute for it on those soils which will not grow the latter grain with certainty and profit.

A rich, sandy loam is the best for rye, though it will grow freely on light sands and gravels which are too poor for the other grains. Loamy soils too rich for wheat will frequently raise an excellent crop of rye, as in such a situation it is not so apt to lodge. Strong clay or calcareous land is not well suited to this grain.

In preparing the ground for sowing rye, principles similar to those in the cultivation of wheat should be observed. It may be advantageously sown upon a rich, old turf, or clover lay, or after corn or roots where the land has been well manured and thoroughly cleaned of weeds. There is not an equal necessity for using a brine steep for rye as for wheat, yet, if allowed to remain a few hours in a weak solution of saltpeter or some of the other salts, it promotes speedy germination and subsequent growth.

There is but one species of rye, but to this cultivation has given two varieties, the spring and the winter. Like wheat, they are easily transformed the one into the other by sowing the winter continually later through successive generations to change into spring grain, and the opposite for its re-conversion into winter grain. The last should be sown from the 20th of August to the 20th of September, the earliest requiring less seed, as it has a longer time to tiller and fill up the ground. Five pecks is the usual quantity sown, but it varies from one to two bushels, according to the quantity of the soil, the richest land demanding the most. It is a practice among many farmers to sow rye among their standing corn on light lands, hoeing or cultivating it, and leaving the ground as level as possible. On such lands this is attended with several advantages, as it gives the grain an early start, and a moist, sheltered position at a time when drouth and hot sun would check or prevent vegetation. As soon as the corn is sufficiently matured, it should be cut up by the roots and placed into compact shocks, or removed to one side of the field, when the rye should be thoroughly rolled. When sown on a fresh-plowed field, it should be harrowed in before rolling. Great success has attended the turning in of green crops and following the fresh plowing with instant sowing of the seed. This brings it forward at once. No after cultivation is needed except harrowing in spring, and again rolling if the land is light, both of which are beneficial If the rye is luxuriant, it may be fed both in the fall and in the spring. Early cutting, as with wheat, produces more weight, larger measure and whiter flour. What is intended for seed, however, must be allowed to fully ripen on the ground.

For soiling, rye is sometimes sown by those who wish late forage in autumn or early in spring. For this purpose it should be sown at the rate of two to four bushels per acre. If on a fertile soil and not too closely pastured, it will bear a good crop. In some cases, when too rank, early feeding will strengthen the stalk and increase the grain.

As to diseases, rye is subject to fewer calamities than wheat. Sometimes it is affected by ergot, or cockspur. (See Ergot.) It is most frequent in those seasons which are at once hot and wet. It is poisonous to both man and beast. This excrescence sometimes grows upon other species of plants. Rye is also subject to rust, like that upon wheat, and in this case the grain should be harvested immediately.

S

SACCHARINE (sak'a-rin), containing sugar; as, the saccharine juices of a fruit.

Sachel, or **Satchel,** a small sack, generally ornamentally finished and furnished with a handle, lock and key, to be used in traveling. It is usually made of some textile fabric, while a valise is made of leather. Very cheap articles of this kind are now made from pasteboard, in imitation of leather. The prices range from 50 cents to $15 or more, strictly in proportion to their substantial character. In this line of goods one pays for what he gets and gets what he pays for. An ingenious lock, latch and key are of no use except to keep the children of the family from breaking into them, as, in traveling, thieves never stop to unlock a sachel, but seize the whole article and run. See Traveling.

Sack, a large canvass bag for holding grain, small seed or other farm products. A number of sacks, proportioned to the quantity of produce likely to be sent to market, should be kept ready for use and in a sound and clean condition, on every farm. All should be marked with the initials or name of the owner. They should be kept in some dry, airy place.

Saddle, the artificial seat of a rider upon the back of a horse. It should be so constructed as to combine comfort to the rider with ease to the horse. It ought to press only on the back, and on neither the spine nor the withers; it must make everywhere an uniform pressure, and must neither tilt forward upon the points or jut backward upon the seat, and when fully adjusted and fastened on the animal, it should have as large a free space beneath the pommel as will permit the introduction of the hand. If these matters, and some others which are well known to all duly qualified saddlers, are not fully attended to in the construction of any saddle, not only discomfort to the rider, but much suffering and serious injury to the horse may be the consequence.

Saddle-backed, applied to a horse when low in the back with an elevated head and neck.

Saddle Gall: see Gall.

Sadiron: see Flat-iron.

Safe, a box, case or apparatus for preserving money, valuable papers and costly articles from theft and from fire. The term is also applied to refrigerators and certain kinds of cupboard, which preserve victuals "safe" from heat, flies and vermin.

Saffron, the name of several species of plants.

1. Crocus Sativus. This is simply called "saffron," and is the one most in repute as a "domestic remedy." It is a member of the iris family and raised around the Mediterranean. It was formerly much used as a stimulant and anti-spasmodic, but now only in eruptive fevers, to a limited extent, to aid the eruption. It is very seldom prescribed.

Saffron is of a pleasant, aromatic, bitter taste, and is both stimulant and narcotic. It exhilarates the spirits and strengthens the stomach. Makes a valuable tea for children afflicted with the measles, chicken-pox, and all eruptive diseases.

2. Meadow Saffron. *Colchicum autumnale.* This is of the lily order and grows wild in Europe, but is not even cultivated in this country. Medically it is said to be a sedative and anodyne, but is used, to a very limited extent, in a great variety of diseases,—both the bulb and the seeds.

3. False or Bastard Saffron, or Safflower. *Carthamus tinctorius.* Flowers yellow, often used for true saffron, and in coloring yellow. Cultivated to some extent in country gardens. It is an annual of the composite family.

Sage, an aromatic herb of the mint family, popular in medical practice and as a flavoring of many articles of food. There are several sorts, as the red, the green, the small-leaved and the broad-leaved balsamic. The latter is esteemed for medical uses, and is used in teas for colds, and as a cooling and sweetening drink in fevers. Sage is originally a native of Southern Europe, but has long been cultivated in our gardens. Its cultivation is simple. The seeds should be sown in a gentle hot-bed early in the spring, and transplanted when large enough in rows 20 inches apart by 12 inches in the row. Keep clean from weeds and cut when in bloom. The plants must be covered during winter, for they will not stand freezing and thawing. If this is done the bed will continue to produce several years, but they should be renewed every three years.

Sago, a species of nutritious fecula or starch, extracted from the pith of a species of East India palm-tree, called the sago palm.

Sainfoin (san'foin), a leguminous plant cultivated for fodder.

Salad, a preparation of uncooked herbs of which lettuce is the most generally used, dressed with salt, vinegar, oil or spices; and also a dish composed of

some kinds of meat, especially of chicken or lobster, chopped fine and mixed with uncooked herbs seasoned with mustard and other condiments. A salad properly prepared should be one of the most attractive dishes upon the table. A variety of vegetables may be used according to taste, but the fewer the better. Those mostly used are lettuce, endive, radishes, onions, mustard, celery, water-cress, mint, parsley, dandelion, sorrel and tomatoes.

CHICKEN SALAD. Boil a chicken that weighs about a pound and a half. As soon as it is done tender, cut it up in small strips, and make the following sauce, and turn over it: Boil 4 eggs three minutes; take them out of the shells, mash and mix with them a couple of tablespoonfuls of olive oil, or melted butter; two-thirds of a tumbler of vinegar; a teaspoonful of mustard; a teaspoonful of salt, and a little pepper. In making chicken salad, the dressing should not be put on until just before the salad is sent to the table.

SALAD OF VEGETABLES. A very nice salad may be made by mixing a variety of cold boiled vegetables together. Asparagus, cauliflower, string beans, beets, carrots, turnips and peas may be used. These vegetables of different colors look well, but one can use whatever is most convenient. Supposing that the salad is to be made of carrots, turnips and peas, boil a pint of peas in salted water until tender, then lay them in cold water. Pare a carrot and a white turnip and cut them into uniform pieces; boil them in separate waters and lay in cold water until needed. Just before serving, arrange the vegetable neatly on a small platter, contrasting the colors well, and pour over them a French salad dressing made as follows:

Mix a salt-spoonful of white pepper with two of salt and a teaspoonful of scraped onion. Add three tablespoonfuls of salad oil, and when well mixed, stir in a tablespoonful of vinegar. Pour the dressing over the salad just before serving.

String beans, alone, make a nice salad, and cauliflower with a *mayonnaise* sauce is excellent. Cold baked navy beans are improved by a similar dressing; and cold boiled potatoes with beets, onions and this sauce, is a dish that seldom goes begging. Cold boiled potatoes with Lima beans and beets, are good in a salad with French dressing. The proportion of oil and vinegar can of course be varied to suit individual taste.

LETTUCE SALAD. Into half a cup of scalding vinegar stir 1 beaten egg, ½ a teaspoonful of mustard, and a piece of butter the size of a walnut; a little sugar if desirable. It can be turned on the lettuce hot or cold, just as one prefers. The same is fine for cabbage.

Another: Two tablespoonfuls of thick cream, one tablespoonful of sugar, and vinegar to taste. This is very much liked by those who do not like much seasoning.

LOBSTER SALAD. Pick out the meat from a hen lobster; lay aside the coral and chop the rest. It can be mixed with lettuce or celery chopped but it must not be allowed to stand a moment after it is mixed. The better way is to have the lettuce in a separate dish and pass it with the lobster.

SALMON SALAD. One and a half pounds cold boiled or baked salmon; 2 heads white lettuce (or celery); 3 hard-boiled eggs; two tablespoonfuls salad oil; one teaspoonful salt, and same of Cayenne; 1 teaspoonful white sugar; 1 teaspoonful Worcestershire or anchovy sauce; 1 teaspoonful made mustard; 1 teacupful vinegar.

Sal Ammoniac, chloride of ammonium, a salt of a sharp, acrid taste, much used in the mechanical arts and in pharmacy. Called also hydro-chlorate or muriate of ammonia. It acts primarily as a stimulant, purging in large doses, but rather constipating in small ones. The dose is from 5 to 30 grains, repeated every two or three hours, given in sweetened water or mucilage.

Saleratus, a bi-carbonate of potash, much used in cookery. It is not always pure, generally containing more carbonic acid than pearl-ash. It is used to raise dough into a sponge by the evolution of gas it occasions with the sour milk put in with it, and is also often used to aid in softening hard or tough vegetables and meats while they are boiling. It is also useful in scalds and burns, in some medicines to correct acidity in the stomach or urine and in many little recipes of household economy.

Saliva. The saliva issues from distinct sets or glands existing in different parts of the mouth, and the quantity of it secreted daily is very considerable, although it varies according to circumstances. This secretion is more copious in children and aged persons than it is in adults, more copious in cold than warm climates, and in the day than the night. The smell or sight of agreeable food makes it flow into the mouth, and the same result arises from the practice of smoking tobacco, or from the presence of sour or bitter substances in the mouth. The quantity of saliva is sometimes largely increased or considerably diminished by disease. Its office is that of keeping the mouth moist, and preparing the food for digestion. Under the influence of rage and some other violent passions it assumes a frothy appearance, and in many animals becomes poisonous.

Salivation, act of salivating, excessive flow or secretion of saliva, as produced by mercury, etc.

Sallenders, same as Mallenders, a supposed disease of the horse: see page 790.

Salmon (sam'on), a celebrated fish which belongs to the trout genus: see article Fish.

Salsify, or **Vegetable Oyster,** a well-known culinary herb. Its small parsnip-like roots are used to give an oyster flavor to soups, and the tops are sometimes used for greens. Sow in early spring on light, rich soil, in drills 14 inches apart, and thin the plants to three inches in the row. The roots will be

ready for use in October, and can remain over winter in the ground without injury. The three leading varieties are, New Blue-Flowered French, Scorzonera or Black and Scolymus Hispanicus. The second mentioned is too bitter for use as an article of diet without soaking.

To Cook Salsify. Scrape the root and put into cold water immediately; cut into thin slices; boil tender; make a nice white sauce or drawn butter and pour over; or boil to a mash, mix with butter, salt, a little milk and pepper, add flour enough and mix as codfish cakes, and fry in the same manner.

Sal-Soda, an impure bi-carbonate of soda, used principally in the laundry as a substitute for soap, and in making Seidlitz powders. Medicinally, its principal virtue consists in dissolving stone or calculous deposits, the dose for an adult being 10 grains to a dram, taken in carbonic-acid water.

Salt (*Chloride of Sodium*). This substance, chemically, is a compound of chlorine and sodium of the following proportion: Chlorine, 60.4 per cent, and sodium, 39.6 per cent. Water can dissolve only a certain quantity. Boiling water dissolves more salt than cold, but when the hot solution cools, all the salt falls down in a solid state above what the cold water can hold in solution. Salt is the only mineral substance universally regarded as an article of food by man and the higher order of the animal kingdom. The uses of salt as a condiment for both man and beast and as a means of preserving substances are so well-known that we need make no further remarks upon the subject.

Bay or solar salt is that which is obtained by evaporation in the sunlight. Rock salt is dug from mines in rock-like masses. Table salt is pure and ground fine, so that it will dissolve rapidly. Stoved salt, packing salt, etc., are common salt of different degrees of fineness.

Salt is a very important article as a fertilizer, its action being favorable in all soils in the interior. Its molecules being smaller than even those of water, they insinuate themselves into nearly all substances, aiding in their disintegration and thus rendering them available as plant nutriment. Salt, sown abundantly on the soil of a garden or field, is also a great protection against insects, and various diseases of plants; and in no case is it known to do harm.

In chemistry the term salt denotes a combination of an acid with another substance, forming an element which is very different in its properties from either the acid or the other substance. The salifiable substance is called the base. Thus, nitric acid combines with potash, forming the nitrate of potash. The word "of" is misleading, as it intimates that the substance denoted by the first word is an *extract of* the other. Hence modern chemistry furnishes a new nomenclature and nitrate of potash is now called "potassium nitrate." The following table further illustrates. The kind of acid denoted in the first column unites with the base of the second column and forms the salt denoted by the various names following:

CHEMICAL NOMENCLATURE OF THE SALTS.

Acid.	Base.	Old Name (unscientific).	Old Name (scientific).	New Name (scientific).
Sulphuric	Lime	Plaster of Paris; Gypsum	Sulphate of Lime	Lime (or Calcium) Sulphate
"	Potash	Vitriolated Potash	" " Potash	Potassium "
"	Soda	Glauber's Salt	" " Soda	Sodium "
"	Magnesia	Epsom Salt	" " Magnesia	Magnesium "
"	Iron	Copperas	" " Iron	Iron (or Ferrum) "
"	Quinia	Quinine	" " Quinine	Quinine "
"	Copper	Blue Vitriol	" " Copper	Copper "
Phosphoric	Lime	. . . . . .	Phosphate of Lime	Lime Phosphate
"	Soda	Tasteless Purging Salt	" " Soda	Sodium "
Carbonic	Lime	Marble	Carbonate of Lime	Lime Carbonate
"	Soda	Soda	" " Soda	Sodium "
Tartaric	Potash	Cream of Tartar	Tartrate of Potash	Potassium Tartrate
Nitric	"	Salpeter; Niter	Nitrate of "	" Nitrate
Hydrochloric	"	Muriate of Potash	Hydrochlorate of Potash	" Hydrochlorate

By the above table it is seen that acids denoted by words ending in *ic* combine with bases to form salts denoted by terms ending in *ate*. Feebler acids are indicated by words ending with *ous*, and their combinations are denoted by corresponding terms ending in *ite*; as, nitrous acid combines with soda, forming nitrite of soda, or sodium nitrite. So sulphurous and phosphorous acids form sulphites and phosphites. In these there is less oxygen than in the *ic* acids and *ate* salts. When no oxygen is present, the fact is indicated by ending the first terms with *ide*; as, chloride of

sodium (common salt), iodide of potash, phosphide, sulphide, carbide, etc.

Saltpeter: see Niter.

Salt Rheum or **Tetter,** a disease of the skin, consisting of rough, red patches and covered with a thin, dry scale. The skin is red and hard and apt to crack and become chapped. It is attended with a sensation of heat, smarting and itching. Keep the skin well washed with warm water, and soften it as much as possible with soft poultices; then wet with tincture of iodine and let it dry; after which apply a little citrine ointment. When the eruption is on an exposed part, a wash composed of 1 dram corrosive sublimate, 2 scruples white vitriol (sulphate of zinc), 3 drams sal-ammoniac, 2 drams salt and 3 ounces sugar of lead mixed with 1 pint soft water may be used alternately with the tincture of iodine. The diet should be light and nourishing. See Magnetic Ointment, page 996.

Salve or **Cerate,** a thick kind of ointment composed of wax, oil and other medicinal substances. (See Ointment.) Below we give recipes for making some valuable salves.

SIMPLE CERATE. Melt together 8 ounces lard and 4 ounces white wax, stirring constantly until cold.

SALVE FOR ALL WOUNDS. Take 1 pound hog's lard, 3 ounces white lead, 3 ounces red lead, 3 ounces bees'-wax, 2 ounces black resin and 4 ounces common turpentine; all these ingredients must be put together in a pan and boil ¾ of an hour; the turpentine to be put in just before it is done enough, and give it a gentle boil afterwards. This is an excellent cure for burns, sores or ulcers, as it first draws, then heals afterwards; it is excellent for all wounds.

LARD OINTMENT. Melt 2 pounds pure lard, add 3 fluid ounces rose-water, and beat them well together while hot. When cold, separate the congealed fat from the water. This is a simple lard ointment.

BALM-OF-GILEAD SALVE. Mutton tallow, ½ pound; balm-of-Gilead buds, 2 ounces; white pine gum, 1 ounce; red precipitate, ½ ounce; hard soap, ½ ounce; white sugar, 1 tablespoon. Stew the buds in the tallow until the strength is obtained, and press out or strain; scrape the soap and add it with the other articles to the tallow, using sufficient unsalted butter or sweet oil to bring it to a proper consistence to spread easily upon cloth. When nearly cold stir in the red precipitate, mixing thoroughly.

Samp, Indian corn broken coarse and boiled, to be eaten with milk or butter.

Sand, fine particles of stone, principally of flinty stone, from which glass may be made. For correcting tenacious clayey soils, that from a sand-bank is best, as it is mostly free from coarse gravel. That which is deposited in the bed of creeks has considerable plant nutriment in it, but on account of the coarse gravel, boulders and other stones in it, it is objectionable. All the solid or mineral constituents of the soil were once in the form of sand; and the finer the grains the farther the water will carry them. Hence, the further we go from the mountains the finer and more tenacious we find the soil and all alluvial deposits; and each grade of soil is characterized by a distinct flora, or class of plants. See Soil.

Sand Crack, a disease of the foot of the horse: see page 804.

Sassafras, a well known tree, generally a shrub, of the Laurel family, yielding a very fragrant bark, which is a stimulant, chiefly used in hot teas for rheumatism, eruptions, scurvy, etc. The bark of the root, obtained in early spring, is a popular material for a table beverage called "sassafras tea." The pith of the tree yields a mucilage much used as a soothing application to inflamed eyes and in drinks for dysentery, catarrh and kidney diseases. In those sections where the tree does not grow the bark can be found at the drug stores, cheap enough for anybody.

This is also a favorite remedy with many farmers for their horses, and is given to them in the spring of the year to strengthen and improve the appetite. Sassafras may be given to horses, either in the form of a powder or as a decoction or tea and mixed with the food.

Satin, a glossy silk twill of a peculiar description, the soft and lustrous face of which is given by keeping a large proportion, frequently even as many as seven out of every eight threads of the warp, visible. In the manufacture of other silken stuffs, each half of the warp is raised alternately; but, in weaving satin, the workman only raises the fifth or the eighth part of the warp, which, presenting an even, close and smooth surface, is capable of reflecting the rays of light very entire, and the fabric thus acquires that luster and brilliancy for which it is so much distinguished.

Sauces. APPLE SAUCE. Take ripe, tart apples, pare, quarter and core; have the stew-kettle ready with boiling water; put the apples in and cook as quickly as possible, stirring once or twice to see that the apple cooks all to pieces; sweeten to taste when half cold.

Another. Take one-third sweet apples and put with them any good sour ones, some variety which will not cook to pieces easily preferred; add water, sugar and a little sirup, cover closely and cook not too fast for seven or eight hours, supplying a little water from time to time that there may be no danger of burning, but do not stir them.

ARROWROOT SAUCE FOR PLUM PUDDING. Rub very smoothly a dessertspoonful of arrowroot in a little water or in a glass of white wine, squeeze in the juice of half a lemon, add the pounded sugar, and pour gradually in half a pint of water. Stir it very quickly over a clear fire until it boils. Serve it with plum pudding. This sauce may be flavored with anything you prefer.

CRANBERRY SAUCE. Take 1 quart of cranberries, 1 pint of sugar and 1 pint of water; boil slowly, and

when the berries are soft beat well and strain through a colander.

Good Common Sauce. One coffee-cupful of brown sugar; 2 tablespoonfuls of butter, and 1 tablespoonful of flour; beat well together; then add 1 cupful of boiling water and simmer for a few minutes. Flavor with nutmeg or lemon, or a little cider.

Dried-Apple Sauce. Take good, sour, common dried apples and prepare for cooking; soak all night in plenty of water, then put in an earthen jar with a cover; add some amber cane sirup and boil until a dark red color; keep plenty of water on them.

Hollandaise Sauce. Stir 1 even tablespoonful of flour into 1 ounce of melted butter; cook well together and add 1 teacupful of boiling water. Stir this into the yolks of 4 beaten eggs and return all to the fire for a minute; add a little more butter cut into bits and season to taste with salt, pepper and lemon juice.

Lemon Sauce. Beat together ¼ pound of butter and ½ pound of sugar; grate the rind and press out the juice of 2 lemons; beat all together and boil a short time.

Mint Sauce for Roast Lamb. Two tablespoonfuls of chopped green mint; 1 tablespoonful of pounded sugar; and a quarter of a pint of vinegar. Pick and wash the green mint very clean, chop it fine, mix the sugar and vinegar in a sauce tureen, put in the mint, and let it stand.

Parsley Sauce. Wash the parsley thoroughly, boil it for six or seven minutes till tender, then press the water well out of it; chop it very fine; make half or a quarter of a pint of melted butter as required (the less butter the less parsley, of course), mix it gradually with the hot melted butter.

Tomato Sauce. Remove the skin and seeds from about a dozen tomatoes, slice them and put them in a stew pan, with pepper and salt to taste, and three pounded crackers. Stew slowly one hour.

White Sauce. Stir an even tablespoonful of flour into an ounce of melted butter. When well cooked, add a pint of rich milk, stirring constantly until smooth and thick. Season with salt and white pepper.

Sauer Kraut (sour'krout) is a name of a preparation of cabbage chopped fine with salt. To make this famous German dish, take as many hard, firm cabbages as you wish to preserve, tear off the loose leaves, cut them into quarters, cut out the hearts or stalks, and chop them up small. To every one hundred pounds of cabbage add three pounds of salt, a quarter of a pound of caraway-seed, and two ounces of juniper-berries, mixing these well together. Procure sweet, clean iron-hooped casks, lay the chopped cabbage three inches deep, then as each layer is put in sprinkle it with the mixture of salt, etc. The cabbage must be pounded down as it is put in the barrel with a heavy wooden mallet. After each cask is filled it must be covered with some cabbage leaves or a linen cloth and the wooden cask-head, and pressed down with heavy weights. After the cabbage has been allowed to ferment for a month, pour off the cold water which will be formed in this process, and to take its place pour in warm water containing black pepper and common salt. As soon as a sour smell is perceived, the cask must be placed in a cool situation and there kept.

There are various modes of cooking it, while some prefer it raw, eating it as a salad. It is frequently boiled, three hours or more, with salt pork cut into small pieces. Perhaps the nicest style is to fry it in pork fat or with the gravy from the roast pork. For frying, it should be boiled two hours to make it tender. It is a wholesome, hearty food, and is particularly appreciated by men requiring a substantial diet, while it is also relished by many of more fastidious taste.

Sausage. To make family sausage, the trimmings and other lean and fat portions of pork are used, taking care there is about twice as much lean as fat; some consider it an improvement to add about one sixth of the weight of lean beef. As to seasoning that is a matter of taste. The majority of people use salt, pepper and sage only; some use only salt and pepper, while others in addition to the above put in thyme, mace, cloves and other spices.

Before putting the meat in the cutter see that it is entirely freed from all bones, lest your cutter be broken. It should be cut in small pieces or strips

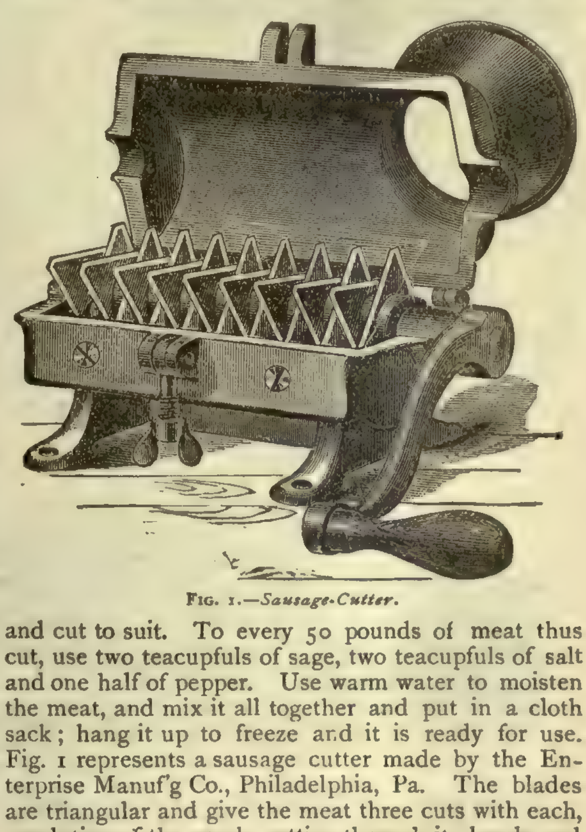


Fig. 1.—*Sausage-Cutter.*

and cut to suit. To every 50 pounds of meat thus cut, use two teacupfuls of sage, two teacupfuls of salt and one half of pepper. Use warm water to moisten the meat, and mix it all together and put in a cloth sack; hang it up to freeze and it is ready for use. Fig. 1 represents a sausage cutter made by the Enterprise Manuf'g Co., Philadelphia, Pa. The blades are triangular and give the meat three cuts with each, revolution of the crank, cutting through it cleanly and

clearly, not pulling or tearing it apart, into strings.

When it is desired to pack the sausage in the intestines of the hog, the intestines should be carefully prepared as follows: Empty them, cut them in

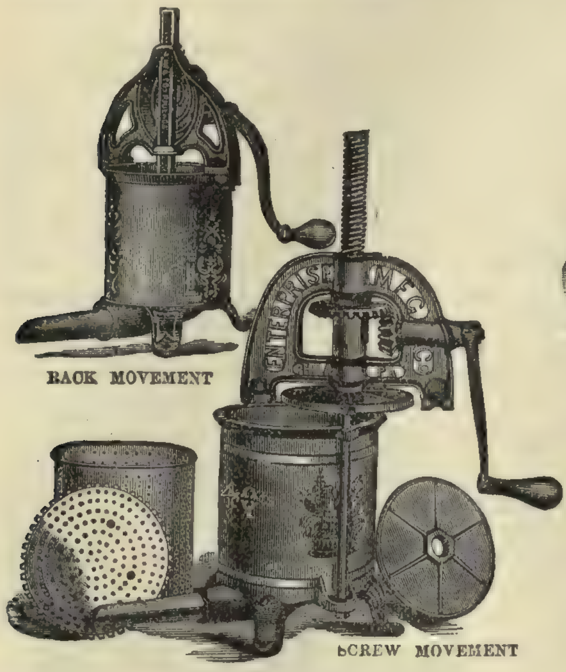


FIG. 2.—*Sausage Stuffer.*

lengths, and lay for two days in salt water. Turn them inside out and lay in soak one day longer. Scrape them, rinse well in soda and water, wipe and blow into one end, having tied up the other with a bit of twine. If they are whole and clear, then stuff with the meat. To do this, it is necessary to have a machine. The one represented by Fig. 2 is made by the same company as the cutter (Fig. 1). It is an economical machine, for the reason that it can also be used for a fruit, lard or jelly press.

For stuffing sausages, the tin strainer and bottom plate are to be removed. They can be easily exchanged by screwing them on or off.

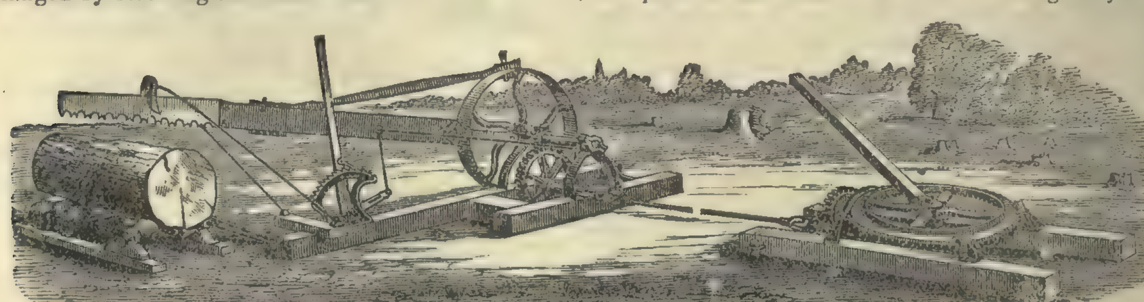


FIG. 3.—*Phœnix Cross-cut Saw* (with detached horse-power).

TO MAKE BOLOGNA SAUSAGES. Take three pounds of lean beef, the same of lean pork, two pounds of fat bacon, and a pound and a half of beef suet; put the lean meat into a stew-pan of hot water, and set it over the fire for half an hour; then cut it small, each sort by itself; shred the suet, and bacon or ham, each

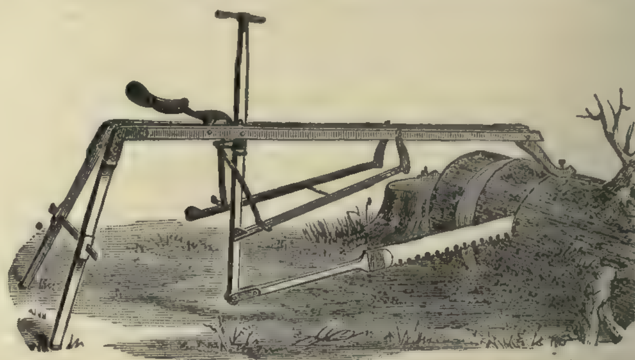


FIG. 1.—*Sawing Machine.*

by itself. Season with pepper, thyme chopped fine and ground mace; fill ox skins with it, tie them in lengths, and put them in a beef brine for ten days; then smoke them the same as ham or tongue. Rub ground ginger or pepper over the outside after they are smoked, and keep them in a cool, dry place.

Savory, or **Summer Savory,** an annual aromatic sweet herb, sometimes cultivated, but running wild in the West, which is used in flavoring meats.

Saw. On every farm are needed at least one hand-saw, one rip-saw, one scroll-saw, one cross-cut saw, and one wood-saw (Fig. 2); and sometimes there are needed, in addition, a meat saw, and sometimes a horse-power saw. We need say nothing particularly on the care of these implements, as nothing is necessary but a little persevance or promptness to execute the common-sense principles which everybody is supposed to have. In filing a saw, the cut should be made even, from the point of the tooth to the base as originally done in the manufactory, and by holding the file at the same slant or angle as will preserve the original

FIG. 2.—*Wood Saw and Saw Buck.*

form of the tooth. To file only the points of the teeth, in haste and for a temporary purpose, costs more than it is worth in the outcome. See File, page 451. Lack of promptness in taking good care of saws makes more trouble than anything else in proportion to the extent of use of the instrument.

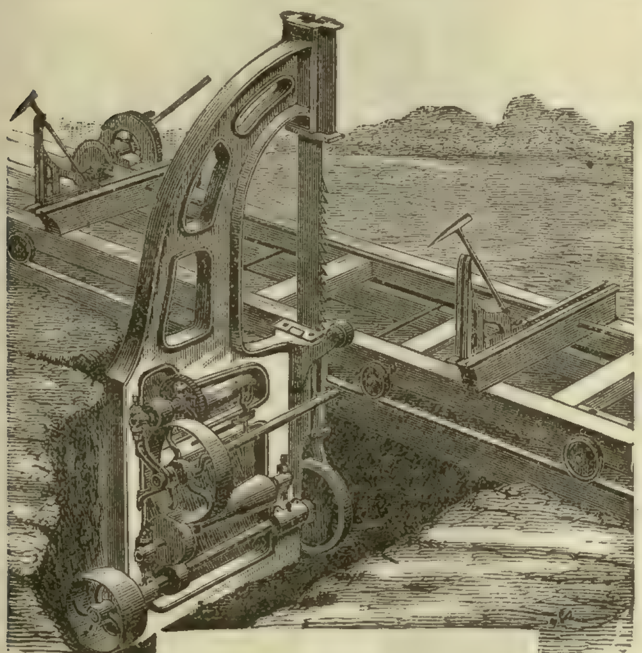


FIG. 4.—*Upright Saw for Mill.*

Fig. 1 illustrates a machine by which one man alone may run a cross-cut saw for sawing logs. Several inventions have been patented for this purpose, but this seems to be the simplest and most substantial.

Horse-power cross-cut saws are also in the market. The cheapest and best form of these for general use in the country, so far as our knowledge extends, is made by the United States Manufacturing Co., of Chicago, and shown by Fig. 3. They also make the one representeb by Fig. 1.

Fig. 4 is a cut of a substantial power saw, made by Chandler & Taylor, of Indianapolis, Ind. The carriage runs wholly on one side of the saw, thus affording a simpler structure of the whole apparatus than the ordinary gate saw requires. Being a "muley" (gateless) saw, the very best of material is used, so that it is perfectly reliable for all sorts of heavy work.

Scab, an incrustation over a sore; a loathsome and troublesome disease in sheep, analogous to itch in man and mange in horse. See Horse article, page 790, and also Scab in article on Sheep.

Scaldhead. This is a very contagious, pustular disease, chiefly affecting the scalp, but it may also appear on other parts of the body. The disease may be known from all other eruptive affections, by the honeycomb appearance of the pustules. These are small, perfectly rounded, and imbedded in the epidermis, and contain a yellowish or straw-colored matter, which soon concretes, representing a depression in the center. The disease is more common among children than adults.

Treatment. The first thing to be done in attempting a cure in this obstinate disease, is to remove the hair, and the crust formed upon the skin. A pair of scissors or a razor will serve to remove the hair, and then the crust should be moistened by an alkaline solution, made by dissolving two drachms of the carbonate of potash, or three of the carbonate of soda, in a pint of water. Washing the parts with strong soapsuds will much facilitate the removal of the crust. As soon as the hair and crust are removed, the parts should be well washed with suds made of soft or rain water, and common soft soap, and then after drying by means of a soft linen cloth, a solution of the extract of bayberry, or of equal parts of this and the extract of dock-root should be applied; and then apply a paste made by dissolving some gum elastic in stramonium ointment, over which some oiled silk may be placed to protect the parts still more from the atmosphere. The latter application should be renewed every morning and evening, and the parts well washed with strong soapsuds, and after drying, saturated with the astringent solution as before.

It will be observed, however, that scaldhead is exceedingly difficult to manage, and that the same treatment will not always prove successful. Thus the astringent and oily applications may be superseded by other similar or different applications. But all the other parts of the treatment are proper in every case. See Tar Ointment, page 995.

Scalds. See Burns and Scalds.

Scales. Scales are a most convenient and even necessary article to the farmer. The produce shipped

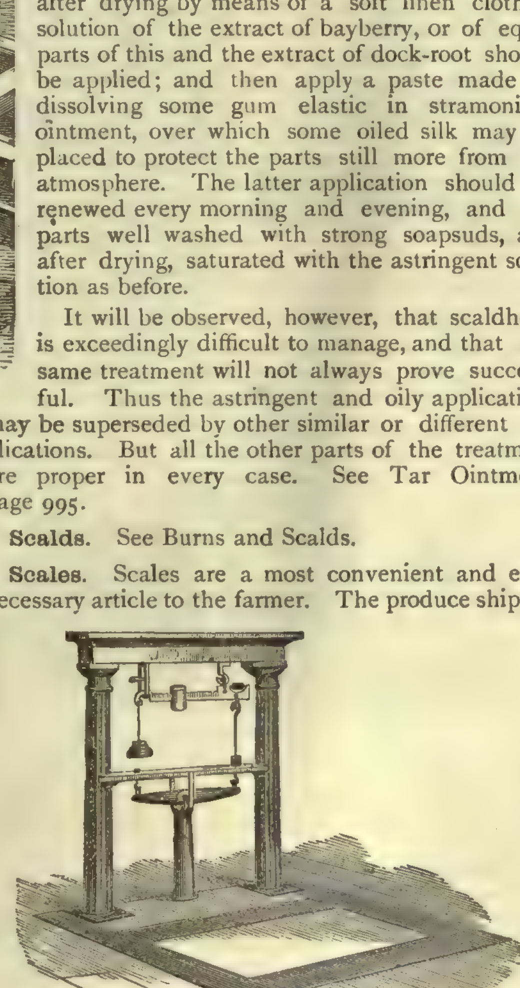


FIG. 1.—*Warehouse Scale.*

from the farm or sold to the village merchant should always be weighed at home, previous to shipment or

sale. When stock is weighed at home, before being placed on the stock dealers' scales, the farmer can easily determine whether he is cheated or not. The value of a scale must depend on the benefit to be derived from it, and its purchase value, on the quality of the material used and the skill employed in its manufacture.

We give some illustrations of different kinds of scales, made by Jones of Binghamton, N. Y., which are adapted to various farm uses.

The platform scale, Fig. 2, is strong, well made, having wheels attached for convenience and adapted to the use of a majority of our farmers.

The warehouse scale, Fig. 1, is larger than the "platform scale" and made stationary in the floor of the warehouse or barn. Its convenience and weighing capacity make it a desirable scale for those having extensive dealings in produce. It is strong, well built, and will supply the wants of large farmers.

Fig. 2.—*Platform Scale.*

Fig. 3 represents a lever scale for the weighing of stock. It has a platform 14 feet long by 8 feet wide and combines the strength of the truss lever with the simplicity of the crown lever. Its capacity is five

Fig. 3.—*Truss Crown Lever Scale.*

tons. In Fig. 4 we give an illustration containing a description of a five-ton scale.

The lumber required to put up a five-ton scale is as follows:

Three sticks 16 feet long, 6 x 7 inches.
Two sticks 12 feet long, 6 x 7 inches.
Two sticks 14 feet long, 8 x 8 inches.
One stick, 14 ft. long for bearing plank, 3 x 8 inches.
Two sticks 14 feet long, to run lengthwise through the center of scale, to spike platform plank to stiffen the platform, 3 x 8 inches.
Two hundred and fifty feet of 2-inch plank.
One stick 14 feet long, 3 x 7 inches.
Fifty feet planed and matched 1-inch stuff.

Figs. 4, 5 and 6 represent a wagon scale. The platform is 14 feet long by 7 feet wide, and where a stock pen is not to be permanently placed this width

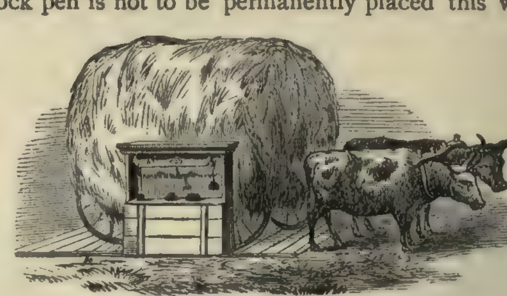


Fig. 4.—*At the Farm Yard.*

is most convenient. In Fig. 8 we give the component parts of the wagon scale. Its capacity is five tons.

These scales are simple in construction, durable and strong. All the wearings and bearings are of the best tool steel, combining toughness, hardness and permanency of edges.

Scarfskin, the outermost lamina of the skin; the cuticle; the epidermis.

Scarlatina in horse: see page 804.

Fig. 5.—*At the Tannery or Mill.*

Scarlet Fever (*Scarlatina*). This disease, like most others, is susceptible of variations in its violence, and hence by the profession is divided into three forms. They are all, however, essentially the same, only varying in the degree of severity. The disease breaks out on the body in spots or blotches, which are called eruptive and are scarlet or red in color. These appear generally between the second and sixth days, accompanied with fever and sore throat, and usually

Fig. 6.—*At the Coal Yard.*

terminating between the seventh and tenth day. These eruptions first appear about the neck and face,

in the form of red spots, which in 24 hours or less cover the entire body. As the fever increases sometimes there is vomiting, generally accompanied with thirst, headache and restlessness. The eruption is at its height on the fourth day and begins to decline the

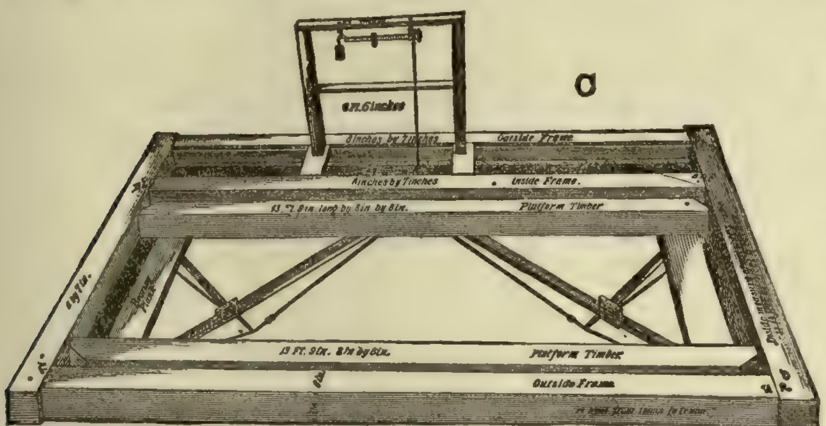


FIG. 7.—*Timber for a Five-Ton Wagon Scale.*

following day. After the eighth day the disease begins to disappear, when the skin peels off in scales. In more severe cases the fever is very high and slight delirium with very sore throat is experienced. The pulse becomes very rapid, in children often reaching 140 to 150 per minute and in adults 120 to 130. Sore throat always attends this disease.

Scarlet fever greatly resembles measles and great difficulty is sometimes occasioned in distinguishing it from measles. The eruptions in it come out earlier than in measles. The eruptions generally appear within 48 hours of the existence of fever in the former while in measles the rash rarely appears before the third day, and most commonly not until the fourth day. The color of the eruptions in measles are much darker, and less diffused, than in scarlatina. The eyes are inflamed, tears flow profusely, there is more or less sneezing and cough in measles, while in scarlatina these symptoms do not appear.

Scarlatina is regarded as dependent for its cause on a specific contagion. It terminates variously. A variety of other diseases may follow. Dropsies are by far the most general. Abscesses of the tonsils, head and ears, enlargement of the parotid glands, loss of sight, deafness, loss of hair, asthma and many other diseases have been known to follow.

Treatment. There have been various modes of treating this dreaded disease, some of which are quite simple and have often proven effective. We present the following: Put 15 drops of the tincture of aconite root and 15 drops of fluid extract of belladonna in a glass of water and take a teaspoonful every hour until recovery. In addition rub the body thoroughly with salt grease, the rind of fat, uncooked bacon being excellent. Keep this up during the course of the disease. This will afford marked relief from fever.

Another remedy is to take sulphate of zinc, 1 grain; foxglove (digitalis), 1 grain; ½ teaspoonful of sugar; mix with two tablespoonfuls water; when thoroughly mixed add four ounces of water; take a teaspoonful every hour. It is claimed that this cures in every instance.

A gargle for the throat of the following solution will prove beneficial: chlorate of potash and muriate of ammonia each ½ dram, water 3 ounces and glycerine 1 ounce. Mix and gargle. If the throat should swell externally bathe with equal parts of tincture of arnica and linseed oil. In all cases the throat should be thoroughly greased with salt grease and wrapped with a piece of flannel. The room in which the patient rests should always be well ventilated and kept at an even temperature.

School-house. We have very fully treated of the proper management of schools and the proper treatment of children at schools, and the rights and duties of teachers, etc., in the article on Education, and therefore will confine our remarks in this article simply to the school building and its surroundings.

During the past few years many rapid strides have been made toward improving the school buildings throughout the country, and yet there is, in many sections, a deplorable lack of the display of this

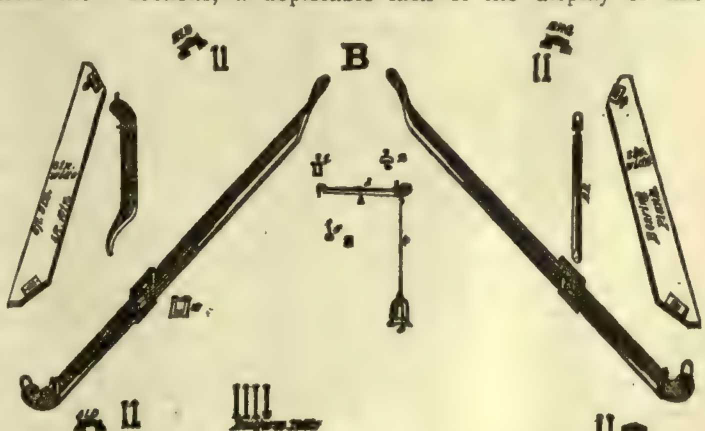


FIG. 8.—*Component Parts of a Wagon Scale.*

public-spirited enterprise. In many districts, dotted over with magnificent farm mansions, with the accompanying spacious and well-planned out-buildings, may be found little dingy, dirty school-houses, without the slightest pretense to the comfort, convenience

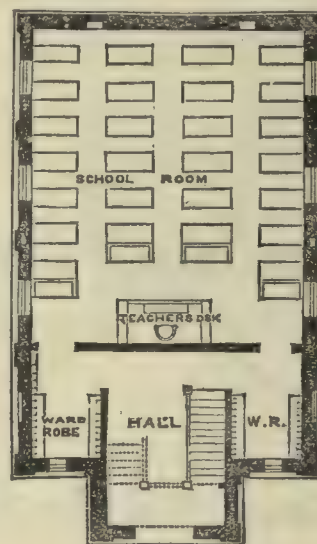
or pleasure of teachers or scholars,—indeed, such buildings as the well-to-do farmers in the district would refuse to keep their stock in. This contrast may be seen in many sections of our country, and it illustrates the folly of man most strikingly. Children are often actually driven from school by the repulsive appearance of the school-house and its surroundings. Remember that the early impressions of the mind are lasting and tend very strongly to direct the future life of the child. Perhaps one of the most potent influences for good that might be easily attained in every district is the cultivation of taste for landscape scenery. This attraction and influence, thrown around the country school, would not only tend to draw the young from the degrading habits of lounging in villages, but would brighten the mind, stimulate the intellect, encourage study, and the better fit the young for the active duties of mature life. They would also enhance the attractions of rural life and of home influences. The more neatly a school-house is made and finished the less inclined will reckless boys be to mar it in any way. Rough furniture they delight to whittle up and deface; nice furniture they do not touch.

While there has been much improvement in the class of school buildings of late, yet little attention is paid to ornamenting the grounds. This may be done at a small expense and will add much to the cheerfulness of the building. Plenty of room should be devoted to the school-house, that the children may not be compelled to use the road for a play-ground, or infringe upon the places devoted to shrubbery, etc. The following order might be adopted: A handsome lawn should be provided in front, which should be planted with the smaller ornamental trees, and with some of the larger shrubs.

A place should be left for the play-ground in the rear, which should be planted with fewer trees. Both should be kept smoothly shaven with a lawn mower. The paths to the closets should be sheltered by small evergreen trees, both for seclusion and for protection in winter. The closets especially should be kept clean, tidy and free from all bad odor. The latter may be prevented by the daily use of coal ashes, road dust, lime, copperas, or other materials.

The general principles of landscape gardening, as detailed in this work under that head, may be in great part applied to the school grounds. The principles of ventilation and heating, of sewerage and of constructing and managing the privies, are the same for the school premises as elsewhere.

As to the choice of a location, the remarks upon this same point in the article on Church are equally applicable to school-houses. The building should be tastefully and conveniently designed, substantially built, well-furnished and painted with a pleasant color. Care should be taken that proper ventilation be provided. Much suffering is caused by children being required to sit for hours in an illy ventilated room. In such rooms it is well-known that they cannot perform their duties so well, and the effect upon some of the more delicate becomes serious. Never pass this subject by as unimportant if you have any part to perform in building a school-house; and if no active part devolves upon you it is your duty as a tax-payer and citizen of the district to see that it be properly observed. For further observations, see Ventilation, on page 1086.



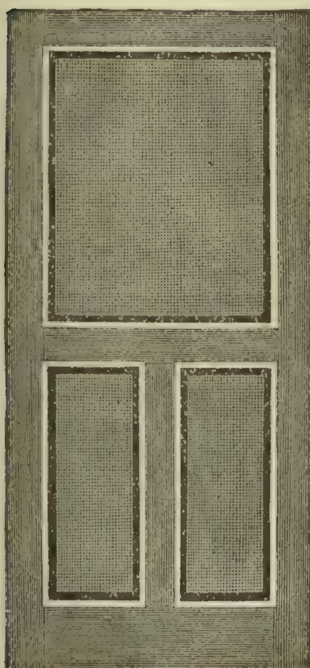
Floor Plan of School-house.

The floor plan of the design of a school-house presented in this connection has been carefully drawn. A town hall may be provided above, or this portion may be devoted to another school if required. If neither is desired, the stairway may be removed and the wardrobes enlarged a little. Ample light is provided, and if thoroughly ventilated this will be found a most excellent plan.

Globes, tellurians and other instruments for illustration in astronomy, natural philosophy, chemistry, etc., should not be furnished without a good case in which to keep them, and, we might add, a competent teacher to handle them and to be responsible for their safe keeping. One of the commonest evils in connection with country schools, is the purchase of a few instruments of this kind, some wall maps and perhaps a large dictionary, and the placing of them in a school-room without a good case with lock and key. Thus they are soon rendered useless by reckless children, and the patrons become so disgusted with such squandering of their means that almost another generation arrives before the people can be persuaded to provide such furniture again. These instruments are the best means, not only for teaching clearly many of the common phenomena of nature, but also for awakening the true scientific spirit characteristic of this exacting age.

In regard to school-room furniture—the desks, seats, hat and shawl racks, stoves, furnaces, cupboards, library, museum and natural philosophy cases, blackboards, slating, crayons, erasers, etc.—manufacturers have all such things made in all styles, with their agents everywhere to introduce them; and probably no person in the land would consult a book with reference to them. The principal dealers are well known by name to all readers of educational journals. Their specialty has been a large business for many years, and competition has brought their work up to the

highest degree of perfection which it is possible for human power in its present stage to invent. At the same time, let every one remember that if he pays but little for an article he is almost certain to get a "cheap" one, and he must not complain of the manufacturers if it soon gives out.



Screen Door.

Screen. During the summer season the doors and windows of every residence should be provided with screens. Those made of wire as illustrated in the accompanying engraving are the most durable and effective in preventing flies and mosquitoes from entering the house. They may also be arranged upon the windows so that they will not interfere with the free movements of the sash.

Scratches, troublesome ulcerations about the heel of horses, occasioned by ill treatment, negligence and filth: see page 775.

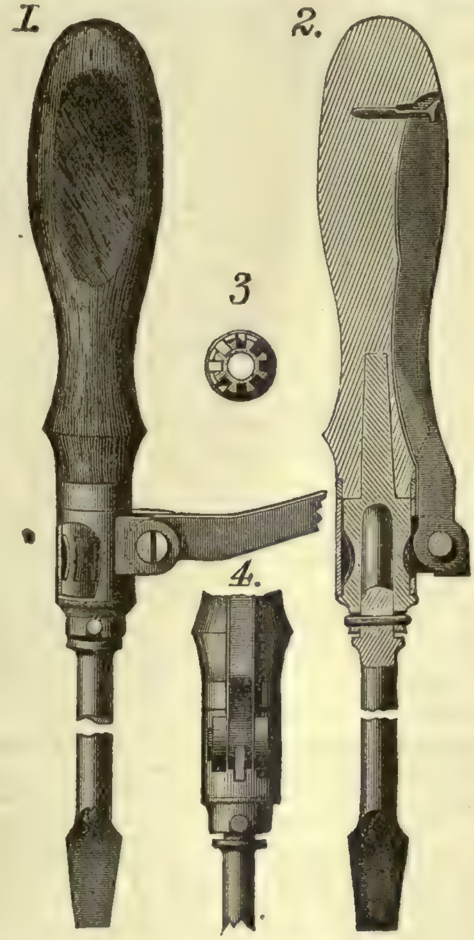
Screw-Driver, a necessary and indispensable tool to every farmer. We give an illustration of one with lever attachment, made by L. E. Rhodes, Hartford, Conn.

It is really a screw-driver handle, with fixed steel socket, to receive the shanks of the screw-driver blades or of socket wrenches as desired. On the socket is a sleeve that turns freely and covers a ratchet, or rather a square-toothed pinion, secured rigidly to the steel socket. There is pivoted to the sleeve a steel lever, which, when not in use, shuts into a recess in the wooden handle. When used thus as an ordinary screw-driver, it merely drives the screw until the resistance becomes too great, when the lever, in connection with the ratchet, is brought into action. A very slight movement of the lever serves to disengage it from one tooth and engage with the next, or with any other, the gradations depending on the number of teeth in the ratchet. 1 shows the screw-driver as in use; 2 shows lever shut up in the handle; 3, the pinion; 4, the sleeve covering the ratchet.

Scrofula or **King's-Evil,** as it is sometimes called, is a constitutional disease, which, however, chiefly affects the glandular system, especially the conglobate glands. The disease is most common among children, and rarely makes its appearance for the first time after the body has attained its full growth. It is supposed that the disease is principally hereditary.

The symptoms which are usually considered to indicate the presence of scrofula are the following: Slight inflammation and swelling of the wings or outer cartilages of the nose; swelling of the glands of the neck, which increase gradually, and at length become hard, painful and of an irregular shape. The color of the skin over the glands is scarcely changed, but the protuberance or swelling is sometimes so great as to constitute considerable deformity. After having remained in this situation for an uncertain period, the tumors may disappear. Such, at least, is usually the case in the grown subject, and it is the more favorable termination; but in young children they more frequently proceed to suppuration. The irregular wound resulting from the spontaneous opening of the abscess heals with difficulty.

Treatment. Bathing in and drinking salt water is good treatment, the latter to keep the bowels free. Iodine is an excellent remedy. Give 20 to 30 drops



Screw-Driver with Lever Attachment.

of the tincture two or three times a day in a half a glass of sarsaparilla, or a decoction of marsh-mallow

root. Rub the swelling or hard kernels on the neck with opodeldoc or iodine, or an ointment made of stramonium and iodine ointment. If in spite of this the tumor should proceed to suppuration apply a poultice, when it will soon open or must be opened with the lance. When opened, the tumor must be well washed and covered with the following ointment: Iodine, ½ dram; iodide of potassium, 2 drams; lard, 2 ounces. A solution of chloride of soda or lime should be occasionally used, especially if the sore is very foul. If the sore is very difficult to heal sprinkle a powder of equal parts of capsicum and mandrake on it. The tincture of myrrh will answer.

Caution. Nothing is more important in the treatment of scrofula than proper attention to the diet and general habits of the individual. Fat meats, gravies, rich pies, etc., should never be eaten by a patient of scrofulous habits. Pork is particularly injurious, being well calculated to favor the scrofulous diathesis. Indeed, it is supposed by many that the disease, in the majority of instances, is brought on by the use of swine flesh, either directly or indirectly through the parent. It is even true that the name of the disease comes from *scrofa*, a Latin name of the hog; but this is in consequence of the disease having so near a resemblance to the common throat disease of that animal.

Vegetables constitute the best food for patients of scrofulous habits. Free exercise in the open air is also very important. Alcoholic drinks must be strictly avoided.

For scrofula in the horse, see page 804.

Scythe, an instrument for mowing grass, grain, etc., composed of a long, curving blade with a sharp edge, made fast to a long, crooked handle called the snath. In whetting a scythe such motion is given to the stone as will turn the invisible teeth on the edge toward the point, that part of the blade which is attached to the snath being called the "heel." Secondarily, the object of whetting is to cut off all the gummy matter which has collected near the edge and obstructs the free movement of the scythe. Further details in the use of this implement can be better obtained by example and practice. Before the introduction of the reaper the cradle scythe was in general use for cutting the cereals, but is now but little required.

Section of Land: see Township.

Sedative, allaying irritability; also, a medicine having such a property.

Sedlitz (sed'litz), or **Seidlitz** (side'lits) **Powders.** The common Seidlitz powders do not resemble the famous mineral water from Seidlitz, Bohemia. A closer imitation would be made by using effloresced sulphate of magnesia instead of the potassio-tartrate of soda. To make an exact imitation is this: Take effloresced sulphate of magnesia, 2 ounces; bi-carbonate of soda, ½ ounce; dry bi-sulphate of soda, ½ ounce. Mix and keep in a close bottle. The common recipe is this: Bi-carbonate of soda, 1 ounce; Rochelle salt, 3 ounces, both in fine powder; mix and divide into 12 equal parts. Divide 420 grains tartaric acid also into 12 equal parts. Put up these parts separately in papers, distinguished by the color of the paper. To use them, throw one paper of each into a glass of water, and drink it immediately while foaming. To be particular with it, dissolve the smaller powder in an ounce or more of water, the larger in two or three times the quantity, then mix the two solutions gradually. The acid is slightly in excess, giving the drink an acidulous taste. The medicinal action is that of an aperient and refrigerant. Particularly valuable in febrile cases where the stomach is irritable. Two pairs of these papers may be given at a dose, or the single dose may be repeated every three or four hours until the effect is produced.

Seedling, a plant raised from the seed, as distinguished from one propagated by layers, grafting, etc. Seedlings always tend to revert to the original wild state. Varieties are always originated by planting seed, but some plants, especially vegetables, as potatoes, have to be propagated by buds a few years to attain the greatest size and certain other good qualities.

Seeds. On pages 560-1 we give directions for raising, collecting and preserving garden seeds, and the seed of other crops is treated in the respective articles. It therefore only remains here for us to add suggestions with reference to seeds in general.

How to Select Good Seed. Seed corn should be plump, bright, of good length, and taken from the central portion of the ear. Seed wheat should not only be thoroughly cleaned from weed seeds, but the small grains should also be riddled out in the fanning-mill. Look for chess seed (see page 232). Place your oats in a heap at the leeward end of a threshing floor, on a day when a gentle breeze is blowing through the barn. With a common wooden flour scoop, throw the oats against the wind, toward the other end of the floor. A few minutes' experience will enable one to throw them so that they will fall in a semi-circle at a nearly uniform distance from where he stands. The grains which fall farthest are the heaviest and therefore best for seed. Collect them up every few minutes in the progress of the work. Of barley that is best which is free from blackness at the tail, and is of a pale but lively yellow. If the rind be a little shriveled, so much the better, as it indicates thinness of the skin. Of potatoes, select large, sound, well ripened specimens. In cutting them up for planting, leave one eye to each piece, and as near the middle of the piece as practicable. The less potatoes are exposed to the air the sounder they will keep.

To Test the Vitality of the Larger Seeds, place them on a hot pan or griddle, and the more perfect ones will pop or crack open with more or less noise. The best test, however,—especially for finding the proportion of good seeds in the lot,—is to germinate a number of them in a favorable place.

Adulteration. Seeds imported are apt to be adulterated, as well as devitalized, and the greater distance

they have come the worse they are. A recent investigation showed that grass seed from Germany was only 62 per cent. pure, while that raised in this country was 79 per cent. pure; and of the former only 42 seeds in 100 were capable of germinating, while of the latter 50 per cent. were vital. Of clover seed, 93 per cent. of American and 94 of German was genuine, while 69 American and 79 German were vital,—an exception to the rule. Of garden seeds, 100 per cent. of American and 99 of German were genuine, while 98 per cent of the former and only 86 of the latter were good. Of grain, 99 per cent. of American and 96 per cent. of German was pure, while 61 per cent. of the American and 66 per cent. of the German were good.

Miscellaneous Items. Considering the care required to grow and secure good stock, the difficulties and dangers of intermixture, the many varieties wanted, the labor of cleaning and drying, the small quantity of seed required for a private garden costs many times the price demanded by the best growers; and even after all this trouble, impurities and defects will constantly appear in the amateur's seed. But if any one find it expedient to grow a part or all of his seeds, he can greatly simplify it by growing of any one variety enough to last him as many years as that kind will keep well, thus avoiding some of the dangers of intermixture, by growing no two varieties the same year.

Seeds, when well kept, will retain germinating powers as follows: cucumber, melons and beets, seven to eight years; tomatoes and squash, six to seven years; lettuce, radish, cabbage and turnips, four to six years; carrots, peas and spinach, two to four years; onions and parsnips, one year. Old seeds, if they have not lost the germinating power, are usually better than fresh, as they give less of stalk and foliage and more of available growth.

Seeds are best preserved, by placing them in rather small, stout paper bags, marked with name and date, and stored in a dry, cool place, where they will not be liable to extremes of heat and cold.

Seltzer Water and "Seltzer Aperient" are very largely advertised. They are substantially the same as "soda water," which is more strictly carbonic-acid water, the effect of which is diaphoretic, diuretic and anti-emetic. It is generally a pleasant drink to febrile patients. The adulterated or counterfeited syrups of the ordinary soda fountains are, however, somewhat deleterious.

Selvage, or **Selvedge**, the edge of cloth, woven in such a manner as to prevent raveling, and often closed by complicating the threads; list.

Seton (se' tn), a piece of tape or lamp cotton passed through and beneath the skin, with the two ends hanging out, to aid the discharge of pus.

Settee (set-ee'), a long seat with a back; a kind of arm chair for several persons to sit in at once.

Setter, one who sets; a dog who beats the field and points out the bird for the sportsman; see article Dog, page 332.

Shade-Tree: see articles Forestry and Landscape Gardening.

Shaft, the timber, rod or beam on which wheels or pulleys are fixed; also, a perpendicular opening to a mine or tunnel.

Shallots, a species of onion, not extensively cultivated at the present day. The divided roots are set out in September in rows a foot apart, allowing six inches between them. It is entirely hardy, and fit for use in the spring.

Shave. In shaving never fail to wash your beard with soap and cold water, and to rub it dry, just before you apply the lather, of which the more you use, and the thicker it is, the easier you will shave. Warm water makes a tender face but makes the beard cut easier. In cold weather, place your razor (closed of course) in your pocket, or under your arm, or put it in warm water to warm it. Always wipe your razor clean, and strop it before putting it away; and put your shaving brush away with the lather on it. The razor (being only a very fine saw) should be moved in a sloping or sawing direction, and held nearly flat to your face, care being taken to draw the skin as tight as possible with the left hand, so as to present an even surface, and to throw out the beard.

To Strop a Razor. The practice of pressing on the edge of a razor in stropping soon rounds it; the pressure should be directed to the back, which should never be raised from the strop. If you shave from heel to point of razor, strop it from point to heel; but if you begin with the point, in shaving, then strop it from heel to point.

To Sharpen a Razor. The simplest method of sharpening a razor is to put it for half an hour in water to which has been added one-twentieth of its weight of muriatic or sulphuric acid, and after a few hours set it on a hone. The acid acts as a whetstone, by corroding the whole surface uniformly, so that nothing further than a smooth polish is necessary.

To Hone a Razor. The surface of the hone must be perfectly level. The razor should be held flat on the hone, and the back never raised, or it will induce a round or thick edge. Draw the razor from heel to point, alternating the sides at each stroke, and the action always against the edge. When the edge is wiry and thin enough to turn, strop it on a coarse strop, drawing the edge occasionally over the thumb nail, until the edge is smooth, then finish on a fine strop, and the palm of the hand.

Shaving-Horse, an apparatus, worked by the foot, for holding in a staunch position a piece of timber while it undergoes the process of shaving with a "drawing-knife." To make one, first make a high, narrow bench about eight feet long, mortise a slot in the middle of it, and over this erect an inclined piece of timber, correspondingly mortised, so that through

these slots a kind of wooden vise may extend. The latter is simply a thin shaft of wood, with a kind of notched head, so arranged as to catch and hold pieces of timber upon the inclined piece just referred to, and is worked by pressing the foot against the lower end, upon a catch or shoe fastened there for the purpose. Two or three holes are bored through the shank of the vise a few inches below the head, for pins to run through, in the inclined timber, whereon the vise swings as on a pivot,—the different holes for timbers of different thickness. This is a cheap but great convenience,which every farmer should have.

Shed, a temporary shelter, generally without siding and with the roof all in one slope; also a lean-to, or an enclosed shelter attached to a larger building, and with a shed roof.

Sheep, a well-known and important genus of ruminating animals. It comprises several wild species and a vast number of domesticated varieties or breeds. It is most extensively diffused over the world, and exists and feeds and prospers under a vast diversity of conditions. The interest of it in all its forms, to a zoologist, is very great; and the importance of it, in its chief domesticated breeds, to farmers and entire nations, has always been high, and rapidly increases with the progress of civilization, of agricultural improvement and of manufacturing enterprise. No animal varies more than the sheep, and none so speedily adapts itself to climate. It would almost appear that nature had bestowed upon it a constitution so pliant as to enable it to accommodate itself to any point in a wide range of temperature, for it has accompanied man to every quarter of the globe, becoming impressed at every change with some peculiarity, alterable only by a change of situation, and varying, we might almost affirm, with the weather; for where the temperature is equable, there does the animal preserve an atmospheric stamp, and defy all efforts to alter the breed; while under a fluctuating sky, we can model it at will. No other animal is worthy of so much attention as the sheep, it being alike valuable to the farmer and to the nation; to the farmer because it is raised with ease and in situations where other animals could not exist, and in general makes a better return for the quantity and quality of food consumed than any other animal; to the nation, as supplying a staple article of food and giving employment to thousands of artisans by the conversion of wool into fabrics. In fact the production and general management of sheep claims to be treated as the foundation of good and profitable farming.

The crying need of American agriculture to-day is a more general incorporation of the sheep into the farming economy. More prolific than horses or cattle, as well as more tractable, subsisting on scantier herbage, and requiring less supervision, it claims the additional advantage of "paying for its raising" in annual instalments of marketable fleece pending its growth to maturity. It is more readily transferred from one enclosure to another, and is easily restrained by fences which would prove no barrier against the encroachments of other farm stock. Its light tread and love of repose warrant its access to fields and pastures where the tramping of cattle and the tearing of hogs would not be tolerated. It wastes less food in proportion to the quantity consumed, and will hunt out and utilize much that would otherwise be lost to the farmer. Yielding a return in both fleece and flesh, it furnishes its owner the double advantage of catching a good market for his product, requiring less water, and disposed to work for its food, it is without a peer when summer's drouth taxes the farmer's resources for enabling his live stock to maintain an average of thrift and flesh.

All that can be said in behalf of feeding live stock on the farm, as distinguished from the soil-impoverishing policy of placing the raw grain and grass on the market, will be found to apply with double emphasis to the farm that carries as part of its outfit one or more sheep per acre. No animal returns more fertility to the soil in proportion to the amount exacted for its support, while none equals it in the evenness with which the droppings are distributed.

General Views of the Sheep Genus. The generic characters of the sheep may be briefly stated as follows: The horns are directed backward, downward and forward, in a somewhat spiral form; the chaffron is naturally convex; a sinus occurs at the internal base of the toes in both the fore and hind feet; two smaller toes or rudimentary hoofs occur behind the larger anterior pair; the tail is always short in the wild races, but varies in length in the domesticated breeds; the teeth amount in all to 32, and comprise eight incisors in the lower jaw, no incisors in the upper jaw and six molars in each side of both jaws. But in its domesticated state, and very especially in its wild one, sheep are distinguished from goats and other species most nearly allied to them, far more by mental tempers and dispositions than by physical characteristics.

Wild races of sheep inhabit the elevated regions of Europe, Asia, Africa and America, and comprises chiefly the several species and varieties of *musmon* and *argali*. They differ greatly from one another, and still more from the domesticated breeds, in habits and in specific characteristics; and in some instances they blend away into near resemblance to wild goats on the one hand or to domestic sheep on the other; yet, in general, they exhibit very boldly the true characteristics of their genus, and may be regarded as, in many mixed methods, and often in their respective localities, the common or aggregate source of the multitudinous and very diversified domestic breeds. Fig. 1 represents a fine specimen of the Rocky Mountain sheep.

The domestic breeds are prodigiously diversified, not only in modifications of the natural characteristics which they possess in common with the wild races, but in the characters of shape and structure, and wool and carcass and habits which belong peculiarly to themselves. Some of the rudest of

them may easily enough be traced up to ancestral connection with some one of the wild races; but the vast majority exhibit strong and intricate marks of a mixed descent; and some are, with good reason, supposed to show broad traces of a more or less free hybridizing with goats; and many or even most of the finer ones have resulted, either from a series of crossings between previously well modified breeds, or from the prolonged, steady and combined influence of peculiar climate, peculiar food and peculiar treatment.

The longer, too, any species has been reduced to domestication, and the more complete its subservience to the human race, the greater and more remarkable will be the alterations which it will undergo. We need not wonder, therefore, that the very ancient dependence of the sheep on man as its lord and master should have caused many signal variations from the character of the original type, or that repeated changes of food and climate and the continuous action of an altered and artificial mode of management should have produced a multitude of new or anomalous features. We accordingly find that in most of our subdued varieties the lengthened limbs and comparatively slender, though strong, active and graceful forms of the original races have disappeared, and been replaced by heavy proportions and a consequently indolent disposition, and that the coarse, dry, brittle coating of hair has been succeeded by that woolly substance of which human industry and ingenuity now form such abundant and manifold materials for the various uses of domestic economy, and the personal comforts of our race. The prodigious development of the wool, and almost entire disappearance of the hair, would indeed of themselves have sufficed to effect a complete alteration in the general aspect and physiognomy of the species; and this remarkable change has been produced in part by physical causes, and in part by the agency of man, aiding or counteracting as he best could the observed tendences of nature, who has contrived to subordinate a general law of climate to his own individual advantage.

The changes produced by domestication upon the dispositions and habits of the sheep are much greater than even those upon his physical properties, and render him eminently suitable to the uses of man, and adapted to the circumstances of enclosed pastures and artificial feeding. When once completely subjugated, he never again appears to acquire the faculties which fit him for a life of liberty. Give him afterwards what freedom we may, he remains more or less dependent upon us, and would fall a prey to wolves and the swifter wild beasts, were he not under human protection. Yet he is not the stupid and insensible creature which some represent him to be. When entirely subdued, indeed, his natural instincts are blunted, and he loses the providence and sense of danger which are natural to him; but when left in a state of comparative liberty, he shows that, though comparatively feeble, he is not without the power of guarding himself from danger.

The ewe bears that affection to her offspring which Nature has imprinted, as it were, on the heart of every animal. Should mishap befall her young one, she mourns over it, and will not be comforted; should it wander from her side, her anxious bleatings are everywhere heard, and the little creature rewards her cares with surprising fondness. Who that has seen shearing of the flock, has not marked the startled aspect of the lamb when the mother first runs toward it divested of her covering, and how quickly it is reassured, and how sensibly it expresses its joy, when it hears the well-known voice and receives the wonted caresses?

The sheep appears insensible and stupid, because it is rarely attached to us by acts of familiarity and kindness. But let the orphan lamb be brought up at the shepherd's cot, and fed from his hand, and we shall find it to be nearly as familiar as the dog, fond of being caressed and unwilling to leave its protector to join its fellows of the flock. In countries where the shepherd guides his flock, and does not herd it by dogs in the manner practiced in other places, the docility which the animals acquire is wonderfully great. Where the shepherd leads they follow; they observe his motions and hear his voice, and when he uses a pipe or horn, they listen to the well-known sound and obey the signal. In the Alps in Switzerland, and in the mountainous parts of Italy, in Greece and elsewhere, we are yet charmed with this remnant of pastoral simplicity and innocence. The shepherd boy knows all his little favorites, he remembers their names, and, when called, they leave the flock and come to him. When the numbers are great, he selects a few, teaches them their simple lesson, and they become the guides of the rest to their allotted pastures and learn to collect the wanderers. The music of the mountain shepherd we find to be no poetic fiction. In the mountains we yet hear the soft and artless tones of his pipe. In the morning he leads forth his little flock, and plays as he marches at its head, and at sunset returns in like manner to the fold, where he pens them, that they may be kept from the wolves.

Sheep were domesticated as early as the life-time of the first man: and they make a somewhat conspicuous figure in the earliest records of the old nations. "Abel was a keeper of sheep" and all the chief patriarchs, whose characters are sketched in the inspired record were possessors and tenders of flocks. The Sacred Scriptures make historical mention of sheep from the earliest times, through all the patriarchal ages, down to the epoch of the kings, and they often describe flocks of them with a richness of coloring and a minuteness of detail which identify the pastoral usages of remote periods with the practices of the wandering shepherds of the East at the present day. Scarcely anything seems to have changed in the habits of men in those countries of pastoral tribes. Where Abraham pitched his tent, with his sheep and oxen and asses and camels, where he sat at the door of his tent, where the stones were rolled from the wells from

ROCKY MOUNTAIN SHEEP.

which his maidens drew water, there the Arab or the wandering Turcoman encamps, and all the scene is like a vivid panorama of the past. In the case of the present people of the Desert, their tents, their journeying, their household cares, their flocks, their camels, their wells, all inform us with what a matchless fidelity the Sacred History has been told.

The sheep figures also in the earliest records of the nations of Southern Asia, on the oldest existing monuments of Western Asia, on the sculptured remains of ancient Egypt, and in the symbols and memoranda of the earliest arts and sciences of the whole civilized world. It was probably introduced into Southern and Eastern Europe, in some of its best and most improved Asiatic varieties, at the very dawn of European civilization, and brought to our shores with the first pilgrims; it was highly esteemed by the ancient Greeks, and is prominently and honorably mentioned by their historians and poets. It was introduced into Italy after the foundation of Rome. It probably was introduced into Spain at an early period from Africa; and it seems to have become diffused throughout all Western and Central and Northeastern Europe at the period of the Roman conquest. In recent times, it has commanded rapidly increasing attention; and at the present day, in the most highly improved agricultural countries of the world, it is more multitudinous, and possesses a wider connection with interests of farming than at any former period.

VARIOUS BREEDS OF SHEEP.

The established characteristics of the several breeds of sheep are so varied and so clearly defined that there should be little difficulty in selecting such as will be peculiarly fitted, by habits of feeding and of growth, for the conditions of climate, soil, forage and markets under which the flock is to be placed. The breeds most known in the United States are the Merino, the Cotswold and the native or scrub of no defined breeding; but several other good breeds have their representatives in America; and there are sheep which have for almost three hundred years been kept under favorable circumstances in Virginia, although they can scarcely be described as a distinct breed because several crosses have been made upon them. That a judicious selection of breeding sheep may be made those who intend starting a flock should consider the peculiar characteristics of the several breeds and the circumstances under which he will be obliged to place them. Mutton sheep are well treated in article on Mutton: see also Mutton and Lamb on pages 964 and 965. Briefly described, the established breeds are:

Beacon-Down. Originated in the United States, by William Crozier, near Northport, Long Island, by crossing South-Down ewes with a Cotswold ram, then interbreeding. Fleece closer, finer and shorter than that of the Cotswold; weighs 11 to 13 lbs. Mutton excellent; weight 140 to 160 at 12 months; ewes prolific, lambs strong, healthy and mature early. Suitable for light pastures under hot suns.

Black-Faced Scotch. This is the oldest breed in Scotland, its origin being lost in tradition. Fleece coarse, weight about 3 pounds; body square, compact, with broad saddle and good quarters; weighs about 15 pounds. Face black, muzzle thick, horns heavy and curved spirally. They are perhaps the hardiest sheep known, the lambs enduring extreme cold and hunger. The ewes are excellent mothers. They improve readily under judicious management and are admirably adapted to the conditions to be met in mountainous regions. The mutton is of very fine flavor.

Caraman. The Caraman, or fat-tailed sheep, native of some parts of Asia and Africa, has been introduced into the United States, by importations from Karamania, in Asia Minor. By some they are considered as a separate group. It is a white, short and soft-wool sheep of several varieties and sizes, its distinguishing feature being a tail which is little more than a lump of fat weighing from 15 to 100 pounds. It is not certain that they will ever be numerous enough in America to be more than a curiosity.

Cheviot. By crossing the Lincoln and a breed of common sheep found in the hilly part of the lowlands of Scotland the Cheviot was produced. Fleece, about 5 pounds, medium, white, coarse; head and legs generally white, but sometimes speckled or dun; face massive and strong; hornless; carcass medium size, long body, fore-quarters light, hind-quarters and saddle heavy and full; dress 80 pounds at 3 years; a good wool and mutton sheep. Wool used for tweed and cheviot cloths. They are quiet, docile and excellent mothers; lambs hardy.

Cotswold. This breed originated as a cross between a Leicester and descendants of sheep brought from Spain to England in the 12th century. Fleece, about 8 pounds, white, coarse, long; head fine, tapers from nose to ears, hornless; a thick forelock of wool comes down to between the eyes; ears long; body large, long, broadens from shoulder to rump; legs rather long, clean, carcass dresses 100 to 340 pounds. Is a mutton and wool sheep. Wool reaches 9 inches in length; used for woolens. Sometimes brown or grey appear on the face and fore-legs.

We present several specimens illustrating this breed. The ram shown by Fig. 2 is owned by T. L. Miller, Beecher, Ill., and the sheep, Fig. 3, owned by S. E. Prather, Springfield, Illinois.

Dorsets. A breed long known in the south of England. Breeds early and often drops twins; may be bred twice a year. Both rams and ewes have horns. Fleece close, soft, heavy, yields about six pounds of combing wool. Faces white, broad and long, with a tuft of wool on the forehead, and black nose and lips. Body heavy, dresses 100 pounds at two years; shoulders low and broad, back straight, loins broad and deep, brisket full, legs long and fine-boned.

Hampshire Down. This breed is from a cross between a pure South-Down and a white-faced horned

sheep of Hampshire, England. Originated about 1809–10. Fleece whitish, medium, coarse and resembling that of South-Downs, but longer and coarser; six to seven pounds. Body good size, yearlings weigh 80 to 100 pounds. A mutton sheep with juicy lean meat.

KENTUCKY. Originated about 1840 in Frankfort, Ky., first, from crossing common ewes and a Merino ram, the young ewes were topped by a Leicester ram, the issue from this cross was topped by a South-Down ram, this was followed by a ram one-quarter South-Down and three-quarters Cotswold, this twice in succession by Cotswold rams, this by an Oxford-Down ram, and this by a mixed Cotswold, Oxford-Down and Leicester ram, followed by careful in-breeding. Not much mentioned since the close of the war of 1861-65. Fleece white, coarse, long, midway between that of the Cotswold and the Leicester. Body and fleece heavy; a mutton and wool sheep.

LEICESTER. Originated by a Mr. Bakewell, in England, over a century ago, from the common sheep of Leicestershire, by a mode of breeding not revealed. Fleece seven or eight pounds, coarse, white, long; body large, angular, square build; hind-quarters tapering toward the tail, legs long, clean; head long, slender, clean; eyes and facial bones about the eyes prominent. Yearlings dress 100 pounds, two-year-olds 150 pounds.

LINCOLN. A cross between a Leicester and a breed common in the rich, low flats of Lincolnshire produced, less than a century ago, the Lincoln breed. Fleece white, coarse, long; used for worsteds; yields 10 to 14 pounds of wool nine inches or more in length. Dresses 120 to 160 at two years old; is a mutton sheep.

MERINO. Produced in the first century by crossing the best native breeds of Spain with the Tarantine sheep from Southern Italy. Brought to the United States in 1800. They have since been greatly improved by careful breeding. Fleece white, fine, greasy, two to three inches long; shears 12 to 30 pounds; skin lies in folds or wrinkles. Body of medium size, short, thick and round; quarters fair, legs short, heavy and covered with wool. Head covered to the eyes with wool; horns of rams curled and wrinkled. Is a wool sheep, thrives in large flocks and is hardy and docile. Is much used for crossing with the coarse-wooled Mexican sheep.

We present fine specimens of the Merino breed, raised and owned by Geo. W. Hunt, Greenwood, Ill.

MEXICAN. Classed as a native American sheep; originated probably in importations of common sheep of Spain by the early Spanish explorers. Fleece coarse, generally white, about two pounds in weight and of little value. Body thin, scraggy; weighs about 40 pounds. Crossed with Merinoes they form the basis of many flocks on the plains of Texas, New Mexico and other Western States and Territories.

OXFORD-DOWNS. Originated in Oxfordshire, England, about 1830, from crossing a Cotswold ram with a Hampshire-Down ewe, followed by careful inbreeding. Fleece rather coarse, white, thick and slightly curly, five to seven inches in length, weighing eight to nine pounds; rams have, under favorable circumstances, been made to shear 20 pounds. Carcass at 14 months weighs 80 to 90 pounds, usually, but by good feeding have been brought to weigh very nearly 300 pounds at 22 months. Body round, legs short and dark; face dark with tuft on forehead. Stand pasturing on damp soils better than most breeds.

By Fig. 7 we very beautifully illustrate this breed by a trio of yearling lambs bred by Cooper, Maddox & Co., of Reading, Pa.

ROMNEY MARSH. This breed has been known for centuries in the marshes of Southeastern England; is very hardy. Fleece rather coarse and long, sound, bright and glossy; weighs 7 to 10 pounds. Carcass long, sides flat, loin broad, thigh full and broad, fore-quarter neither heavy nor full, dresses from 70 to 120 pounds. A good breed for wet country.

SHROPSHIRE-DOWNS. Product of South-Downs and a hardy, short-wooled stock; many flocks have a trace of Cotswold, South-Down and Leicester blood. Fleece white, thick; shear six to eight pounds. Body large, full and round; quarters good, breast broad and deep; straight back; the mutton shows large proportion of lean of choice quality. Head fine, face dun or speckled, as are the legs also; hornless; ears neat. Very hardy, thrive well on moderate keep, fatten readily and yield 80 to 125 pounds of meat of very desirable quality.

SOUTH-DOWNS. Product of long and careful inbreeding of native sheep of the hill country of the south of England. Fleece coarse, white and short; shears about six pounds; used for flannels and soft goods. Body medium in size, hind-quarters full and square, fore-quarters full, breast broad, legs short and clean, dark brown and free from wool. Head hornless, face brown. Yearlings dress 70 to 80 pounds. Is a mutton sheep.

WELSH MOUNTAIN. A very hardy, small sheep found in the remote pastures and barren moors of Wales. Fleece weighs about two pounds. The body is small, the hind-quarters weigh about four pounds each, but sell for two or three times as much as those of other breeds. The rams have horns, ewes seldom so; faces white, speckled or rusty brown; the head is small, shoulders low, chest narrow, sides flat, rump high and the girth small. A good breed for wild pastures of mountain districts.

BREEDING, CARE AND MANAGEMENT.

The general principles of breeding as set forth in the article on Breeding, page 101, are equally applicable to sheep as to other stock. In selecting sheep for breeding purposes, the peculiar conditions of soil, climate, food and markets having been duly considered, the most important thing then to do is to choose a suitable ram. As one ram will impress his qualities, good or bad, on the offspring of from 20 to 50 ewes each season, and if strong from 50 to 75, it is plain

that his influence upon the outcome of any venture in sheep farming is very great. (See article Breeding.) It may safely be said that he who puts his ewes to a grade ram, when he can get a thoroughbred of good family, even if a seemingly high price be demanded for the latter, is losing time, care and food; for the grade is much less likely to transmit to his offspring desirable qualities than is a thoroughbred, even though the latter may be in outward appearances less desirable than the grade. But when a thoroughbred ram can not be got a good grade will make a great improvement upon the common native or scrub stock. By selecting the best native or common ewes obtainable, and insisting firmly upon great excellence in the ram, the breeder will have made a beginning which will give him, the first lambing season, lambs showing marked improvement. A clear pedigree, showing a long line of ancestors of high value as breeders, is presumptive evidence of power to transmit those good qualities. It is better to buy only of established and reputable breeders and to insist upon satisfactory pedigrees. Grades sometimes have excellent form and appearance which might deceive even good judges, yet do not have that prepotency which makes the thoroughbred so valuable.

Unless a ram be full grown and vigorous, not more than 30 ewes should be put to him in one season, and the number should not exceed 50, even when the ram is exceptionally strong. He should be fed liberally on good and sustaining food just before and during the breeding season. Some skillful breeders have been in the habit of adding to the other food a teacupful of wheat per day during this season. Flock masters smear the breasts of rams each day with a mixture of ochre and raw linseed oil; this marks every ewe served. On the approach of and during the rutting season rams should be condemned to solitary confinement, that they may not exhaust themselves and annoy the flock by constant effort with the ewes and by fighting. Keep each an enclosure by himself out of sight of the ewes, and turn in to him at nightfall or in the morning the ewes in heat, until all shall have been served.

The ewe may be bred to the ram at the age of 18 months, at which age the ram will also be fit for service. The average period of gestation does not vary much from 152 days. See tables on page 144 and 569.

Ewes. The best mothers among the ewes should be year by year selected, and may be profitably kept until 10 to 15 years old, while the less valuable ones may be sold. This selection can be easily made by marking each breeding animal with a metallic tag, and keeping a record in a form similar to the following:

No. of Ewe.	Ram No.	Served.	Due to Lamb.	Lambed	Remarks.
210	7	Aug. 7, 1881.	Jan. 7, '82.	Jan. 10, 1882.	Twins.

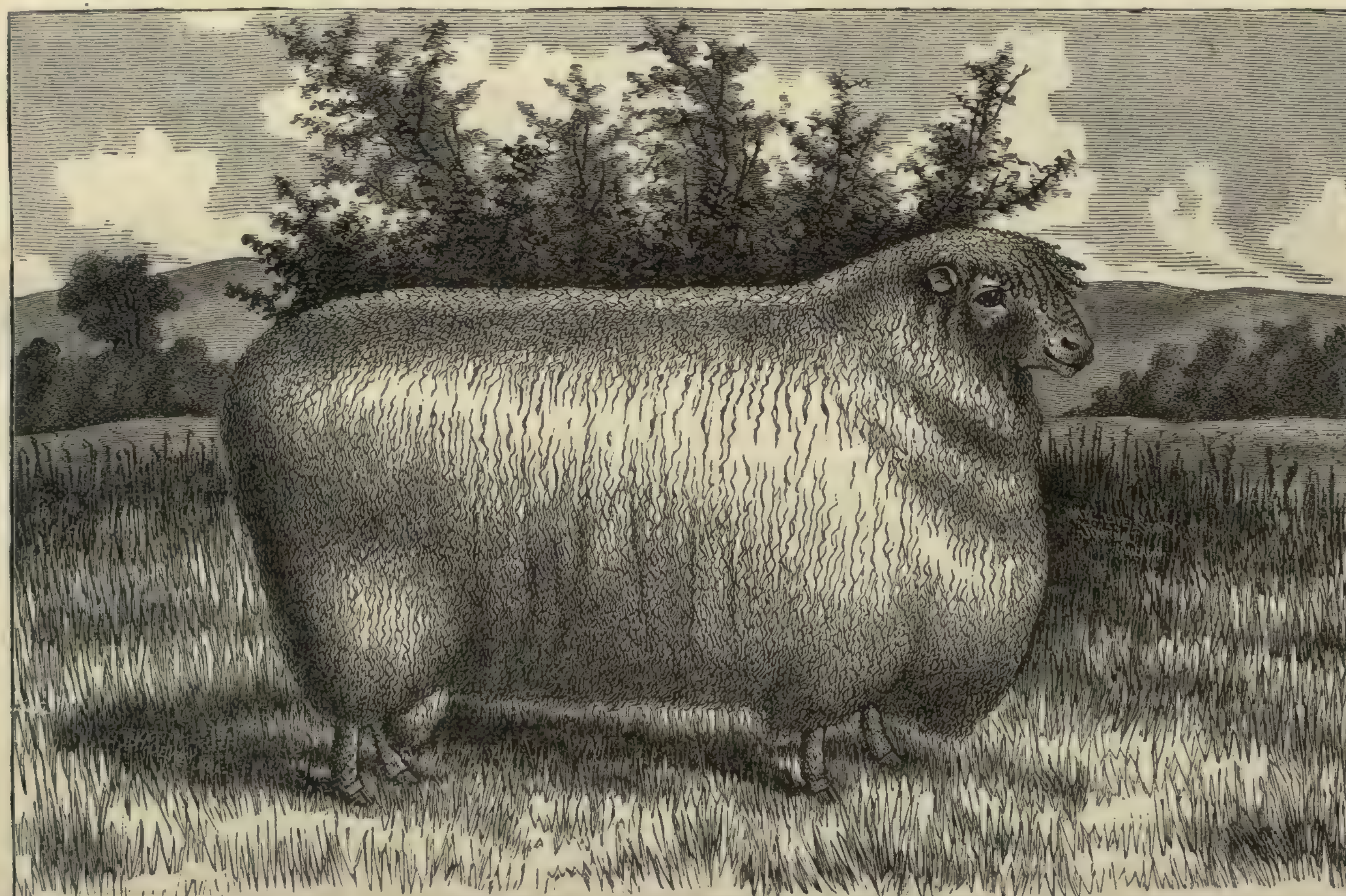
The period of pregnancy in the ewe is 150 to 153 days. Fully five months before the date when the lambs should come, the ewes should be separated from the rest of the flock. Where the ewes cannot be closely watched one or more wethers may be permitted to run with them; as each ewe comes in heat a wether will keep near her. In the evening those in heat should be turned into the yard where the ram by which they are to be served should be kept. Here they may be allowed to remain until morning, or they may be taken away as soon as served. Should any fail to breed give of Epsom salt two ounces, and reduce their feed until they come in heat.

During pregnancy it is essential that ewes should be as free as possible from disturbing causes, especially from annoyance by dogs. A regular amount of exercise each day, with a variety or judicious change of food, is deemed necessary to the maintenance of a healthy, active condition, especially for a short time before lambing. It is thought that goiter or swelled neck in lambs is caused by a plethora in the dam, the result of inactivity and over-feeding. If ewes can at this time be taught the habit of eating salt from the hands, and in other ways be made familiar with handling by the shepherd their lambs will be more docile and quiet. After service ewes should be fed enough grain to keep them in thrifty condition but not too fat; half a pint each per day of oats, bran and corn while they are on pasture, to be increased to a pint per day as winter approaches, has been found very satisfactory. Avoid giving food which is likely to move the bowels actively either way when lambing time draws near.

When it can be done a pen 4 by 5 feet, which can be darkened, should be given to each ewe when the time for dropping her lamb is at hand. Perfect quiet is thus secured, and there will be little or no trouble from ewes disowning their young. At this time a drink of thin oat-meal gruel well salted will do the ewe good.

Young ewes sometimes have much difficulty in giving birth to their young; help should in such cases be given as gently and carefully as possible. Naturally the head of the lamb, with both fore-feet beside it, should appear. Should there be difficulty about passing the head, gentle pulling in line with the vagina, and simultaneously with the efforts of the ewe, will usually be enough to give relief. If both hind feet and the rump appear there need not be much difficulty; but, as a rule, when there is an unnatural presentation the lamb should be pushed back into the womb with the hand, which should first be well covered with linseed oil after the finger-nails have been cut close. The head of the lamb can then be brought gently into position with the fingers, after which there should be little difficulty. Should a ewe lose her lamb she may be led to adopt another by rubbing the skin of the dead lamb over that of the living one. Sometimes the teats are closed so that the new-born lamb can get no milk. They should be squeezed with the wetted fingers until milk flows.

With the coming of weaning time the supply of food, especially for ewes giving a heavy flow of milk, should be gradually reduced, as the lamb draws less and still less upon its mother for nourishment. Any hardness or heat in the udder at this time should be



Owned by T. L. Miller, Beecher, Ill.

Fig. 2. —COTSWOLD RAM.

the signal for giving a dose of Epsom salts, two ounces dissolved in water, with a teaspoonful of ground ginger stirred in, followed by twenty grains of saltpeter, morning and evening, for the next two days.

FEEDING EWES AND LAMBS. If your ewes with lambs are strong and healthy and have some range, you find corn good feed. Feed lightly at first when it is fed alone. When feeding corn you will find corn fodder an excellent addition, as there is no better food producing a good flow of milk than corn grown for fodder and properly cured. If fed on this, the lambs will come strong and healthy. After a few feeds of corn there will be no danger of the sheep eating more than they need. If you have no rye pasture or corn fodder begin feeding about two weeks before the ewes begin to drop their lambs, a very wet, but not a thin, slop, proportioned as follows: One-half bran, one-fourth oats and one-fourth corn, mixed, put to soak twelve or twenty-four hours before it is fed. You will find that this feed, in addition to clover or timothy hay, will promote the final development of the lamb, strengthen the ewe, increase the secretion of milk, etc. If you wish to fatten any sheep in the flock, separate them from the others and feed more liberally with corn.

TEETH AS AN INDEX TO AGE. In reference to telling the age of sheep by the teeth we quote from Prof. Stewart on dental changes that are usually depended upon for determining age.

"The two central or front teeth appear before or soon after birth, and in about three weeks after birth, the whole of the twenty temporary teeth appear. The first change in the teeth occurs at the age of three months, when the lamb cuts a permanent molar tooth. The next change also occurs at the back of mouth, when, at nine months old, another, the second permanent molar tooth, appears. At one year old the lamb has but eight permanent teeth, or two at the back of each side of each jaw. The age of fourteen months is marked by the appearance of two permanent incisor teeth at the center of the front of the jaw.

"In judging of the age of a sheep, the condition of the molars may be studied with advantage. If a sheep is certified to be not exceeding one year old, and the fifth molar (the second permanent one, and the last one on each jaw) is found to be sharp on the edges and but slightly worn, the age may be reardee as properly stated, even though the central pair of front teeth have already appeared. But if these teeth are well up, and the last molar is worn and smooth, and there is a space between this tooth and the angle of the jaw, the sheep is certainly over a year old.

"The sixth molar tooth is in its place at the age of eighteen months, and this is the only test of this age of the sheep. The second pair of front teeth, one on each side of the first pair, appear at twenty-one months of age, and at two years are fully grown and stand well up from the gum and level with the first pair. After the sixth molar is cut, the three forward and temporary molars are replaced by permanent teeth, which are full grown at the age of twenty-seven months. At two years and a half the third pair of front teeth have become fully grown, although, in some forward sheep of the quickly-maturing breeds, these teeth may appear at two years of age: generally they indicate an age of two years and a half. At the age of three years in the Cotswolds and other forward breeds the fourth and last pair of front teeth appear; but in other breeds they are not present until three and a quarter, or three and a half years: the sheep is then known as full-mouthed. The following table of the periods of dentition will be found useful in determining the age of a sheep:

"At one month, eight temporary front teeth and three temporary molars on each side of each jaw.

"At three months, a permanent molar is added to these three.

"At nine months, the second permanent molar appears.

"At fourteen months, two permanent incisors appear.

"At eighteen months, the third permanent molar appears.

"At twenty-one months, there are four permanent incisors.

"At twenty-seven months, the temporary molars are changed, and the permanent cnes appear.

"At thirty months, there are six permanent incisors.

"At thirty-six to forty-two months, there are eight permanent incisors.

"It has been decided in an English court of law, that a lamb becomes a sheep when the first pair of permanent incisors have appeared. When the mouth is full-toothed, the sheep is considered as mature, or full-grown; when the teeth begin to show signs of wear, the sheep is 'aged.'"

There are other evidences of age to which attention may be given—such as the loss of wool on the head, legs, and parts of the body; loss of vigor; lack of plumpness; an aged look of the skin; and susceptibility to changes of weather. Some idea of a Merino ram's age may be had from the appearance of the horns, which become not only larger, but more corrugated as age advances. Sheep that have been well kept will be found to "carry age" better than those subjected to privation. With ewes, the number and frequency of lambs borne has an important bearing upon the appearance as age advances, as every draft upon the constitutional vigor tends to enhance the appearance of age.

SHEEP BARNS AND SHELTERS. Shelters are certainly indispensable, in all northern climates, to profitable sheep raising. An animal eats much less when thus protected, is more thrifty and less liable to disease. See Feeding of Animals. Some sort of protection should be provided for sheep by those who would attempt to raise them successfully. Sheds or barns may be variously constructed to suit the condition and circumstance of the farmer. Whatever kind of a tight barn is built thorough ventilation must be provided. We present some plans for sheds and shelters in this connection.

SHEEP SHEDS AND RACKS. Sheep that are not being prepared for market do not thrive well during winter, unless they have exercise and a well ventilated shed. Such a building may be of any height, but the floor need not be more than six feet from the ground, which gives a large amount of storage room

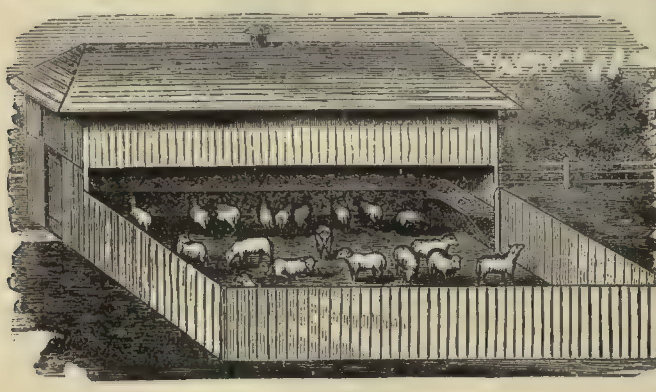


FIG. 4.—*Shed, Pen and Rack for Sheep.*

for hay. The floor should be of matched boards, or the cracks should be otherwise closed up to prevent hay seed or chaff from dropping upon the wool. The front of the shed is boarded to within a few feet of the ground, leaving that space open, that the sheep may go in or out when they please. The feeding rack is placed around three sides of the shed, and slopes forward so that the sheep can consume the last mouthful of hay contained in it. It is made so high that the sheep cannot reach over the front of it and pull the hay out over each other's wool. Three and one-half feet is the right height forlarge sheep. The slats are placed three inches apart, which prevents the sheep from pushing their heads through, and wearing the wool from their necks. Everything about a sheep pen should be smooth, leaving no rough splinters to catch and tear the wool. The pen and yard should be kept well littered. This shed, shown in Fig. 3, is arranged especially to keep the wool clean and free from hay seed, clover heads and dust, and that the sheep may be out-doors or in-doors as they wish, and according to the weather.

SHED FOR SOILING SHEEP. When it is desirable to keep sheep in yards near the barn, for the purpose of soiling, a structure can be made as follows: A green paddock of about an acre is divided by fences into four parts, as shown in the illustration. A partly open shed with feed racks all around it is placed in the center. For fifty sheep a building twenty feet square is amply large. A door from each quarter of the paddock opens into this shed. As one quarter is used, the doors opening to the other are closed.

Figure 4 gives the elevation of the shed, with a large double doorway closed by half-doors, and open at the top. There are also large open windows, so that the shed is airy. There is no provision for water in the yards, and this is the best plan, as the yards are kept dry, and it necessitates at least so much exercise as will be derived from driving the sheep to water twice a day. The change of yards is needed to keep them dry and free from mud in wet weather. The crops that may be usefully fed in such a yard are rye, clover, grass, rape, mustard, peas and oats, barley and tares, turnips, or any others that are used when sheep are fenced by hurdles.

SHEEP SHELTER ON THE PLAINS. The climate of the Western plains is arid and exhilarating, the soil dry and porous, the herbage short, sweet, and nutritious. Aromatic plants, which are healthful for sheep, abound, and the main obstacle which has hitherto presented itself, to interfere with the complete success of those who have experimented in sheep-raising, has been the sudden snow-storms which have overwhelmed the flocks. Ordinary buildings are frequently out of the question, both from want of material and the funds wherewith to erect them. The flocks may be sheltered from the tempest by means of walls which are semi-circular in shape, and consist of stones roughly laid up, or of sods cut from the plains and piled five feet high. The outside of the curve is always placed towards the north or northwest, the direction from which the prevailing storms blow. Where the flocks are small, a few walls

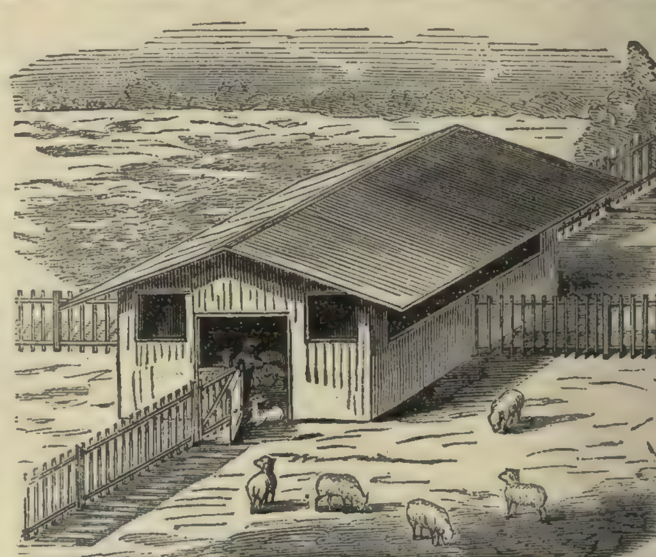


FIG. 5.—*Shed for Soiling Sheep.*

are sufficient, scattered about in convenient and accessible places, generally where the configuration of the ground gives additional shelter, as, for instance, on the southern slope of a hill, or where a grove helps to break the force of the storm.

Figure 5 shows a more elaborate one, suitable for

larger flocks, and also designed as a protection against storms from whatever direction they may come. This

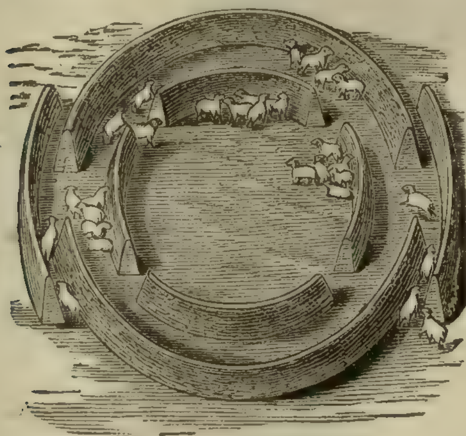


FIG. 6.—*Concentric Sheep Shelter.*

shelter consists of two half-circles, with entrances flanked and protected by other walls, so that the flock is harbored on all quarters. Very often an inner circle is built, which again adds to the protection and increases the amount of shelter.

CARE OF LAMBS. Many a dollar that would otherwise come to the flock-owner is lost through his failure to appreciate the fact that maximum profit is secured through the quality and condition of his sheep, rather than through their numbers. Quality and condition are the indispensable requisites to real success. The first of these is secured through breeding, the second through subsequent attention. "Blood will tell," but its record will never be satisfactory unless the breeder's art is supplemented by the feeder's liberality. The well-bred lamb must be a well-fed lamb, or the breeder's ideal will never be attained.

Keep the lambs thriving. During the hot and dry summer days, extra attention will be necessary to insure this, but compensation therefor will surely come. Where the young and tender animal is required to withstand privation and hardship, diminished size and impaired vigor will follow, to the embarrassment of every subsequent effort at maximum results. Mistakes in early management may be avoided; they cannot be wholly corrected in the life of the animal. Scanty pasturage must be pieced out from other sources; and artificial food should be supplied before the advancing season robs the pasture of its highest nourishment.

Experienced shepherds are sometimes asked for devices by which sucking lambs can be fed a ration of grain, bran, or meal, aside from what is given their dams. Devices of this character—such as a small pen inside the usual resting place, with openings through which the lambs can pass, but not large enough to admit the grown animals—will readily suggest themselves under such circumstances as warrant this peculiar treatment. The strongest apology for such an arrangement is found in the exemption from crowding, which allows the smaller animals to get their proper allowance. The fact is the mothers can profitably be allowed as liberal treatment as their offspring. The effect of a little attention to the dam, while on pasture, will be quite as apparent in her lamb as upon herself; and without this regard to her condition, much of effort for lamb thrift will be vain.

All that has been heretofore said in behalf of comfortable surroundings for a flock, receives emphasis in its application to the lambs. The idea that privation and harsh treatment toughen the young animals, is a delusion. A perfect physique and a vigorous constitution are not to be secured by exposure to extremes of heat and cold, and by subjection to hunger and thirst. The perfectly developed and healthy sheep can withstand these to almost incredible extremes; but its capabilities in such direction do not result therefrom. Sweltering beneath a summer sun, or shivering before a wintry blast, develops neither health nor strength. Forced subsistence on scanty pasturage may test constitutional hardiness, but does not create or foster such a characteristic.

Many owners fall into the error of giving the lamb flock the same treatment as is bestowed upon those animals of more advanced age, overlooking the fact that what requires development in the one instance needs but to be maintained in the other. As the sturdy tree, now withstanding exposure at the roadside, could once have been crushed by a fawn's footprint, so is there to be found in the young sheep's life a time when harm will result from incidents which would in nowise affect the matured animal—a fact which finds unpleasant emphasis in the experience of the most careful shepherd.

What with docking, and marking, and weaning, and the other rough treatment inseparable from lambhood, the little ones of the flock have a rough enough time, be the supervision of their owners ever so thoughtful and thorough. When these trials are reduced to the minimum, and all the avenues to thrift and comfort within command are opened wide before them, then it is, and only then, that the reasonable estimates of the owner may be realized, and, under exceptional conditions, sometimes exceeded.

DOCKING. In docking lambs the animal should be held between the knees of the operator, its rump against a smooth block of hard wood. A sharp chisel is held between the first finger and the thumb of the left hand and the skin of the tail is drawn well forward. A smart blow upon the handle of the chisel completes the operation instantly. A little tar, or a touch of carbolic acid and pure lard will serve to keep the flies away until the wound heals. Lambs should be docked when about a week old.

CASTRATION. When lambs are a week old they may be easily and quickly castrated by a single decided clip with a pair of shears, the whole scrotum and testicles being taken. When the lamb is some months old there is need of more care and skill. Some operators sit on a bench with one of the lamb's

Fig. 3.—COTSWOLD SHEEP.

hind legs held down by each thigh; an assistant holds the head and fore-legs. Pressing the testicles tightly against the lower end of the bag an incision is made with a keen knife through the tight, smooth skin beneath each testicle. These slip from the openings, the cords are scraped off, not cut, and the work is done. A little tow or wool is sometimes left in the opening in the scrotum of older rams, to allow the passage of any pus which might otherwise collect and cause blood-poisoning. A dressing of tar or carbolic acid mixed with pure lard will serve to keep away flies.

CROOKS. Although unknown on most American farms the shepherd's crook is an implement very useful in catching sheep. Any wagon-maker can readily furnish one. The crook is quietly passed in front of and above the hock, and the leg is then seized by the hand. Never catch a sheep by its wool, it is cruel; the blood settles under the skin where the wool was pulled, and the wool itself is weakened there.

DIPPING. Where but few sheep are to be dipped a large tub will serve to hold the dip during the operation, and some have used a large, tight barrel, set at an inclination in a hollow prepared for it in the ground, much as in the old way for scalding hogs. When large flocks are to be treated tanks are so made that the sheep may be driven from one end to the other through the decoction, after which they stand upon an inclined plane which conducts back to the tank the liquid which drips from the fleeces. Such an arrangement is used on the farm of G. H. Wadsworth, in Pawnee county, Kansas, and which is thus fully described:

The boiler for the dip is 18 inches deep, 30 inches wide and 8 feet long, with plank sides and galvanized iron bottom, in a clay and partly excavated furnace; the smoke-stack is 10-inch stove-pipe. Total cost, $7. The dipping vat is of two-inch pine planks, is 16 inches wide, 5 feet deep and 12 feet long at the top. The end farthest from the dripping platform is perpendicular, but the end nearest the platform slopes from the upper edge inward, for 6 feet, or to the middle of the vat, forming at once the end and the bottom of one-half of it. On this slope are nailed cross-slats to give the sheep a foot-hold in walking out. It leads to the dripping-platform, an ascending inclined plane 16 feet long by 10 feet wide, divided by a fence supporting a gate at the lower end, and at the upper end a gate for each division. The floor is made of matched stuff with half-inch strips covering the joints. Crosswise over these are nailed strips an inch thick, to give the sheep a foot-hold. The half-inch strips make the floor water-tight, make a clear way under the cross-slats for the drip, and guide it back to the vat. When one division of the platform is filled with drying sheep the cut-gate is swung, so as to shut them in and open the lower end of the other division. When this is nearly filled the upper gate of the first division is opened and the sheep are driven out, making room for a fresh lot from the vat while those in the other division are dripping. Pens of portable fence are made so that the one nearest the vat will hold only about 100 sheep. Next to and connected by a gate with that is a pen which will hold 1,000. The dip used here is made of tobacco 50 pounds, sulphur 2 pounds and arsenic 1 pound for each 100 sheep; cost $2.30. The liquor is prepared the day before the dipping, and after boiling is run into a reservoir. When wanted the liquor is heated again in the boiler and fed gradually into the dipping-vat, as needed. This apparatus cost $23.50, and with it four men can dip 3,000 sheep per day.

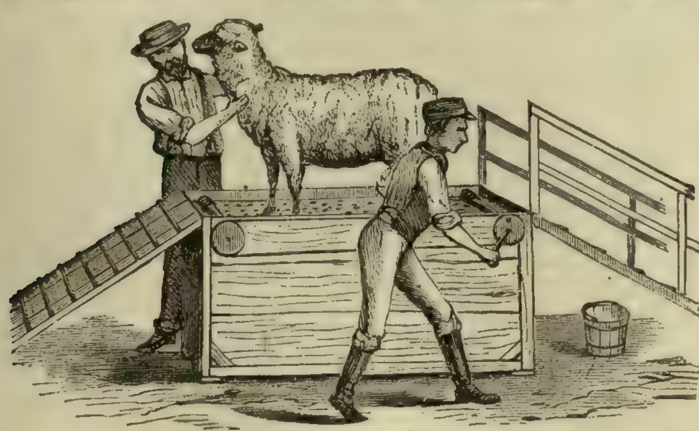


FIG. 8.—*Method of Dipping Sheep.*

To insure a cure a second, and even a third dipping may be necessary, as after the first and even after the second operation, young parasites may be hatched from eggs deposited before the first dipping. It is important that all be destroyed, and, if the flock can not be removed from the pastures and buildings in which they were kept, that everything they may have touched shall be disinfected as thoroughly as possible, for the presence of even one living female upon a post, a rack, or any other object with which the sheep come in direct contact, may be enough to cover the whole flock with the pests again. Each animal should stay not less than three minutes in the dip, during which time the liquor should be thoroughly worked into every part of the skin, and the scabs broken by squeezing the skin into wrinkles or folds. Thoroughly saturate every part of the neck and head, occasionally submerging the whole. No harm will come from the entrance into the nostrils, or into the throat, of the tobacco dip. There may be sneezing and shaking of the head to free the nostrils and ears, but this may serve to dislodge any grubs there may be in the sinuses.

By Fig. 8 is illustrated a most convenient apparatis for dipping. The cut shows plainly the methods of its working.

Scab should be cured as early in the spring as possible, as, if the winter is stormy, the sheep which were treated late in the season run great risk of becoming poverty-stricken and worthless before spring.

FATTENING. The value of a mixed and varied diet in fattening sheep is more highly appreciated in England, on the Continent and in the Eastern States than it is in the Western States, where corn (maize) is the grain most used for this purpose, as carefully conducted experiments have shown that upon a diet of clover hay, mangels and linseed meal, sheep gained one-third of one pound per day. Of ruta-bagas 150 pounds were required to make a pound of flesh. Experience has shown that a pound of Indian corn daily, with good clover hay, may be reasonably expected to add one-half a pound daily to the weight of sheep of good fattening quality. Changing from green to dry food should be done gradually that no time may be lost through any derangement of the digestive organs. Sheep are at all times, and particularly when fattening for market, to be kept as quiet and free from disturbance as possible.

FEED-RACKS. Racks for feeding sheep should be so made that seed, bits of hay and other substances will not fall therefrom upon the head and neck, there to find lodgment in the wool and cause discomfort, and to lessen the value of the sheep by giving it a dirty appearance.

Where there are floors over a sheep-fold or enclosure, they should be made so tight as to prevent chaff, seed, etc., falling upon the animals. For feeding roots or grain a feed-box may be readily made by nailing together the edges of two boards as in the ordinary way for making a trough for pigs; across this should be nailed bars at short intervals, to keep the animals from crowding each other.

FENCES. Portable fences are found very useful in sheep-farming, and many simple and inexpensive ones have been used. See Fig. 18, page 454. To protect traveling flocks from dogs, wolves and other marauders in a new country a corral or enclosure made of light canvas or duck, held up by iron rods sharpened at one end and with an eye turned in the other end, has been found cheap, easily managed and effective.

GUARDS. Dogs have in many parts of the country been a most formidable obstacle to success in sheep-growing. Where the fences surrounding the flock is so built that dogs cannot crawl through, a strand or two of barbed wire placed above the top, will be found an effective guard. The sheep-fold may be protected against raids by wolves and dogs by placing two strands of barbed wire above.

DISEASES OF SHEEP.

In America sheep suffer from fewer diseases than they do in the Old World, some of the more virulent being scarcely known here, except by report. This may be in part due to the climate, the great variety of food and to other conditions which greatly favor sheep-farming in America, but is probably more owing to the fact that for many generations on the lands of the Old World, under unsanitary conditions, the germs of disease have been multiplying and spreading, infecting herds, flocks, soil and other objects with which they come in contact. How long the domestic animals of America will enjoy this comparative freedom from disease none can say, but importations of breeding stock from Europe, and especially from England, threaten American flocks and herds with constant danger. The most rigid quarantine, together with the use of all the best preventive measures known, would give no more protection than the general welfare of the country should demand.

Prevention is certainly better than any cure, and as domestic animals properly cared for give to the farmer a very satisfactory return for his investment of capital, thorough study of and continued efforts to secure the conditions necessary to their thrift and comfort will bring a rich reward. In the following pages the causes, symptoms, remedies usually adopted and the prevention of diseases have been given as concisely as is consistent with a plain understanding of the subjects.

ABORTION. Rough treatment by dogs, hooking by cattle, or hasty, careless driving over bars, fences partly let down, over-feeding with roots in cold weather, and sudden changes in diet resulting in moving the bowels strongly, may cause ewes to abort. Stewart says of abortion, in his excellent Shepherd's Manual: "It has been known to occur in consequence of, or after, the heavy dressing of turnip or mangel land with superphosphate, the crop having been fed to the ewes; but this is probably in consequence of the greater succulence of the roots so grown, rather than of the direct action of the phosphate. The distension of the stomach with cold, watery food so greatly reduces the temperature of the abdominal viscera as to destroy the life of the fœtus, which is prematurely expelled."

Treatment should be chiefly preventive. Follow abortion with Epsom salts ½ ounce, laudanum 1 drachm, powdered camphor ½ drachm. Give in some liquid food. The second day give of laudanum 1 drachm, powdered camphor ½ drachm, if needed. Dogs should be guarded against, cattle and breeding ewes should not be permitted to run together, heedless driving should be prevented, and all disturbing causes avoided.

APOPLEXY. Staggers or apoplexy may be caused by too high feeding, by indigestion or other disturbance of the digestive organs, or by poor feeding. The symptoms are a blood-shot appearance of the eyes and membranes; eyes wide open and staring. The sheep suddenly staggers blindly about, stops and stands swaying unsteadily.

Treatment. Give 5 drops of tincture of aconite in one pint of water.

BLACK-LEG. Known also as quarter-ail, black spauld, anthrax fever, blood-striking and braxy; appears more frequently in the Western States than elsewhere; in the West it is also called murrain. It is

Fig. 5.—GROUP OF YEARLING COTSWOLD SHEEP BEFORE SHEARING.

caused by gorging in spring and autumn upon luxuriant grasses produced by hot suns and too much moisture. It most frequently attacks those animals pastured on rich, flat river-bottom lands.

Symptoms are redness of the eyes, dark urine, constipation with bloody dung when discharged, lameness, and swelling on sides and quarters; the mouth and tongue are inflamed and blistered, the skin makes a cracking sound when the hand is pressed upon the swollen parts of the quarters and sides. The animals soon fall and quickly die.

Treatment must be prompt. Give of sulphate of soda 2 ounces, flour of sulphur 1 ounce, powdered myrrh 1 scruple. Six hours after the above a teaspoonful of spirits of nitrous ether in a pint of water may be given. Law had good results, where cattle were affected, from the use of nitro-muriatic acid 60 drops, bi-chromate of potassa 3 grains, and chlorate of potassa 2 drachms, given twice daily by the mouth, and 2 or 3 drachms of a saturated solution of sulphate of quinia, iodide of potassium and bisulphite of soda injected at equal intervals beneath the skin. He also recommends the use of stimulants (alcohol, ether, valerian, angelica, etc.,) in advanced stages.

Prevention consists in keeping stock from undrained moist soil when heat favors luxuriant growth of vegetation and malarial emanations; prevent access to stagnant water, shelter the stock at night in sheds or barns, and in day by trees or otherwise, when the days are warm and nights cold; keep in thrifty condition, without over-feeding; give a little nitro-muriatic, sulphuric, carbolic or salicylic acid daily in water or food; separate diseased from healthy animals; burn all carcasses, dung, litter and secretions of diseased animals, and disinfect yards, sheds and barns occupied by them, and clothing of attendants; keep dogs and other animals from carrying infection.

BLEEDING. In bleeding from the neck cut a small slit *lengthwise* of the jugular vein, having first cut the wool from a spot large enough for the purpose over the vein; press the finger on the vein firmly and make the opening with a keen knife or a lancet. Draw from 2 ounces to half a pint of blood, as the case may require, and close the opening by a few stitches of soft linen or uncolored silk thread. If but little blood is to be let, open the facial vein beneath the eye, or one in the ear, or inside the fore-arm.

BRONCHITIS. An extension of catarrh or sore throat to the large air passages in the lungs. Symptoms are a cough at first hard but afterward becoming soft and rattling as a discharge from the nose is established. The mouth dry and fevered, membrane of the nose red, and breathing quickened. In severe cases there is dullness, loss of appetite, quick breathing, with dry, hard and painful cough.

Treatment should consist of good nursing, with nourishing gruels of oat-meal, linseed tea, in which half a teaspoonful of ground ginger has been stirred. When there is fever give powdered gentian 1 drachm, saltpeter 1 drachm, linseed oil 1 ounce. If the mucous membranes show a yellow tinge give injections of warm water to move the bowels, instead of laxatives. Niter or sweet spirits of niter, belladonna, lobelia or aconite; and expectorants, such as oxymel of squill, liquor ammoniæ acetatis, guaiacum, ipecacuanha, or antimony is recommended by high veterinary authorities.

Prevention consists in careful attention to general sanitary measures, especially such as will prevent sheep taking colds. Exposure to cold, wet storms, to chilling draughts, and to sudden removals from heated barns or stables to cold outer air should be guarded against.

CANKER OF THE FOOT. Caused by folding sheep where the dung is collected in a fermenting mass, and by neglecting cases of simple foot rot. It is an inflammation of the sole of the foot, and a growth of spongy sprouts instead of the natural hoof; discharges an offensive, white, curd-like matter.

The remedy consists in cutting away all separated hoof at each dressing; wash the diseased parts with a solution of chloride of zinc 1 drachm, in a pint of water, and apply tow or lint dipped in a mixture of three parts of water to one part of nitric acid. Or, a dressing of carbolic acid may be applied.

CATARRH. The changeable weather of fall, winter and spring, exposure to cold outer air after confinement in too warm stables or barns, lead to the appearance of nasal catarrh, or inflammation of the lining membrane of the nostrils, sinuses, throat and windpipe. This not infrequently extends to the air passages of the lungs, producing bronchitis.

The symptoms are redness accompanied with watering of the eyes, the membrane of the nose is red, dry at the first but afterward discharges a thin, clear fluid, which changes to a yellowish, purulent mucus.

Remedies are good feeding and nursing, light feeding with bran mashes, oat-meal gruel, in mild cases without medicines. In more serious cases give Glauber salts, to be followed by niter, or by acetate of potassa. As a tonic spirits of nitrous ether or gentian may be given. Law recommends, in cases of chronic discharge from the nose, an injection of weak solution of sulphate of zinc ½ drachm, glycerine 1 ounce, warm water 1 quart. This may be administered by the aid of a syphon, one arm of which is 16 inches long, and the other 3½ inches long, ½ inch in diameter at the point and at an angle of 45 degrees from the larger part. Pass the short arm through a wide piece of cork or of sole leather, to prevent the escape of the fluid from the nose; wrapping tow around the nozzle between its end and the leather effectually stops the return of the liquid. Bring the face of the sheep into a vertical position and pour the liquid into the long end of the syphon until it rises in that nasal chamber and flows from the other. One or two such injections are enough to cure. Prevention is indicated sufficiently by a description of causes.

When the sheep are costive the following may be substituted for the remedies described above: Steep in a quart of water, rhubarb 1 ounce, ginger 2 ounces, gentian 2 ounces, strain and add corrosive sublimate 8

grains. Give two tablespoonfuls of this twice daily.

CHOKING. Sheep sometimes choke upon pieces of turnip or other food, although not very often. The head should be held well up and an effort made to work the obstruction downward by gently pinching the walls of the gullet together above the lump. Some pour melted lard, or linseed oil down the throat to aid the operation. Should these means fail, a long, smooth and flexible rod, having fastened on its end a soft ball of linen strips or a piece of soft, tough sponge saturated with oil or lard, may be pushed gently down the throat until the obstacle is reached, when a few light strokes against the end of the rod will usually be found effective. If this will not remove the obstruction and the animal is valuable enough to warrant it, an opening may be made through the wall of the gullet and the offending substance removed. A stitch with a curved needle and a thread of coarse uncolored silk will close the wound.

COLIC. Spasmodic colic or cramp is always accompanied by indigestion, and generally by constipation. The animal falls, struggles or lies with eyes fixed and staring.

Treatment. The remedies are tincture of rhubarb 1 drachm, carbonate of soda 1 drachm, warm water sweetened 2 ounces. Give slowly with a spoon, and follow by linseed oil ½ ounce, after the spasms cease. Or give linseed oil with belladonna ¼ ounce, to relieve pain. Copious injections of warm water will be found very useful.

CONSTIPATION IN LAMBS. Lambs fed artificially upon milk from cows or from ewes are subject to constipation. The lamb becomes dull and stupid, its belly swollen, urine scanty or entirely stopped, and soon dies if not relieved by treatment.

Treatment. Injections of warm milk or water in which a little molasses has been stirred has been recommended. A strong syringe is used. The lamb is held up by the hind legs, its fore-feet just touching the ground during the operation and for a few minutes after. The injection should be repeated if hardened dung is not voided with or soon after the discharge of the fluid. A tonic may be given once a day, composed of common salt 1 drachm, golden sulphur of antimony, ½ drachm.

DIARRHŒA. Colds arising from exposure to sudden changes in the temperature, from cold drinks or other causes, an unhealthy condition of the milk of the ewe, or indigestion in the lamb, frequently cause diarrhœa of a severe nature.

Symptoms. Clok thus describes the ailment: The disease appears without warning; the lamb becomes languid and sad, keeps away from the other lambs, stands with back bent, or lies down frequently. The excrement, which is repeatedly discharged, is thin, whitish or greenish, afterward watery or mixed with mucus, and finally bloody. The animal ceases to suck and eat, but is very thirsty. It bleats frequently, evinces signs of pain if pressure is applied to the belly, and makes efforts to discharge excrement. The lamb rapidly loses flesh, its belly sinks in, and death ensues between the second and fifth days, and sometimes even on the first day.

Treatment. Prompt change to the best sanitary conditions, a general change of food for both ewes and lambs, and the best of care. An excellent food for the lambs may be made by beating the white of an egg with six times its bulk of water and giving, lukewarm, as much as the animal will take. A few drops of laudanum may be profitably added to the above.

A tablespoonful night and morning of the following mixture should be given: Opium 1 drachm, ground ginger ½ ounce, prepared chalk 2 ounces, calamus or peppermint tea 1 pint. In severe cases one ounce powdered catechu should be added to the above. Where the excretions are tinged with blood two or three drops of Fowler's solution of arsenic in a teaspoonful of water should be given, three or four times per day, to young lambs. Sometimes five or six doses, of two or three grains each, of quinine are given, per day.

"White scour" is a diarrhœa in lambs which is so called because the excrement is white and watery. It is acrid and irritating. There is with this form of disease great loss of appetite, colic and weakness. This comes from an unhealthy character of the milk of the dam, from the weakness or from the overloading of the lamb's stomach. High feeding of the ewes is likely to cause this disease. Putting the lamb on short allowance, or feeding with cow's milk diluted with water, will usually serve to cheek it. Give four times a day a dose of bicarbonate of soda ½ ounce, calcined magnesia ½ ounce, divided into eight powders.

To restore vigor in cases of great weakness the following will be found most valuable: Eggs 2, whisky 2 ounces, essence of ginger 1 drachm; beat up with a pint of gruel made of oatmeal and milk; give a few spoonfuls every three hours.

DROPSY. Dropsy of the abdomen is caused by keeping sheep upon watery, rank, succulent forage, by which the blood is impoverished, and is a gathering of a watery fluid in the abdomen.

Symptoms are a distension of the belly, full and tight where there is much liquid, or flabby and pendulous, with hollow flanks where the fluid is less abundant. Urine is scanty, appetite lost, digestion poor, breathing excited; sometimes swellings appear along the lower part of the body and on the limbs and chest.

Treatment. Remove to pasture having finer and more nutritious forage, or to dry food. Give of nitrate of potash 1 drachm, sulphate of soda 1 ounce, ginger 1 drachm. When the animal is in very poor condition substitute for sulphate of soda 2 ounces of linseed oil.

DYSENTERY. Exhalations from marshes or from lands which have been flooded, musty or rotten food, over-heating in hot weather, drinking stagnant water, or contagion are among the chief causes of dysentery or bloody flux. Other causes are sudden changes

from poor to rich pastures or the reverse, very hot and wet weather, and especially neglected cases of diarrhœa.

Symptoms are the frequent passage of offensive dung mixed with blood and mucus; the animal strains with great pain during the voiding. There is much thirst but little desire for food; the mouth is fevered, the extremities become cold, the muzzle dry and cracked, the eyes sunken, the wool becomes harsh, and, when the disease has run for some days, it may be easily pulled off in handfuls. The sheep may die in a few days, or it may linger for weeks.

Remedies consist of first removing the active causes, and in giving olive oil 3 ounces, or Glauber salts 5 ounces, with a sedative of Dover's powder 2 scruples, or laudanum 2 to 3 drachms; or, give linseed oil 2 ounces, powdered opium 2 grains, in oatmeal gruel or linseed tea. Follow this for several days with powdered opium 2 grains, and ginger 1 drachm, or with laudanum 2 drachms. Keep the patients as cool and quiet as possible.

Preventives are keeping sheep from poor food, avoiding sudden and extreme changes of water or pasture, overheating and impure water, and pasturing where sheep suffering from dysentery, have recently grazed.

EPILEPSY. Young or very poor sheep are subject to attacks of epilepsy, when permitted to fill themselves in the morning with herbage covered with snow or frost. There is congestion of the brain, resulting from the chilling of the rumen, and the animal is convulsed. Prevention is the cure.

FLUKE, LIVER ROT. England has lost millions of sheep in a very few years, and Australia and South America have also lost very heavily from the ravages of the liver-rot or fluke; but it has not been shown that sheep in North America have suffered much from this cause, although some writers declare that thousands of sheep are lost annually from fluke in the United States without their owners suspecting the cause. The high and arid plains west of the Mississippi and east of the Pacific slope do not present conditions favorable to its spreading.

Fluke, or liver-rot, is caused by the presence in sheep of the flat, leaf-like parasite *Fasciola hepatica*, which attains a length of from three-quarters of an inch to one inch. Found in the gall ducts of all domestic animals and of mankind; in most of these they do little injury. Deposited in the gall ducts the eggs can not hatch there, but passing out are washed by rains, or are otherwise carried to pools of fresh water, in which the egg hatches and the embryo floats until lodgment is found in some mollusk, in which many new embryos are developed. Law says: "These embryos may form new brood capsules and thus increase their number materially, or, if swallowed by a mammal with its food and water, develops into mature flukes, inhabiting the bile ducts and reproducing themselves only by eggs. These intermediate generations are necessary and can only take place in fresh water and in fresh-water mollusks."

Symptoms. The eye becomes jaundiced, the belly swells, there is weakness and tenderness of the loins, a weak circulation and general stupor. By rubbing the skin over the loins to and fro between the finger and thumb a flabby, soft feeling will be perceived, as if there was water underneath.

Remedies. Remove from the infected lands to pastures perfectly dry; give liberal supply of salt, which is fatal to young flukes; give abundant and rich food. An English remedy said to be effective is: Yellow rosin 1½ drachms, oil of turpentine 1 ounce, calomel 10 grains, tincture of iodine 30 drops; one-third the above to be given in gruel each morning for three days. Another remedy is: sulphate of magnesia ½ pound, oil of turpentine 3 drachms. Mix and give one-third the above quantity once in two days. Yet another is: Saltpeter 1½ ounces, powdered ginger 1 ounce, carbonate of iron ½ ounce, salt 1 pound, and boiling water 3 quarts, to be mixed, and when nearly cool 9 ounces spirits of turpentine are to be added. The infected sheep are each to receive a wine-glassful, after having been kept twelve hours off food and water, on the morning of each fourth day for two weeks.

FOOT-ROT. Much trouble and loss was formerly caused by contagious foot-rot in that part of the United States lying east of the Mississippi, but the general diffusion of a knowledge of it and the treatment necessary to its prevention and cure, aided by changes made by clearing away forests and the drainage of lands, has reduced these losses materially. There is still, however, reason for exercising constant care to prevent the spread of this troublesome contagion, which may appear on high and dry lands as well as elsewhere. It can never be completely eradicated from a flock without great skill, labor and watchfulness, combined with the use of proper remedies. Constant wetness of the soil makes the flocks more liable to the attacks of the contagion.

Symptoms. The symptoms of contagious foot-rot have been concisely and clearly described by Dr. Randall in the following words:

The first symptom is the disappearance of the naturally smooth, dry, pale condition of the skin at the top of the cleft over the heels. It becomes somewhat red, warm and moist, and slightly rough or chafed. Next the moisture increases to a discharge, and an ulcer is formed which extends down to the upper portion of the inner wall of the hoof. These walls are then attacked, become disorganized and the disease penetrates between the fleshy sole and the bottom of the hoof. The hoof is thickened at the heel by an unnatural deposition of horn. The crack between it and the fleshy sole pours out an offensive and purulent matter. Soon all parts of the foot are penetrated by the burrowing ulceration, the horny sole is disorganized, and the fleshy sole becomes a black and swollen mass of corruption, shapeless, spongy, and often filled with maggots. The fore-feet are usually first attacked; lameness is early noticed and soon becomes complete; the appetite is lost and

the animal dies from exhaustion. The offensive odor of the true foot-rot is characteristic, and once made familiar will serve as a certain guide in recognizing the disease. The disease may present itself in a malignant and rapid form or in a mild one. The first attack on a flock is generally of the severe character. When it is kept under the first year, its appearance the next summer will be mild, and the third season still milder.

Remedies. Every affected part must be laid bare by carefully paring the horn away to the quick with a thin, sharp knife, stanching the blood which may flow. Tow, saturated with tincture of muriate of iron, solution of blue-stone, butter of antimony, or of nitrate of silver, should be applied, and the wound bound up to prevent the intrusion of foreign substances.

Many sheep owners, after exposing by the judicious use of the knife every part which is in even the slightest degree affected, compel the animal to stand from ten to twenty minutes in a saturated solution of blue vitriol, kept as hot as the hand can bear by the addition of boiling solution from time to time, or by dipping hot irons into the tub or tank containing the liquid. Upon coming from the solution it is well to cover the hoofs with chloride of lime, and fill with tow the cleft in the foot. The ends of the tow should be twisted into a cord which should be fastened around the fetlock, thus making a good bandage. The sheep should not be permitted to stand in a damp yard, nor to go into pasture wet by dew or by rain. Butter of antimony is a good application.

Whatever remedy may be used it is of the greatest importance that the work be done thoroughly, and that the flock should be carefully inspected each day for some time, as if even a minute portion of a diseased part escape the action of the remedy it will serve to again contaminate the whole flock.

Foot-and-Mouth Disease. Aphthous fever or foot-and-mouth disease was introduced into North and South America by importations of stock in 1870. It is a contagious fever attacking cattle, sheep, swine, rabbits, and hares. Fortunately, it has as yet spread but very little in North America, but the germs are very sure to be transmitted by clothing, by animals, manure, litter, fodder, or by any one of the hundreds of articles which may be carried from the presence of infected animals.

Symptoms. Law says: The poison may remain latent in the system for one or two days, or in exceptional cases perhaps as many as six. Then there is roughness of the coat, or shivering, increased temperature, dry muzzle, hot, red mouth, teats and interdigital spaces, lameness, inclination to lie, and shrinking from the hand in milking. The second or third day, blisters arise, on any part of the whole interior of the mouth, one-half to one inch in breadth, or on the teats and between the digits about one-half inch across. Saliva drivels from the mouth, collecting in froth around the lips, and a loud smacking is made with the lips and tongue. Swine champ their jaws. Sheep and swine suffer more especially in the feet, often losing the hoofs or even the digital bones, a contingency not unknown in neglected cattle.

Treatment. The same authority advises as remedies Epsom salts 2 oz., as an astringent wash for the mouth, borax and tincture myrrh 1 oz. each, water 1 qt.; or carbolic acid 1 dr., honey 2 oz., vinegar 1 pt., water 1 pt.; as a lotion for the teats carbolic acid ½ dr., glycerine 10 oz.; and as a dressing for the feet, oil of vitriol 1 oz., water 4 oz., to be applied with a feather after cleaning the space between the hoofs by drawing a cloth through it. After dressing tie up with a tarred bandage. All loosened horn should be removed in dressing the feet, and a poultice applied if there is much inflammation.

In England great good has followed the free use of salicylic acid, of which 1 part is soluble in 600 parts of cold spring water, 1 part in 100 boiling water, only one in three hundred remaining on cooling, unless the boiling has been continued 15 or 20 minutes. Carefully heated in glycerine 1 part in 50 will dissolve, and 1 part to 10 of alcohol. As the liberal use of salicylic acid has no bad effects it may safely be used.

Preventives should be thoroughly used and most stringently insisted upon. Every place and thing with which the affected animal has come in contact should be thoroughly disinfected and, except the necessary attendants, should be rigidly excluded; poultry and birds should not be forgotten. Fifteen days should pass after full recovery before this rigid quarantine should be removed, and then the diseased animal should be washed with a wash of carbolic or of salicylic acid.

Gad-fly Grubs. In July and August the sheep gad-fly (*œstrus ovis*) deposits her eggs in the nostrils of sheep. In their efforts to prevent this the sheep crowd together, their noses close to the ground, shaking their heads frequently, and stamping vigorously. At such times the gad-fly, which resembles in appearance, but is smaller than, the ox gad-fly, will be seen hovering near the animals. The maggot, which soon comes from the egg, follows the sinuses of the nose, in which it remains through winter, greatly irritating the animal, and becoming a thick grub about an inch long. On the approach of warm weather in the spring, this grub descends to the ground, in which it burrows, and from which it in time emerges in the form of a fly, ready to perpetuate its kind. Some hold the opinion that these grubs do no serious harm, but many others believe that discomfort and even death is caused by their presence. It is certain that the irritation resulting can scarcely tend to make the sheep more thrifty, and therefore any measure which will prevent or remove the annoyance will be worthy of trial by owners of sheep. See Sheep Gad-fly, in article Gad-fly.

Remedies. Strong snuff may be driven up the nostrils, or tobacco smoke may be blown from an ordinary pipe, the stem being placed in the nostril and the bowl covered by a cloth. This will cause violent sneezing, which may dislodge the worms, though they are not easily dislodged. A mixture of equal parts of

Fig. 7.—OXFORD DOWN YEARLING LAMBS

turpentine and sweet oil well mixed and a teaspoonful poured into each nostril will be effective, care being taken to prevent the mixture entering the lungs. A decoction of tobacco, injected into the nostrils by a syringe, has been found effective; this should be prevented from entering the lungs.

Preventive. Smearing the nose daily with tar, with which a few drops of crude carbolic acid have been mixed, has been found an excellent preventive. This smearing may be easily done by boring holes an inch and a half in diameter and an inch deep in a thick plank, or in a log, to which the sheep have easy access. In these holes salt is placed, and tar is thickly spread around them. In their efforts to get the salt the sheep will cover their noses effectually with the mixture. Should any fail to do so, they can be smeared with but little labor.

GARGET. Chief among the causes which produce inflammation of the udder or milk glands (garget), are, leaving the milk too long in the bag; exposure to cold rains, chilling currents of air or to cooling quickly after undue exercise; lying upon cold, wet ground, or sharp, hard substances, and blows from the horns of cattle.

Symptoms are a feverish feeling, with fullness in the bag, which is often caked or hard; or there may be a hard mass in the middle of the bag. In severe cases there is shivering, considerable heat, quickened breathing, strong, quick pulse, costiveness and stoppage of urine, lameness on the affected side and sometimes a clotted mass streaked with blood. They sometimes cost the ewe her life, but more frequently result in the loss of her bag, and her usefulness as a breeder.

Remedies recommended are Epsom salts 2 ounces, nitrate of potash 2 drachms, ginger 1 drachm, to be given in water and repeated each day. Wash the udder thoroughly with warm water, and inject into the teats a solution of carbonate of soda, which should be milked out. In mild cases rub the bag vigorously with weak iodine ointment, or camphorated spirits. Milk three times a day, rubbing well each time.

HOOVE OR BLOAT. Colic or hoven in sheep results from the causes which produce the same ailment in cattle. The walls of the third stomach, or rumen, have sometimes been ruptured by the confined gas, resulting from over-feeding upon luxuriant pasture, or from eating ergot in fodder, or musty or blighted grain.

Symptoms. Great swelling of the abdomen, oppressed breathing, and ofttimes a turning of the head toward the sides as if to point out the seat of the trouble.

Remedy. If swollen greatly make an opening with a pen-knife blade or with a trocar, through the skin and the underlying muscles, midway between the thigh and the ribs and about three inches from the backbone, to give an outlet to the gas confined in the rumen. A quill is sometimes thrust into the opening to furnish free egress to the gas. After an attack of hoove an ounce or two of Epsom salts are generally given.

HYDATIDS. Water brain in lambs is caused by an undeveloped form of the tapeworm of the dog (*Tænia cænurus*) which, in its cystic form (*Cœnurus cerebralis*), in the brain and spinal cord of sheep and cattle, causes nervous diseases of varying character. Voided by dogs the eggs or the larvæ are taken in with their food by sheep, and find their way to the brain. The pressure of the hydatid upon the brain causes symptoms known as blind-staggers, sturdy, turn-sick, and by other names. Fortunately the disease has not yet become general in America, although sheep in Texas are afflicted with what is there called lombrez,—a Spanish word meaning "worm,"—the symptoms indicating the presence of hydatids.

Remedies. When the softening of a spot in the skull denotes that the hydatid is lodged underneath, the skin should be laid back, and a small opening made through the bone. The cyst may then be opened and the fluid within suffered to run out, or it may be withdrawn by a small syringe. The membranous sac of the parasite should then be carefully pulled out, and the wound dressed with lard, with which a few drops of carbolic acid have been mixed. It is objected that this treatment is liable to be followed by death caused by inflammation of the brain, resulting from exposure to the air, and it is recommended that, instead of opening the cyst to the air, there should be injected into it, by the aid of a strong hypodermic syringe, half a teaspoonful of a mixture of iodine 1 grain, iodide of potash 5 grains, water 1 ounce.

Tellor says: "The location of the hydatid in the brain is indicated by the motion or turning of the sheep. If it is in the left lobe or half of the brain the animal turns to the right; if in the right lobe, his turning is to the left; if in the back part of the brain, the cerebellum, the movements are performed without control, the head is elevated, the limbs moved with difficulty, and he starts and falls repeatedly; finally, if the hydatid is in the middle of the brain in front, the sheep goes forward in a straight line, holds its nose in the air, steps very high, and some lose the sight of one or both eyes."

Authorities agree that these cysts in the brains of sheep and cattle come mainly from one source,—the droppings of dogs,—and that after passing into the brain they must then remain until again eaten by a dog, when the tapeworm results. As a preventive all strange dogs trespassing upon sheep pastures might be killed, and to the dogs belonging with the sheep a vermifuge should be given occasionally. Salicylic acid in doses of 3 to 5 grains followed by oil has been given with success for the removal of tapeworm. To avoid risk all sheep's heads should be thoroughly cooked before placing where dogs can get them.

The growth of the hydatid is rather rapid, and in three weeks' time from the first appearance of the symptoms, if the skull be pressed firmly with the thumb where the above rules point out the lodging of the hydatid, a noticeable degree of softening will be found, as if the skull were wanting in that particular

spot. In fact the bone has become thin, and been absorbed by the suckers of the small tapeworms above described. In size the hydatids range from that of a pea up to that of a hen's egg.

Inflammation of the Bladder. Eating too heartily of corn meal, second growth of clover containing poisonous plants, or drinking hard water, frequently causes inflammation of the bladder; the urine is retained, blood-poisoning may follow with high fever. Males and fattening stock are especially subject to such troubles.

Symptoms are a strong odor of urine given off by the secretions of the skin, and feverish condition, uneasiness, costiveness, stamping with the hind feet, straining to void urine, and moaning, frequent looking at the flanks, and a stiff and straddling gait.

Remedies. Give light, soft, watery food with linseed or slippery-elm tea, olive or linseed oil, pure soft water to drink, and inject into the bladder gum Arabic 1 drachm, opium 1 drachm, warm water 1 pint. Finally follow with small doses of copaiva, or cubebs, or buchu. Salicylic in doses of 3 to 4 grains at intervals of five or six hours has been found of value.

Inflammation of the Bowels. Not common in America, but sometimes follows feeding on dry, poor pasture, with bad water in hot weather.

Symptoms are weakness and staggering, watering and redness of the eyes, loss of appetite, high fever, swollen flanks, hard breathing and pained, puckered expression of the face, passage of dung stopped.

Treatment consists in giving linseed oil, castor oil or Epsom salts, followed twice daily by sulphate of soda. Food should be much like that recommended for inflammation of the bladder.

Inflammation of the Brain. Phrenitis, or inflammation of the brain, results where they are long continued, from the causes which lead to apoplexy. The diseased animals dash about in a frenzy, blind to all danger. Lambs jump about as in play, until convulsions end their agony. The remedy is free bleeding from the neck, and prompt purging with salts. The treatment must be instant, or death will ensue.

Inflammation of the Liver. Is an advanced stage or the result of neglect of congestion of the liver, caused by high feeding and want of exercise. There is fever, with hot, dry nose and mouth, breath offensive, eyes dull, extremities cold, pulse uneven, urine scant, hot and yellow; dung black, hard and coated with greenish-yellow mucus.

Purgatives and injections are required. Give Glauber salts 6 ounces, or calomel 5 grains, powdered opium 1 grain, sulphate of potash 2 drams. May be given twice daily in an infusion of linseed or gum Arabic, or in molasses, mixed thoroughly and placed on the tongue. Injections of warm water and Castile soap are useful. Diet of corn-meal gruel, bran mashes, pulped roots and green food should be given, but rather sparingly.

Influenza. The causes which produce influenza are not clearly known, but at times it affects animals over wide areas. There is inflammation of the nasal and bronchial passages, a discharge at the nose, coughs, red and weeping eyes, and impaction and sometimes hoove or bloat. Stewart recommends as treatment mixed salt 1 pound and sulphur 4 ounces, good nursing and hearty, strengthening food. When the attack is more serious give Epsom salts ½ ounce, ground ginger 1 drachm, in water ¼ pint, or mixed with molasses and honey. To those suffering most should be given tincture of aconite 10 drops, solution acetate of ammonia 1 ounce. This should be given once in five or six hours, lessening the aconite at each dose until five drops only are given. The eyes may be bathed with a solution of sulphate of zinc 1 grain, laudanum 20 drops, water 1 ounce. Feed well with mashes and shelter carefully after recovery and, of course, during treatment.

Intestinal Worms. Examination of a dead sheep will sometimes reveal the presence of intestinal worms. It may be assumed that when they appear in one others in the flock are afflicted. Plenty of salt will act as a preventive and should be where sheep can have free access to it at all times. The remedies most used are: Powdered gentian ½ pound, sulphate of iron ½ pound, sulphate of magnesia 1 pound, common salt 2 pounds; mix and give with ground feed. The above quantity is enough for 80 to 100 sheep. Or, give a pint per week of sulphate of iron 5 ounces, quick lime 1 pound, mixed with five gallons of water. As a drench for round or thread-worms use oil of turpentine ¼ ounce, linseed oil 2 ounces. For tape-worm powdered areca nut ½ to 1 drachm, oil of male fern 10 to 20 drops. For any of the worms inhabiting the intestines 3 grains of salicylic acid in four doses, followed by a purgative, may be given two or three times in a day.

Inversion of the Womb. Sometimes after exhausting labor the womb, turned inside out, hangs from the ewe like a red bladder. Wash this very thoroughly with warm water and very gently return it to its natural position. The hand must be well covered with sweet oil or with pure, fresh lard, the nails close cut, the ewe meantime held so that her hind-quarters are considerably raised. A stitch should then be taken with linen or coarse silk thread so as to make a loop across the vagina to prevent the uterus coming out again. Give 20 to 30 drops of tincture of opium in some warm gruel, and leave the ewe in perfect quiet on a soft bed with her hind-quarters higher than her head, for some days. Instead of stitches two ropes, each more than twice the length of the animal, are doubled and twisted together in the bights so as to form an opening a little larger than that of the vulva. This is so placed as to support the orifice; the upper ends are carried over the rump, crossed two or three times along the back and finally tied to a collar or band placed around the neck; the lower ends pass between the thighs, and forward along the sides, and are attached to the collar. This truss

may be made quite tight, and with every straining will tighten.

LOCKJAW. Sometimes injury to the spermatic cord in the operation of castration, or even exposure to wet and cold causes lockjaw, in which the jaws are firmly closed, the limbs stiff, the neck twisted and the head turned to one side. A warm bath is recommended, and warmth and quiet are necessary. Give Epsom salts 2 ounces; follow two hours after with 2 drams laudanum. Two or three times a day give warm gruel with ¼ ounce ginger.

LOMBREZ. For years shepherds in Texas have suffered serious losses from a mysterious disease known by the Mexican name *lombrez*, signifying "a worm." The causes of the disease and the treatment necessary for curing are just now the subject of animated debate among stockmen of that State. Some, in answer to questions addressed to them upon the subject, say that the disease results from pasturing upon long rank grasses, from drinking filthy water, from too close herding, and from confining to damp bedding grounds. Others declare that "the worm is a water worm," which the sheep takes into its system by drinking impure water. These theories are vigorously assailed by others who justly urge that lombrez would be easily prevented by avoiding the causes were they known to be those mentioned.

It is said that the young sheep in several counties in Middle and Southern Texas, in Bee, Live Oak, and in other counties east, west, and north of those named, have been destroyed by this disease during the last six years. The worms which are by some supposed to cause the death of these sheep, are found in the fourth stomach; but it is asserted that the same worms are found in sheep of all ages and conditions in Texas. An extensive sheep herder of Texas gives it as his belief, founded upon many examinations of sheep in his own flocks and those of others, that chronic constipation causes the death of the animals supposed to die of lombrez. He asserts that the sufferers have all the symptoms of this ailment, are exposed to every predisposing cause of chronic constipation, and the dissecting knife discloses the fact that the grass in their little stomachs is almost destitute of any moisture. See Hydatids.

LOUSE. The red sheep-louse (*Trichodectes ovis*) has a red head, pale yellow body with dark bands. Seeks the tender skin inside of the thighs and on the neck of sheep with fleeces free from yolk. Carbolic acid and lard or salicylic acid and glycerine mixed and rubbed on the parts will free the sheep from this pest.

LUNG WORMS. Hurried breathing and a dry cough, diarrhœa, loss of appetite and flesh, examination of the mucus and the evacuations, may show indications of *Strongulus filaria*, worms which are usually found in the windpipe, bronchial tubes and bowels of sheep affected, and sometimes in their lungs.

Remedies. Salicylic acid will probably be found a safe and efficient remedy, in doses of 3 grains each, administered twice each day for three days. A remedy composed of sulphate of magnesia 6 ounces, nitrate of potash 4 ounces, put into 3 pints of boiling water, and with which when milk-warm oil of turpentine 4 ounces, and bole armeniac ½ ounce have been well mixed, in doses of two or three tablespoonfuls every other day, is recommended. Or give each lamb a wineglassful of the following: common salt 3 pounds, powdered ginger ½ pound, nitrate of potash ½ pound; dissolve in 3 gallons warm water, and when nearly cold add oil turpentine 24 ounces.

A tonic and vermifuge mixture of 2 ounces each of oil of turpentine, powdered gentian and laudanum, dissolved in a quart of linseed tea or of lime water, has been given with good effect. One-tenth of the above quantity is enough for a dose.

Prof. Townshend advises giving, once a day for a week or two, a tablespoonful of oil of turpentine ½ ounce, whisky 1 pint, mixed.

MAGGOTS. Flies will in hot weather often deposit their eggs in wounds or in the dung adhering to the thighs of sheep which are not kept clean; maggots are hatched and cause considerable uneasiness.

Remedy. Shear the inside of the thighs and from under the tail; remove all maggots and wash the wounds with diluted crude carbolic acid, or apply a dressing of lard with which a few drops of carbolic acid have been thoroughly mixed, or pour on spirits of turpentine.

OPHTHALMIA. Often results from irritation of the eye by chaff or other foreign substances, from wounds, blows or other injuries, or from colds. There is watering of the eyes with redness; pus discharges from the corner of the organ. Bathe the eye with a wash of 4 grains of sulphate of zinc in 1 ounce water; shut the animal from the light for a few days. If there is much pain and inflammation give 1 ounce Epsom salts dissolved in water, and add 20 drops laudanum to the eye-wash above described.

PALE DISEASE. Known also as hoose, husk, or verminous bronchitis, is caused by thread-worms in the air passages in sheep, goats and camels. There is a husky, dry, loud cough, and from the nose a froth in which are worms or their eggs. Loss of appetite and of flesh, diarrhœa, great thirst and a disposition to eat earth are among the symptoms.

Treatment should consist of a sound and nutritious food, with which should be mixed equal parts of sulphate of iron, gentian and ginger, 2 ounces daily for nine or ten lambs three months old. To destroy intestinal worms give a teaspoonful of table salt and one of oil of turpentine well mixed with milk and administered every second morning, on an empty stomach. Or give salicylic acid 1 to 2 grains. For removal of lung worms fumigate by confining in a tight room and burning flour of sulphur, a pinch at a time, stopping when the animals begin coughing violently; repeat daily for a week or ten days and then weekly for several weeks. As preventives, remove at once from

association with affected animals, and from pastures on which such have grazed. Plenty dry food and a free supply of salt are needed.

PALSY. Entire or partial loss of action of the nervous system sometimes appears in lambs or sheep which have been chilled by long exposure to cold storms, in neglected newly dropped winter lambs, and in ewes after abortion or long continued and severe labor in lambing. Feeding heavily on watery roots has caused palsy, as has also the chilling influence of currents of cold air. As a remedy first remove the causes and give twice daily spirits of nitrous ether 2 drams, powdered gentian 1 dram, powdered ginger 1 dram. If this fails the following may be tried: tincture of nux vomica 4 drops, or strychnine ¼ grain, in a quart of linseed gruel; later repeat the dose slightly increased. Mustard or ammonia and sweet oil may be rubbed on the brisket and along the backbone; the animal should be kept warm, and be carefully nursed.

PARTURIENT FEVER. High-bred and imported ewes sometimes suffer from parturient fever, usually a few days before lambing; native sheep rarely suffer. The chief symptoms are a dull, drooping, listless attitude, loss of appetite, eyes nearly closed and nervous twitching of the hind legs; a dark liquid escapes from the vagina. Should the dead lamb be dropped at this stage the dam will, if well cared for, probably recover in a few days. If the lamb does not come away the fever increases greatly and the ewe seldom recovers from the attack.

PARTURIENT APOPLEXY. Very highly fed ewes sometimes suffer from parturient apoplexy, or after-pains, usually the second or third day after lambing. It is caused by plethora, or a feverish condition of the system, and is indicated by redness or swelling of the vagina, which becomes purple and then black; the scanty discharge of highly colored, offensive urine and costiveness; and by panting, straining and heaving of the flanks. Give promptly camphor ½ dram, laudanum 60 drops, mixed with molasses and placed on the tongue. When the pains are very severe, increase the dose one-half.

This disease is easily prevented by gradually reducing the condition of the ewe, beginning some weeks before she is due to lamb, and by giving for some days, daily doses of saltpeter, followed in four hours by solution of acetate of ammonia 1 ounce, and repeat twice at intervals of two hours. Inject into the vagina a solution of chloride of lime 1 dram, in warm water 1 pint, if there is an offensive discharge. Bleeding from the jugular vein, before the pulse has lost its fullness and hardness—never after—will relieve. Apply ice-water or bags of pounded ice, or a solution of an ounce each of niter and sal ammoniac in a quart of water, to the head. Law advises giving Epsom salts 2 ounces, carbonate of ammonia ½ dram, nux vomica 5 grains, with friction to the limbs. Repeat the nux vomica and carbonate of ammonia every four hours.

PLETHORA. Animals which have been rapidly fattened with rich albuminous food not infrequently suffer from plethora, or engorgement of the system with blood. In extremely hot weather or after severe exercise death sometimes results. The treatment is bleeding and a reduction of the condition by purgatives and giving light rations of food.

PLEURISY. Any sudden and thorough chilling is likely to cause pleurisy, or inflammation of the membrane covering the lungs and lining the cavity of the chest. Law says of this disease: This is common in all domestic animals, and particularly in cold, exposed localities, which suffer at the same time from rheumatism. Symptoms are shivering, followed by heat of the skin and even of the limbs, and partial sweats of the surface, uneasy movements, pawing and sometimes looking at the flanks, lying down and rising. If one side of the chest only is involved that fore limb is often advanced in front of the other. Pulse rapid and hard, breathing hurried, with inspiration short and suddenly checked; expiration slow and prolonged. On the abdomen a prominent ridge reaches from the lower ends of the last ribs to the outer angle of the hip-bone. There is a short, dry, painful cough, no discharge from the nose, and no redness. Give Glauber salts 6 ounces, follow with niter 2 drachms, and digitalis 10 grains. Where there is marked weakness give stimulants, as sweet spirits of niter 3 drachms. Nursing as in bronchitis should be given, and in the early stages treat as for congestion of the lungs.

PNEUMONIA. Inflammation of the lungs, or pneumonia, is caused by chilling, over-exertion and congestion or by parasites.

Symptoms are a dry cough, shivering, later a full pulse, quick, heavy breathing, redness of membranes of the eyes, nose and mouth; with the fever there is costiveness, scanty urine, and, as time passes, a yellow or a white discharge from the nose. Law says: Auscultation detects a very fine crackling (crepitation) over the affected part of the lung, or there may be an area of no sound encircled by a line of crepitation and beyond that by the normal murmur, slightly increased. Or over the dull spot the blowing sounds from the larger tubes or the beating of the heart may be detected. Percussion causes flinching or even groaning when the affected part is reached; the space where sound was wanting in auscultation sounds dull and solid and the remainder of the chest retains its healthy resonance. There is no tenderness on merely pinching the spaces between the ribs.

Treatment advised by the above authority consists of giving pure, dry air in a place exposed to the sun; injections of warm water, and drinks of warm gruel; neutral salts (niter, acetate of potassa, bi-carbonate of soda) should be given with sedatives, as belladonna, henbane, tincture of aconite, digitalis or white hellebore; if there is much prostration, sweet spirits of niter or liquor of acetate of ammonia three or four times daily.

POX. Sheep-pox seldom if ever troubles American

Fig. 8.—MERINO SHEEP.

flocks, but has caused much loss in other lands. It is an eruptive contagious fever, *variola ovina*, resembling in general features the small-pox in man. In its virulent form the sheep refuses food, and avoids moving, the wool pulls out easily, irregular cracks appear in the skin, the head is swollen and a stinking discharge fills the nose, the eyes become closed, sometimes inflamed and run from their sockets. Treatment consists of inoculation with virus from an affected sheep, which should be placed in an excoriation of the tender skin of the inside of the ear.

RED WATER. Exposure to wet and cold storms, confinement to cold, wet ground, and chilling, sometimes cause red water (*hæmaturia*), a disease marked by a red, a pink or a dark color of the urine.

Symptoms are dullness, continued scouring or diarrhœa, sometimes with passages of bloody matter; pink, red or dark urine; difficult breathing, and, later, palsy of the hind-quarters. In ewes the flow of milk is stopped.

Remedies. Careful nursing, protection from all chilling causes, and nourishing food. Hot mustard water should be very freely applied to the loins and belly which should be wrapped with heavy blankets to retain the heat. Give oil of turpentine ½ ounce, linseed oil 1½ ounces.

RHEUMATISM IN LAMBS. Injudicious management of ewes during gestation, feeding unsound or improper food, tends to vitiate the blood of the lamb, and thus produce acute rheumatism, or "palsy," as it is frequently called. Experience has shown that if the ewe be fed largely on clover hay, potatoes, grain and drinks of groats during the last months of pregnancy the lambs are likely to suffer from paralysis soon after birth. Moldy food, rotten carrots, potatoes, and stagnant, putrid water are potent causes of this disease, as also exposure to wet, chilling weather and a diseased condition of the ewe which may be suckling the lamb.

Remedies. A nourishing diet of sound food for the ewe and good shelter for both ewe and lamb. The latter should have a wine-glassful of sulphate of magnesia 2 ounces, powdered caraway or ground ginger ¼ ounce, mixed with half a pint of thin gruel and given warm.

The following is recommended as a certain remedy for mild cases: sulphuretted antimony, powdered, 5 parts, fresh butter, 1 part, mixed. Give a piece of the size of a hazelnut three times a day. A liniment of oil and laudanum or a soap liniment, with hot fomentation, may be used locally to relieve the pain.

SCAB. Scab is caused by a minute insect (*scabies ovis*), which, finding lodgment upon the wool, seeks its way to the skin and burrows under the cuticle. Here the female deposits her eggs, and in a short time myriads of young are hatched, in their turn to burrow in the skin, breed, and extend the destructive work. Pustules appear from which yellow pus exudes, and a yellow scab is formed which adheres firmly to the wool. The intolerable itching caused by the burrowing insects leads the sheep to rub itself vigorously against posts, fences, trees or other objects, and to scratch itself with teeth and hoofs. The wool, torn from its place and infested with the parasites, drops to the ground or clings to the things against which the animal has rubbed, thus spreading the germs of disease. A single female insect may quickly colonize a large flock; and as the parasites are so tenacious of life that, it is said, they have lived in pastures unoccupied by sheep for three years, the necessity for the enforcement of the stringent measures for preventing the spreading of scab is apparent. Figures show the upper and under side of the female mite, greatly magnified.

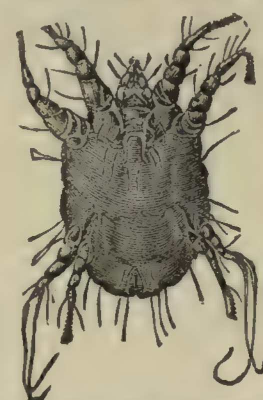


FIG 11.—*Under Side Female Mite.*

Symptoms. To relieve the irritation the sheep rubs itself against any fixed objects, scratches with hoofs, horns and teeth those parts it can reach, and the wool falls out in places, leaving the skin bare in spots, sometimes uncovering a large part of the body. Made restless by its suffering, the sheep is unable to eat enough to keep it in thrifty condition, and finally dies of exhaustion. Nothing but the extermination of every female insect in the flock can permanently relieve the animals from their suffering and restore them to comfort and health.

Remedies. While remedies are many and most of them are effective, that most used in the Western States and in Australia is composed of tobacco leaves 1 pound, sulphur 1 pound, water 5 gallons. The tobacco is boiled in the water and the sulphur added afterward. Stems from tobacco leaves may be got from tobacconists for a small price, and are preferred by many for that reason. They have less strength than have the leaves.

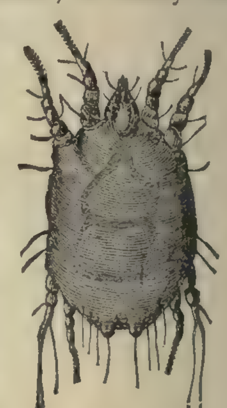


FIG. 12.—*Upper Side of Female Mite.*

Crude carbolic acid has been used in dips with good effect; a liquor composed of one part of acid to one hundred parts of water has killed the parasites in two minutes; one part of acid in fifty parts of water has killed them in from forty to ninety seconds. Care should be taken to keep the acid from the eyes, and not to allow the dark, tarry carbolic acid to rest upon the surface of the dip in the form of a skum, as the first sheep immersed in the tank may be injured by the contact of the powferful acid with their skins.

A dip which is received with much favor in England is composed of arsenic 3 pounds, pearl-ash 3

pounds, sulphur 3 pounds, soft soap 3 pounds, mixed with one hundred gallons of cold water. The sheep is kept in one minute in this dip, the head being carefully kept from entering the mixture. When the fleece has dried, after dipping, the head must be thoroughly rubbed between the ears, on the forehead and the face under the jaws and along the neck with an ointment prepared as follows: mercurial ointment 1 pound, lard 6 pounds, rosin 1 pound, oil of turpentine ½ pint; heat the lard and mercurial ointment gently and stir together; when cold add the rosin, previously dissolved in the turpentine, and mix all together thoroughly.

The use of the above is not approved in the United States because of its poisonous nature. The most highly recommended if not the most generally used dip is composed of tobacco 6 pounds, oil of tar 3 pints, soda-ash 20 pounds, soft soap 4 pounds, water 50 gallons. Boil the tobacco and dissolve the other agents in boiling water; add water enough to make 50 gallons of all. This will be enough for fifty sheep. The dip should be kept at a temperature of about 75 degrees Fahrenheit.

FIG. 13.—*A Severe Case of Scab.*

TAPEWORM. Sometimes sheep are infested with tapeworm (*Tœnia expansa*), or folded tapeworm (*Tœnia plicata*). The symptoms usually are voracity, alternating with refusal of food, loss of flesh, a disposition to eat earth, ashes, etc., evidence of internal pain, and the voiding of soft dung mixed with mucus which adheres to the after parts. Linseed oil 2 ounces and spirits of turpentine ½ to 1 ounce is advised as a remedy to be given twice a week for two weeks; or give of the powdered root of male fern 3 ounces; repeat in one week. Give linseed oil 2 ounces six hours after giving male fern.

TICKS. The red sheep-louse (*Trichodectes ovis*) has a pale yellow body, on which are dark bands. It frequents the tender skin inside the thighs and on the sides of the neck. Carbolic acid and lard should be rubbed into the skin on the parts infested. Kerosene oil rubbed into the wool has been tried with success. Sheep dipped regularly are seldom troubled by this parasite. Soon after shearing ewes their lambs should be dipped, if ticks have been on the ewes, as the insects will leave the latter to find more shelter in the wool of the lamb.

Sheepberry, a species of black haw, which is a sweet, edible fruit. It prevails mostly in the Northern States, where it is generally called "black haw;" but the true black haw has more obtuse-pointed leaves and flourishes more toward the South. These species belong to the same order with arrow-wood, snowball, elder, snowberry and the honeysuckles.

Sheep Dipping, the process of immersing sheep in a prepared solution to free them from vermin and as a means of curing the scab. See page 1133.

Sheep Shearing. This is the yearly removal of the fleece of sheep with a pair of shears. The operation should be performed as soon as the old fleece is sufficiently raised from the skin by the growth of the young wool. The best time, in most cases, when the weather proves fine, is generally the early part of June; for when the operation is postponed until the latter part of that month, or especially till July, the carcass of any of the sheep which may be destined to the shambles before the close of the summer, is seriously impaired, and the bodies of all the rest have not a sufficient defense against the mischievous and even destructive attacks of flies in the hottest time of the year. Eight days or so before the shearing, the sheep should be washed, and from that time until the day of shearing they must be kept in a clean grass field where they can not soil their wool under banks of earth. See Fleece and Wool.

Shepherd, a person who has the care and management of a flock of sheep. A shepherd in Eastern countries and in patriarchal times is a character of intense interest, and forms the subject of many of the most glorious and sublime allusions in the best of books. See Sheep.

Shetland Ponies: see page 699

Shingles, To Measure. White-pine sawed, shaved and star shingles average 16 inches long and 4 inches wide. A square of 100 feet will require 1,000 laid 4½ inches to the weather, allowing for waste. Cedar shingles are 30 inches long by 7 inches wide, and of these 248, laid 8 inches to the weather, will be required to the square; 9 inches to the weather, 220 will be required.

"Shingles," an eruptive disease which spreads around the body in the form of a girdle. It is a kind of tetter. Often fever accompanies and considerable acute pain. It continues for a week or two. Patient should keep his bed, apply lime-water and oil externally and take anodynes internally. When there is fever, eat but little.

Shirt. It is an exceedingly difficult matter to have always a well-fitting shirt. One is therefore justified in taking special pains to secure a good adjustment, especially of the neck-band, the wrist-bands and of the length of the sleeves. A very little oversight in these respects often causes an infinite amount of annoyance to the wearer. More especial pains are required in these days of factory-made linen and paper collars and neck-ties, in order to have these set neatly and permanently.

The custom of field-hands and other laborers wearing colored shirts is not healthful. Their drawing the heat of the sun in hot weather, their "hiding the dirt" so as to enable the laborer to wear them longer, and the dye-stuff in them, constitute three important objections to their use.

Enamel for Shirt Bosoms. Melt together with a gentle heat 1 ounce of white wax and 2 ounces of spermaceti; prepare in the usual way a sufficient quantity of starch for a dozen bosoms, and put into it a piece of this enamel of the size of a hazel-nut, and in this proportion for a larger number. See Starch.

Shock, a small stack of grain, as it is put up in the field immediately after cutting, in order to protect it temporarily against the rain until it can be hauled to the mow, or built in larger and more permanent stacks. Often called "stook" in the older States.

Shock Dog, or **Shock,** a dog having long, shaggy hair.

Shoes: see Boots.

Shoeing Horse: see page 733.

Shoot, or **Shute,** in farming, a passage way down which grain, hay or straw is slid; also, the passage way through which live stock is driven on or off cars or weighing scales.

Short, in cookery, crisp, brittle; in commerce, engaging to deliver what is not possessed, as "short contracts." The "shorts" are those who have not the stocks they contract to deliver. The term "shorts" also denotes the coarser part of flour, namely that which is sifted out next to the bran.

Short-Cake: see page 173.

Short-Hand, Phonography and **Stenography.** These are practically three names for the same thing. As almost every farmer's boy has a desire at some period of his youth to learn the art of short-hand, so that he can write down a discourse as fast as it is delivered, and many of them actually commence the study of the art, we feel compelled here to state the facts concerning the nature of the business, and in such a way as to answer the questions which are almost universally asked about this matter.

Nearly all the short-hand in the world is "phonetic," and in the English language it is all based upon Pitman's system, called "phonography." "Stenography" is a general name for all systems of short-hand writing, whether phonetic or not. By "phonetic" is meant the principle of having a distinct character for every sound, and but one sound for each character. For short-hand writing these characters are of course as simple as possible, consisting of simple dashes and dots, in various positions, light and heavy. The 37 elementary sounds in our language are accordingly represented by a dash or a dot. These simple marks constitute the alphabet of short-hand; and by rules of abbreviation afterward learned, the words formed by the joining of these characters are still further abbreviated until a practical hand can write them as fast as words are usually spoken. The so-called "systems" of short-hand are only different modifications of Pitman's phonography, so that one who is versed in any one "system" can, with a few minutes' study of the peculiarities, read any of the others. The four most prevalent "systems" in this country are Pitman's, Graham's, Munson's and Lindsley's. Scores of others have been offered to the public, many of them indeed as good as the above mentioned, if not better, but for want of means their authors have not been able to push them into notoriety.

While every short-hand alphabet and the first principles of writing are so simple, philosophical, symmetrical and even beautiful as to tempt many to commence their study, not more than one in a thousand has the perseverance to master all the intricacies of the art so as to become a successful verbatim reporter. A smart boy or man can commit to memory all the principles in a few days, but at the end of this time he will write very slowly and imperfectly. On an average it takes about two years' practice, devoting two or three hours a day to the exercise, to become able to take down a speech as fast as it is uttered. It is like learning to play on a violin or a piano: the principles are few, but the practice is much. Theoretically, one might memorize all the principles of piano playing in a few minutes, but he would have to practice for years before he could successfully entertain the public with his performances. So it is with short-hand. Now and then is seen an advertisement in a newspaper of some "system of short-hand that one can learn in half a dozen lessons, and be able with it to report a speech in three months,"—if you will "only forward the small sum of

25 cents!" or other words to this effect. These are all catch-penny humbugs.

We therefore do not advise any one to commence the study of this art with the hope of making himself a verbatim reporter, unless he has a special aptitude for phonetic writing as well as a determination to follow the business for a livelihood. If one has a fancy for playing with this fascinating art, of course no harm can come from it. There is a degree of mental discipline in its study. It gives clear views of and good practice in phonics and pronunciation.

The course of study should be divided into 15 or 20 lessons, and the lessons should be taken at least a week apart, with many hours' practice between. The student should not look ahead of his lessons to see what is coming or pick up fragments of principles, as such practice tends to confuse and retard him. This is the most common reason why a student with a book and without a teacher fails to succeed. Also, with a book only, the task is apt to grow monotonous and be gradually dropped—apparently from the want of time. The more familiar one becomes with the ground he has gone over before taking new ground, the better. At first there is great enthusiasm—generally too great. The student is dwelling upon it in his mind all day and nearly all night; he can hardly sleep on account of it. The regular course will take the learner to what is called the "corresponding" or "easy reporting" style; after that the advances and improvements he will make cannot well be divided into lessons, as he has to catch them up one at a time in the progress of his practice. For this purpose, books are only aids, not complete guides.

The average rate of delivery of a public extemporaneous discourse is about 110 to 115 words a minute, commencing deliberately with 70 to 80 per minute, and increasing with the growing warmth of the effort to 125 to 140. If the discourse is read from manuscript, the reader keeps up a uniform rate from beginning to end, about one-half faster than he would speak extemporaneously. In reading, a person pronounces more words to the minute than he appears, as his enunciation is so constant. On this account many wrong estimates are made of the comparative rate of different public speakers. One snaps out his words quickly, with frequent short pauses, which are not noticed by the hearers, and pronounces, say only 100 words to the minute, while another speaker, who seems slow and deliberate, yet by a steady stream he utters 140 words to the minute. In this regard appearances are very deceiving.

Now, a learner of short-hand, everything being favorable, will at the end of two years write about 100 words a minute, so that he can read them at any future time; at the end of three years he can write 125, after another year 135 or 140, and so on in diminishing ratio, until he reaches the rate of 160 or 170 per minute, the rate of tolerably rapid speakers, but not of the most rapid. Ordinary conversations cannot well be reported word for word, on account of rapid enunciation, interruption, fragmentary sentences and both talking at once. Many short-hand reporters give the figures much larger than we have given above, boasting that they have written 200, 250 or 300 to the minute, or that they held a watch while they saw some one else do it. But short races, on selected sentences, resulting in illegible writing, etc., yield no profitable instruction to the public.

Short-horn, a most popular breed of cattle. See page 205.

Shoulder. A horse is said to "shoulder" when he attempts to crush the leg of the rider against a wall or fence.

Shovel, a hand implement of the spade kind, used for collecting and lifting. It differs from a true spade in having a broader and thinner blade, and in not being used for cutting and digging. Several varieties of it are used on the farm, for widely different purposes, and differing from one another in the size, form, and material of the blade, and sometimes has a blade of wood, edged with iron.

Shrew (*Sorex*), a genus of small carnivorous animals, somewhat allied to the moles. They live in holes which they dig in the earth, and seldom leave them until the evening, and they feed on insects and worms. They are covered with hair, and have on each flank a small band of stiff, thickly set spines, and discharge from that part of the body, during the rutting season, an odorous humor. The shrew mouse, or common shrew, is gray above, and ash-colored below, and has white teeth, exposed ears and square tail. It is found in fields, meadows and similar situations. It has been accused, but falsely, of producing a disease in horses by its bite. Cats kill it, but will not eat it. Some varieties of the shrew are the smallest quadrupeds known. They are about two inches long to the tail, which is about one and a half inchs long. They are found all over the world, and over 20 species belong to North America.

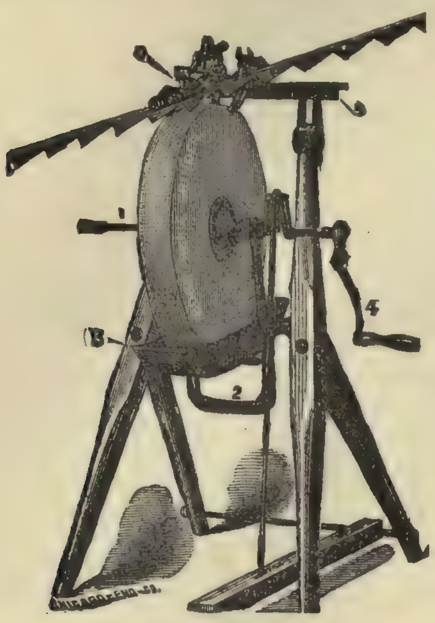
Shrub, a woody plant inclining to send up a number of stems, which do not grow to the height of trees. "Shrubbery" denotes a number or collection of shrubs, referred to in a general or indefinite manner.

Shying of Horse: see page 711.

Sickle, a curved blade or knife, set in a handle, and used for cutting grain and grass. A number of stalks are grasped by the left hand, while the right hand cuts them off with a sickle, by first thrusting the instrument around the bunch of stalks and then bringing it toward one's self. This method of reaping was almost the universal mode up to the close of the last century—a very tedious process as compared even with the cradle. Sickles are sometimes used at the present day, in trimming small lawns about the door yard.

The term "sickle," as well as that of "knife," since the invention of reaping machines, is also used to denote the compound saw-toothed cutting blade of such machine.

Many devices for sharpening and grinding sickles have been invented, but the one represented by the



Sickle Grinder.

accompanying engraving illustrates one of the best. It is known as the "Improved Boss" sickle-grinder.

Sickness: see Doctoring, Medicine, and the various diseases.

Side-board, a piece of furniture or cabinet work with compartments, or a series of shelves placed on one side in a dining-room, to hold dishes. Very costly and ornamental side-boards are sometimes found in the homes of the wealthy.

Sight, vision: see Eye. Also, a small point of metal or aperture on a gun or a surveyor's compass, to guide the eye.

Silent Partner, one who invests his capital in a business house, but whose name does not appear in the firm. His liability is limited to the extent of his share of the capital, except in cases where he fails to make the proper publication of his connection with the concern.

Silk, according to the ancients, was first brought from Serica, or Serinda (China), whence the silk-worm was introduced into other countries, but not until the reign of Justinian, when two Persian monks succeeded in secretly conveying a number of eggs to Constantinople in a hollow cane. From these eggs Europe and America have been supplied with their race of worms. The time of the origin of the silk manufacture is uncertain, but the Chinese ascribe the invention to the empress Si-ling-shi, wife of Hoang-ti, about 2,700 years before the Christian era. However this may be, the raw material had been exported from China long before the insect which produced it and had given employment to extensive manufactories in Persia, Tyre, etc. Considerable interest has been paid to the culture of the silk-worm in the United States, but the only two States where the industry is profitably carried on at present is in Kansas and California.

To Remove Resin Spots from Silk. Stains by wax, resin, turpentine, pitch and substances of a resinous nature, may be removed by pure alcohol. Applied to stains with a clean sponge it will remove the spots, because alcohol dissolves the resin. The silk stains should be moistened with the alcohol first, and allowed to remain soaked for a few minutes. Fresh alcohol is then applied with the sponge, and with a slight rubbing motion. It is then wiped as dry as possible and afterward allowed to dry perfectly in the open air.

To Remove Grease from Silk or Velvet. Rub the spots on the silk lightly and rapidly with a clean soft cotton rag dipped in chloroform, and the grease will immediately disappear without injuring the color of the silk. Repeat the operation if necessary. Be careful to rub the article rapidly and lightly, then finish with a clean, dry cloth. If these precautions are not taken, a slight stain is apt to be the result. Very highly rectified benzine, such as is prepared by the first-class druggists, will also immediately remove grease from the most delicate colored silks.

Fluid for Removing Grease Stains from Silk, etc. A fluid for removing greasy stains from silk, etc., may be prepared by mixing 2 ounces rectified spirits of turpentine, ¼ ounce absolute alcohol, and ¼ ounce sulphuric ether.

To Restore the Color of an Acid Stain on Violet Silk. Acid dropped on violet-colored silk destroys the color; to restore it, brush the discolored silk with tincture iodine; then, after a few seconds, saturate the spot well with a solution of hyposulphite of soda, and dry gradually; the color will be perfectly restored.

To Extract Stains from White Cotton Goods and Colored Silks. Salts of ammonia, mixed with lime, will take out the stains of wine from silk. Spirits of turpentine, alcohol and clear ammonia, are all good to remove stains on colored silks. Spots of common or durable ink can be removed by saturating them with lemon-juice, and rubbing on salt, then putting them where the sun will shine on them hot for several hours. As fast as it dries, put on more lemon-juice and salt. When lemon-juice cannot be obtained, citric acid is a good substitute. Iron-mold may be removed in the same way. Mildew and most other stains can be removed by rubbing on soft soap and salt, and placing it where the sun will shine on it hot.

To Clean Silk Cord. White silk cord and tassels can be cleaned if not stained, in dry corn meal. Rub the meal over them with your hands, and renew with clean corn meal till they are thoroughly cleansed.

To Wash Silk, see page 909.

Silo, a repository for preserving green fodder in its juicy state, to be fed out during the following winter and spring. See Ensilage.

Silver, a metal which appears to have been known almost as early as gold, and, without doubt, for the same reason, because it occurs very frequently in a state of purity in the earth, and requires but an ordinary heat for its fusion. Mention is made of silver in the book of Job, which is considered the oldest of the books contained in the Old Testament. Pure silver is of a fine white color, with a shade of yellow, without either taste or smell, and, in brilliancy, is inferior to none of the metallic bodies, if we except polished steel. It is softer than copper but harder than gold. When melted, its specific gravity is 10.47; when hammered, 10.51. It is next in malleability to gold, having been beaten out into leaves only 1-100,000th of an inch in thickness. Its ductility is no less remarkable. It may be drawn out into a wire much finer than a human hair,—so fine, indeed, that a single grain of silver may be extended about 400 feet in length. Its tenacity is such that a wire of silver 0.078 of an inch in diameter is capable of supporting a weight of 187.13 pounds avordupois without breaking.

The processes for silvering are too complicated for home work. We give here the best directions for cleaning silver, etc.

To Test Silver and Gold. Slightly wet the metal and rub gently with lunar caustic. If the metal be genuine the spot will scarcely change color; otherwise it will become quite black.

To Protect Silver-Ware from Tarnishing. Coat it with collodion. First warm the silver, and then with a brush carefully put on the collodion diluted in alcohol. Such a coating will effectually guard silver from tarnishing by the sulphurous atmosphere which is so certain to be present when coal is burned.

To Preserve the Polish on Silver. Wash it twice a week (if in daily use) with soft soap and hot water, and polish with Canton flannel.

To Clean Silver. With a nail-brush or tooth-brush wash it in a mixture of 2 teaspoonfuls of ammonia with a quart of hot soapsuds. Or boil 1 ounce finely powdered and calcined hartshorn in 1 quart of water, and while on the fire put in the articles, as many as the vessels will hold; in a few minutes take them out and dry them over a fire. When the work is done, if you saturate some clean woolen rags in this solution and dry them, you will have something excellent for polishing the silver, as well as for cleaning brass door-knobs. A good cleaning powder is made as follows: Mix ¼ pound jeweler's rouge with ¾ pound prepared chalk; or, ¼ pound levigated putty powder, ½ pound burnt hartshorn, 1 pound prepared chalk and 1 ounce rose-pink.

To Remove Ink Stains from Silver. Rub them with a paste made with chloride of lime and water.

To Clean Silver and Other Coins. Bath them 2 or 3 seconds, *not more*, in a weak solution of cyanide of potassium, a deadly poison to be obtained at any drug store; then immediately wash them with a very fine brush in soap-suds; rinse in clean cold water and dry in box-wood saw-dust, to be had at jewelers'.

German Silver, which consists of ½ copper and ¼ each of zinc and nickel, is cleaned and polished as genuine silver.

Silver Nitrate, or Lunar Caustic. See page 949.

Single-Tree, a single whiffle-tree, or the cross bar to which the traces are attached.

Sinus (si'nus), a cavity in a bone or other part, wider at the bottom than at the entrance; also, a venous canal into which several vessels empty themselves.

Sirloin, the loin of beef, or a piece of beef covering both kidneys. King James I., who loved good eating, being invited to dinner by one of his noblemen, and seeing a large loin of beef at his table, drew out his sword and in a frolick knighted it Sir-loin, since which time it has ever been thus known. For cut of sirloin see article Meat, page 963.

Sirup (sir'up), or **Syrup**, the sweet juice of vegetables or fruits, or sugar boiled with vegetable infusions; also, sweetened liquid of any kind. To make cane sirup see pages 181–3, and maple sirup, see article Sugar.

Sit-fast or **Warbles**: see page 805.

Sitz-Bath, a tub for bathing in sitting posture; also, the act of bathing the portion of the body thus immersed. This is one of the most important and general of all hydropathic processes, as it is beneficial in almost all diseases. Its action, according as to whether it is hot, warm, tepid, cool or cold, short or prolonged, etc., is to relieve congestion, relieve pain, invigorate (act as a tonic), regulate the bowels and urinary processes, etc., etc. The duration of the sitz-bath (or "hip-bath," or "sitting-bath," as it is often called) is generally short,—from five to fifteen minutes, and the temperature is regulated by the nature of the case and the sensations of the patient. Probably it ought never to be administered by any one not educated at a "hygienic institute," else a chance will be risked of doing more harm by it than good, as indeed with all hydropathic processes. Some persons, however, have a sufficient degree of natural medical instinct, without special education, to work into these appliances without taking leaps in the dark.

Skin, the natural covering of the body of animals. It defines the form of the body, protects it from injury, modifies the action of the surrounding elements, indicates sensation from without to the interior parts, and comprises an inconceivable minute and complex texture of organisms for the offices of touch, of exudation, of absorption, and of many of the parts or concomitants or dependences of the highest functions of animal life. Volumes might be written to describe the wonders of the skin.

Skunk, an American quadruped of the weasel family, most noted for the excessively repulsive odorous fluid which it discharges upon an enemy attacking it. By sight it is most readily distinguished at a little distance by the white stripe along its back. It is about the size of a cat, but its legs are short, as those of weasels generally are, and it waddles along somewhat like a fat pig. It commits extensive depredations upon the poultry yard, killing the birds, sucking the blood, and devouring both eggs and young fowl. Skunks may be caught with the steel-trap and the fall. Some dogs are good at giving the alarm when finding them, when a person can approach with a gun and kill them. One can go up and kill them with a club or pole, but will be almost sure to be sprayed with the fetid liquid. Garments thus damaged can be buried in the earth a week or two, and in that way may be thoroughly deodorized; or, above ground, in much less time, by frequently renewing the application of clay, or by a frequent sprinkling of dilute carbolic acid for a week. A half-bushel of unslaked lime scattered about in a cellar will, in a few days, drive away (or absorb, rather) all the odor which a skunk may have left in it. The skins of these animals bear a good price in the market. The pole-cat of Europe is of the same "family," but of a different genus.

Skunk Cabbage, a coarse, fetid plant, abundant in many cold, swampy places throughout the North, and formerly in some repute as an antispasmodic, in doses of 10 to 20 grains of the pulverized root. By age the dried root loses its virtue. One may distinguish it in early spring by the mass of pulp, about the size of a small walnut, and covered with small and indistinct flowers, appearing above the mud before the leaves unfold, and later in the season by the plant's having larger leaves than any other, as large as cabbage or rhubarb leaves. The whole plant is characterized by the same peculiar skunk-like odor that abounds in the root.

Slab, the outside plank of a log of timber when sawn into boards; also a flat, thin piece of marble, or of other compact stone.

Slate, a dark-colored stone, easily split into thin plates, used for covering houses, making tablets for writing upon, etc. Many of our most substantial farm houses are covered with slate, and it is found to be a good and durable roof.

Slaughtering and Dressing. It is not expected that farmers can carry out the same details in this work as are practiced at the large slaughter-houses in cities, where they have steam machinery. We give here only such hints as are practicable in the country.

All animals should be killed when they are in the coolest state, or when respiration is the least active. The flesh will then keep much longer fresh, and be more beautiful, sweet, and healthful. But when killed in a heated condition, or immediately after a hard drive, the flesh will take longer to cool through, spoil sooner, and the flesh and fat will have a feverish, dark look, caused by its being full of blood, and of course it will not be so inviting to the eye or so digestible as when better killed.

BEEVES. To kill the animal, shoot him with a rifle, sending the ball into the middle of the forehead, a little above a line with the eyes; or, in the absence of the rifle, strike him at the spot with a powerful blow of an ax or sledge-hammer; or with a strong, sharp-pointed instrument, reach the same point in the brain by striking in just behind a line connecting the bases of the horns. This last process is known among butchers as "pithing," because by it you cut the pith, or marrow, of the animal, and thus cause instant death. First blindfold the beef, so he will not dodge the blow.

As soon as the beef falls, cut his throat with a sharp, long-bladed butcher-knife, making the gash square across, and deep enough to reach the spinal column. This is for the purpose of thorough bleeding.

When the bleeding ceases, cut the skin from the throat along the center of the brisket and belly, into a line between the center of the thighs to the tail. Divide the skin of the legs in the same manner on the inside, the cuts running down into the former cut. Cut off the fore-legs at the knees, and the hind feet about three inches below the hock-joints. Remove the skin from the upper side of the animal to the back-bone; turn him over and skin the other side. The entrails may be partly removed while lying, or the carcass may be first strung up by the hind legs (page 963). Some butchers swing the animal before skinning, first removing the skin from the hind legs, and finishing on the hooks.

A good way to swing the carcass is to fix up a horizontal pole eight or nine feet high, then place a heavy gambrel under the large tendons above the hock-joints, similar to those used for hogs, and applied in the same manner. The gambrel is placed over the hooks, or may be attached to the cross-nail by strong cords. The rack is then raised by drawing forward the hind legs or uprights, until the carcass swings from the ground. The entrails may then be removed. It will be found to be easier to skin the animal in this position than when lying on the ground. The brisket and belly should be opened in the center to remove the entrails. The carcass is then washed, after cooling divided into halves, by splitting the back-bone, and kept hanging from 12 to 24 hours, that all animal heat may entirely escape. Then the sides may be cut into quarters, by cutting square across, about midway between the fore and hind legs. Finally, if for curing, cut the quarters in the usual manner, as indicated on page 963.

For cutting meats, every farmer should have a fine-toothed saw, as all bones should be sawed, and not splintered by an ax or cleaver.

Beef is the staple animal food of this country, and it is used in various states—fresh, salted, smoked, dried, etc. When intended to be eaten fresh, the ribs will keep the best, and with care will keep five or six days in summer, and ten days in winter, even without

freezing. The middle of the loin is the next best, and the rump the next. The round will not keep long unless it is salted. The brisket is the worst, and will not keep more than three days in summer.

HOGS. Shoot the hog or stun him with an ax or large hammer. Turn him square on the back and stick him, care being taken that the knife does not penetrate either shoulder. As soon as bleeding ceases, dip in the scalding vat. Most farmers use a large barrel or hogshead for scalding. These, however, are very inconvenient, and anyone who has ever used a vat prepared for the purpose, would never use a barrel again. The vat or trough can readily be made of two-inch plank by any farmer. A trough six feet long, thirty inches wide, and two feet deep, is a convenient size. One end should be sloping so that the carcass of the hog may be easily thrust in and pulled out of the water. A wide platform on a level with the top of the trough should be constructed at the sloping end of the trough. The trough should be nearly filled with boiling water, and the hog immersed in it, being turned over several times. When the hair "slips," or is readily removed from the ankles, draw the carcass out on the platform, and scrape. This is done with blunt knives, hoes or sticks. The hind-legs are then split at the hock joint and a gambrel inserted under the main cords, with which to hang the hog. In removing the entrails care should be taken not to cut into any of them. The rack, or frame, above described may be used as well in hanging hogs. The carcass should be thoroughly washed and left hanging until perfectly cool. After the hog is slaughtered and dressed it should hang in a dry place, where the air can circulate freely, for twenty-four hours before cutting, so that all animal heat may escape and the meat become firm.

SHEEP. These are slaughtered and dressed in a manner similar to that for beeves. Additional care is required to avoid touching the cut flesh with the hands after they have been in contact with the wool or outside surface of the skin, as that would taint the meat with a rank odor.

POULTRY. See page 1065.

Sleep: see page 833.

Sleigh (sla), a vehicle on sliding "runners," instead of wheels. A small, one-horse sleigh, for carrying two persons, and corresponding to a buggy, is called a "cutter;" if rudely made, a "pung." A large sleigh, of one pair of runners, and employed as a wagon, is a "sleigh" or "sled;" if of two pairs of short runners, corresponding to the four wheels of a wagon, it is a pair of "bob-sleds." The latter, although more costly, is more substantial and convenient, as it can be turned about in deep snow or in rough places with comparative ease and without wrenching the tongue or fretting the team. For logging, it is a good plan to have the "bobs" connected by chains, and the tongue attached by two clevises so as to form a universal joint. By this arrangement the bobs can go "bobbing" up and down more freely according to the unevenness

of the road, and thus not be overstrained when a heavy log is upon them.

Slough (pronounced by Webster slou, but popularly in the West called sloo), a deep miry place; a hole full of mud. Pronounced sluff, it is the skin, particularly the cast skin of a serpent; the part that separates from a foul sore.

Slink: the young of a beast born before its time.

Small-pox (*variola*). Small-pox, like the measles, is an eruptive fever, propagated by contagious matter, running a definite course, and as a general rule,—to which, indeed, the exceptions are extremely rare,—affecting persons but once in the course of life. Its origin is lost in antiquity, and the common opinion is, that in these days it never arises except by contagion.

Symptoms. In from seven to twenty days after the exposure, the patient experiences a sense of languor, weariness, aching pains in the back and lower extremities, slight creeping chills, with flushes of heat, and pain in the forehead, when more or less nausea and vomiting, thirst, tenderness of the stomach, and soreness of the fauces rapidly supervene. The eruption now makes its appearance, first on the face, neck, and breast, then, on the following day, it is seen on the other parts of the body. On the first and second days of the eruption, being about the fourth or fifth of the fever, the inflamed points are papular, small, globular, red, painful, separate and distinct from each other, the interstices being of the natural color and appearance. On the third, fourth, and fifth days, they become vesicular, containing a little yellowish fluid, and the interstices become red.

About the eighth day, the eruption is perfectly pustular. On the ninth and tenth, the pustules become orbicular, and are filled; finally, on the eleventh, twelfth, and thirteenth, the pustules break or burst, and scabs are formed.

The diagnosis of small-pox, after the eruption appears, is not difficult; and before this, it matters not, as the treatment does not vary from that of the same symptoms in other affections.

When the fever is mild, and the strength of the patient keeps up, and if, moreover, the color of the eruption keeps of a bright red, there is not much danger. But if the fever runs very high, and there is much delirium, the danger is considerable. When there is a disposition of a typhus character, and the pustules turn dark or black, and the strength fails suddenly, the case is almost certain to terminate in death.

Prevention. Vaccination seems to be an effectual prophylactic against the small-pox, provided that the vaccine matter be genuine, and produces its constitutional impression on the subject. See Vaccination.

VARIOLOID—MODIFIED SMALL-POX. This disease has many of the symptoms common to the genuine small-pox, but they are invariably more mild. Varioloid usually occurs but once during life.

The following particulars may be regarded as among its most prominent characteristics:

1. The eruption appears in clusters, occurring usually from the second to the fifth day.

2. Unlike the genuine small-pox, the eruption seldom or never enters into complete suppuration.

3. Excepting in very violent cases, the eruption is seldom attended with much fever, and the desiccation or scabbing invariably occurs much earlier than in real small-pox, and instead of inclining to leave pits or depressions, the scabs leave rather an elevated disk or tubercle of a red appearance.

Treatment. When the fever runs high and the skin is dry and husky (a condition unfavorable to the natural development of the eruption), the body should be sponged with cold water, while the other usual means applied in fevers are instituted. Lobelia, thoroughwort, saffron, Seneca snakeroot, and black cohosh, are all valuable here. Should it be needed, the lobelia may be pushed to the extent of emesis. It is always comfortable in fevers to have the air rather cool and the skin moist, and this seems especially favorable in small-pox. The patient's room should not only be kept cool, but well ventilated, and his surface should be daily sponged with tepid or cool alkaline washes, or lime-water. The skin should be kept relaxed, and the determining powers to the surface.

In confluent small-pox, when the patient inclines to a typhus condition, stimulants and tonics must be freely used, such as capsicum, ginger, compound tincture of myrrh, brandy, wine, columbo, gentian and poplar bark.

About the time that the pustules are filling, the circulation should be well sustained with light, nourishing food and stimulating medicine, thus to prevent the pitting or pock-mark; and with a view to this, the patient should be well guarded against picking and scratching the pustules, which all have a disposition to do, owing to the intolerable itching that attends the drying up of the pustules. If the face be oiled, or covered with oiled silk so as to shield it from the air, it will serve to prevent the pitting.

The black cohosh has of late proved itself of great utility in small-pox, and should be constantly used throughout the treatment. Indeed, it is thought by some that this article is a complete preventive of the disease.

Another good remedy is the following: Sulphate of zinc 1 grain, foxglove (digitalis), 1 grain, ½ teaspoonful of sugar; mix with two tablespoonfuls of water; when thoroughly mixed add 4 ounces of water; take a teaspoonful every hour.

Smart-weed, or Water Pepper, is a very common weed, the leaves of which have an acrid or peppery taste. It is a stimulant, diaphoretic, diuretic, emmenagogue and antiseptic. In cold infusion, it is very valuable in dropsy, gravel and urinary diseases.

Smoke is considered a disinfectant, but its power to disinfect is very weak, its main virtue consisting simply in overpowering a weaker odor which is supposed to be morbific. The germs of disease cannot be killed by smoke, unless it is poisonous enough to kill any large animal. In preserving meats, it simply keeps away vermin until they can be cured. See **Bacon and Ham.**

Smoke-House, a small house where meats are smoked. Its plan and purpose are so simple that no special directions concerning it are necessary.

Smoking: see Tobacco.

Smut, a parasitic fungus growing upon grain. On corn it generally grows into a mass of considerable size,—enough to fill a pint cup or more. It propagates itself by spores (minute granules answering to seeds or cions), and these have great vitality, retaining their germinating power for several years. The species of smut in wheat called "bunt" fills the grain, while the latter retains its normal size and proportions. On pressing the grain, it bursts easily, exhibiting within a dark smutty mass instead of the natural farina. "Rusts" and "brands" are also parasitic fungi.

All these growths are of course unfit to go into food, either for man or beast. Some of them are poisonous, especially ergot. Corn smut has been systematically experimented with, and found to be not very poisonous, but sufficiently acrid to keep up a constant irritation of the alimentary canal as long as it is eaten.

To prevent smut in wheat, soak the seed in brine and then dust it with unslacked lime. The same process might prove beneficial with corn. Sowing the land with salt is also recommended. Vigorous growth is the best general preventive of all fungoid and parasitic diseases.

Snaffle, a bridle consisting of a slender bit-mouth without branches.

Snake. For remedies for snake-bites, see Bites, page 101. Most snakes are non-poisonous, and their bites (which indeed they seldom inflict) are as harmless as that of a toad. All water snakes in the North, for example, never bite any one, and if they did they would do no more harm than a deep brier scratch would do. In the extreme northern portion of the United States the rattlesnakes are the only venomous species; further South are the copperhead, water moccasin, viper, etc.

Snakeroot. A dozen or more wild medicinal plants in this country have been called "snakeroot." We have Seneca, Black, White, Button, Virginia, Canada, Heart, etc., snakeroots; and like nearly all other weeds, if you take small doses the effect is "alterative" and "tonic," little larger doses, "diaphoretic" and "diuretic," a little larger still, "purgative" and "laxative," and largest of all "emetic." It is pretty evident now that "milk sickness" in cattle is due to their eating "white snakeroot," or *Eupatorium ageratoides.*

Sneeze, to expel the air suddenly from the lungs, by an involuntary, explosive impulse, to carry off some foreign substance from the nose. Most of the air thus emitted, however, is of necessity passed out through the mouth. To prevent sneezing, as soon as you perceive the sensation coming, commence emitting the breath through the nose gently and steadily;

or, with the tips of your fingers press slightly against the region of the gums of the upper teeth in front, immediately below the partition of the nose; or rub the nose briskly.

Snipe, the name of several species of game birds, of widely different genera. The principal inland species is called Wilson's, American, Jack, etc.; but the woodcock also is a true snipe. Several species flourish along sea beaches. For an illustration of snipe-shooting, see cut facing page 626.

Snore, to breathe with a rough, heavy noise in sleep. It is generally caused by the person's sleeping on his back, with his mouth open, permitting the uvula, or soft palate, to fall down against the trachea and obstructing the respiration. Some persons, overburdened with fatty deposits, will snore in all recumbent positions, even with the mouth closed, when they are asleep. If an individual desires to sleep on his back and at the same time avoid snoring, he must have a bandage extending over the head and underneath the lower jaw, to prevent the latter from falling down.

Snuff, the charred portion of a lamp or candlewick; pulverized tobacco or other substance, to be taken into the nose. The scents generally used in the latter are tonka beans, and their oil or essence; ambergris, musk, civet, and their essences. "Cephalic" snuff consists of dried asarabacca leaves, 3 parts; marjoram, 1 part; lavender flowers, 1 part; these are rubbed together.

Soap, a compound resulting from the combination of an oil or a fat with an alkali or an alkaline earth. It was invented by the Gauls at a period prior to historical record, and has long been a common article of manufacture, in many ways, of many varieties and in many lands.

Hard soap owes its distinctive character to soda; soft soap, to potash; white soap, to comparatively pure tallow; yellow or brown soap, to a mixture of tallow and resin, and mottled soap, to the depression of lye throughout it in the last stage of its manufacture, or to the admixture of sulphate of iron, oxide of manganese and other coloring substances. The desirable properties and the detergent uses of all common soaps are so universally known as not to require any remark.

The principles of soap as a detergent substance are so fully laid down in the article Laundry that we need make no further observations upon that point in this connection.

The old-fashioned, pioneer method of making soap at home consisted in the simple process of draining water through wood ashes, boiling it down until it is strong enough to "bear up an egg," putting in all the old animal grease that could be found about the premises,—old, rancid, maggoty, with rinds, bones, etc., and then boiling this mess until it was "soap;" but, like everything else, as society advances, methods multiply and are refined, as human wants multiply.

In the preparation of lye, water which is perfectly clear and free from organic matters, and even free from that which makes it hard, should be used. Hard water for lye will make good soap, but it is at the expense of the alkali which has to be neutralized. At the present day the alkalies can be purchased very cheaply at groceries, and much soap is made from commercial potash and soda. Instead of the hen's egg, the good soap-maker, in order to prepare his lye for the different kinds of soap, will use a simple and cheap hydrometer, that of Baume being in common use.

Animal fats and oils are used for the cruder soaps, and vegetable oils for toilet and fancy soap. There are several methods of making almost any kind of soap, but we will endeavor to give the simplest and most practical.

Be careful to use soda and potash in which there are no foreign salts, as such inferior kinds prevent a good union with the fats, and good suds is not obtained. But when the soap has been separated from the lye by a salt, lyes containing salt may be used. The lye must be caustic, in all operations, else it will not decompose the fat, for transforming 100 pounds of fat into soap about 14 pounds of caustic soda are necessary; but generally more is employed, because the soda used in this country is never a pure hydrate. Some add in the beginning the whole amount of lye, and others add it gradually in small quantities. The last mode is preferable, for water retards saponification, as the resulting soap, being insoluble in the strong lye, forms a smeary mass, that surrounds the decomposed fat and impedes the action of the lye upon the fat. But when one-fourth of the lye is added in the beginning, it soon forms an emulsion with the fat, which in heating gradually becomes clearer, producing a transparent soap solution, with intermingled fat drops. From time to time in order to test it, a drop of the paste should be put on the tip of the tongue, when, if there still be free alkali in it, a burning sensation will be produced, in which case the boiling must be continued until a sweetish taste is experienced. More lye can then be added under constant stirring, until the entire quantity is consumed. At this stage the contents of the kettle are transformed into a homogeneous, clear liquid in which we can discover neither lye nor fat. If this liquid be perfectly clear, it shows that the right proportion of fat and lye has been applied. Should saponification progress too slowly, a weak lye of one to two degrees Beaume may be added, and even soap scraps will facilitate the process. By heating with an open fire that portion of the paste which thickens first will sometimes become attached to the bottom of the vessel and burned. This burning is indicated by a black smoke passing off here and there with a vapor. In such a case the fire should forthwith be reduced and a considerable quantity of the strongest lye be added to prevent further mischief. By these means a slight separation of the soap from the lye is occasioned, and the contact between the former and the metallic surface destroyed. In all cases, however, the operation

will be complete when, having taken out the stirring rod, the paste no longer drops from it but slides down in long threads. This appearance is called "spinning" of the soap.

The next operation is called "cutting up the pan," which is done by stirring into the mass soda lye containing salt, or a solution of salt or dry salt. Soap does not dissolve in brine or strong caustic lye. Of all soaps the cocoanut-oil soap is the most remarkable, for, being dissolved by a brine solution, it is peculiarly serviceable for washing in salt water; hence its name, "Marine Soap." This soap becomes so hard that, when separated from the glycerine, it cannot be cut with a knife, and consequently the salting operation should not be performed, but the soap boiled in strong lye with one water.

The following is a method by which the salting operation is performed: one person gradually adds the brine or dry salt while another agitates the paste with a stirring rod from below upward. This is done under gentle boiling. Be careful to add the salt in right proportion, namely, about one-sixth at the time. After half of it has been dropped in, the soap should be allowed to boil for about ten minutes before any more is put in. According to concentration 12 to 16 pounds of salt are necessary for 100 pounds of fat, in order to separate the formed soap from the surplus of water. The separation is perfect when the water runs off from the curdy mass, when a sample is taken up with the paddle while hot it is not sticky, and when it will harden into scales by rubbing some of it in the palm of the hand with the thumb nail. The process is done when the surface splits up into several patches separated from each other by deep furrows, in which the appearance is that of dry slabs, instead of froth. These slabs are arranged by the escaping vapor one above another. The fire should be extinguished when the soap, which was always covered with froth and bubbles, suddenly sinks, and the froth breaks up into roundish massive grains, distinctly separated from each other, and from the saline solution. The salting being completed, the mass should remain quiet for several hours, and then the under lye drawn off by a faucet.

The object of "clear boiling" is to obtain hardness, consistency and complete neutrality of the soap. Begin to boil the paste gently with tolerably strong lyes. Should the soap, during the intervals, become too liquid, which may happen if the lye has been too weak, add some handfuls of salt, or the soap boiled with a weak lye containing salt. If, after each addition of lye there should be, in taking up a portion with the paddle, some difficulty in running off the lye, water must be added, that a quicker union of the lye and the fat may take place. The process is ended when large, regular and dry scales appear on the surface, and when these give elastic, brilliant, white scales, and are easily pulverized by rubbing in hands. The soap should then be covered, left for some time, and eventually removed in the ladles. The spent lye does not have to be of an alkaline test.

Marbling results from the sulphurets of iron and sodium in the soda, but as some kinds of soda have not a sufficiency of these compounds, marbling can be induced by adding copperas, previously dissolved,—in quantity about four ounces of dry copperas to 100 pounds of fat. Mottled soap as thus prepared is the "Castile soap" of commerce. The streaks in the course of time assume a brownish color. To be successful with this process, be careful to run the soap into the frames as soon as it shows signs of being in that condition where the operator has been successful in his own experience: the process is a difficult one.

Hard soap is made by the use of soda, and soft by the use of potash, and "grained" soaps are those from which the under-lye has been drained, as before described, and "filled" soaps are those in which the whole contents of the vessel are kept together and sold as soap. Cocoanut-oil soap, an exception to the rule, is soluble in brine, and it is employed in the making of filled soaps; weak lyes produce light soap, and strong lyes heavy soap,—that of 25 to 30° B. heavier than water. Sometimes a small addition of soda sulphate is made to prevent too great solubility of the soap, but it interferes with the practical use of the same if too great quantity is introduced; the soap ought not to contain more than one per cent. of it. For hardening, one-third to one-fourth of the fat is frequently substituted by rosin.

For making hard soap, about one pound of soda is employed for eight pounds of fat, on an average. To make no mistake in the proportions, the strength of the soda and the character of the fat must be exactly ascertained.

Rosin, when incorporated with a soap to a certain amount, will make it more soluble and detersive. The lighter the rosin, the more it is valued; 15 per cent. of rosin with 85 per cent. of tallow is probably the best limit; beyond that the soap is depreciated in color, firmness and qualty. Even for the cheapest grade the quality of rosin should not exceed 33 per cent. Rosin is saponified with alkali; for every ten pounds of rosin about three quarts of lye of 30° B. are needed. Stir and beat thoroughly for half an hour, pass through a sieve and then fill into frames, where it should be well stirred and crutched. Some palm oil, when saponified with tallow, will very much improve the appearance of the soap.

To make rosin soap, to eight gallons of lye, while boiling, throw rosin in every five or six minutes, each time one and a half to two pounds until 130 pounds have been added. The rosin must be previously well pulverized and one should stir while another throws in, to prevent its rising to the top. In this operation it is not necessary to keep the contents actually boiling, but near the boiling point. Constant stirring is required, to keep the rosin from collecting into lumps. Saponification will be finished in two hours.

To make cocoanut-oil soap, use lye 25 to 30 strong, which will saponify an equal weight of cocoanut oil. Heat the oil and lye together for one or two hours, continually stirring it, when the mass will commence

thickening; moderate the heat and continue the stirring; after awhile the mass becomes a white semi-solid, when it should be immediately filled into the frame.

Palm oil is rarely used as a soap stock, but generally with a mixture of rosin, when it yields a yellow soap. For white soap they are employed in the bleached state.

Transparent Soaps are prepared by dissolving well dried soaps in alcohol. Take good suet soap, cut it into very thin ribbons, dry it on strong paper, pulverize it in a marble mortar, pass it through a fine sieve and then dissolve the powder in strong boiling alcohol. While the soap is liquid, put in the colors and the perfumes. Three and a half gallons alcohol about 85-100ths as heavy as water are required for 50 pounds of soap.

To color soap red, use vermilion or chrome red; violet, a fuchsine dissolved in glycerine; brown and red brown, use caramel and various kinds of umber; for green, take chrome green; for blue, smalts or ultramarine; for yellow, take palm butter; for rose, the tincture of carthamine or archil; for yellow and orange a tincture of annotto or saffron; for blue and violet, a tincture of litmus, or of alkanet root, or Prussian blue, or a very little pure indigo in impalpable powder; for black, common lampblack.

To Perfume a soap the process is very simple, though much mechanical work is required, as the soap has to be taken hard and dry, cut into thin shavings by machinery, perfumed in air-tight cylinders kept in motion.

Windsor Soap is made of one part of olive oil to eight or nine of ox suet or tallow, with a lye of caustic soda. The fatty basis of French Windsor soap is usually hog's lard, with the addition of a little palm oil.

Brown Soap is so made with umber or brown ochre.

Honey Soap is made of one part each of olive oil and palm oil soaps to three parts of white curd soap, scented with essential oils, as that of rose geranium or of ginger grass, supported or not with a little oil bergamot or verbena.

Musk and Ambergris Soaps are scented with the essence or oil of musk, supported with a little of the oil of bergamot, cinnamon and cloves.

Glycerinated Soap has about one-fifth of its weight glycerine and scented variously.

Almond Soap is white curd soap with one-ninth to one-seventh of olive oil soap, scented with oil of almonds, 1 ounce, to 4½ or 5 pounds of soap.

Violet Soap is strongly scented with essence of orris root and colored or not with tincture of litmus or a little levigated smaltz, ultra-marine or indigo.

Bouquet Soap is made of the finest white curd soap, 17½ pounds, olive oil soap 2½ pounds, oil of bergamot one ounce, 1½ drams each of oil of cassia, oil of cloves, oil of sassafras and oil of thyme, 1 dram of neroli and two ounces levigated brown ochre. There are other formulas.

Rose Soap is perfumed with the finest otto of roses, with the essentials in the usual proportions. There are several formulas.

Cinnamon, lavender, orange flower and other soaps are also made.

Shaving Paste may be made of white soft soap 4 ounces, finest honey soap 2 ounces, olive oil 1 ounce, sodium carbonate 1 dram and one or two tablespoonfuls of water.

A good shaving essence or fluid may be also of one-fourth of a pound of white hard soap in shavings, one pint of rectified spirits and one gill of water. There are several other recipes.

Hard Soap. It is a simple matter to make hard soap, which is not only agreeable to use, but which has the greatest merit of cleanliness. To seven pounds of tallow use three pounds of rosin, two pounds of potash, and six gallons of water; boil for three hours, or, better still, for five hours; turn from the kettle into a wash-tub; let it stand all night. In the morning cut into bars, and lay them on a table or board in the sun to harden for two or three days. This quantity will last a family of four persons a year if used for ordinary household purposes.

Another. 6 pounds of unslacked lime, 6 pounds sal-soda, 5 gallons soft water; when dissolved and settled, pour off, and add 6 pounds of fat, and boil until thick, and pour into a tub that water has stood in; when cold cut, and put where it can dry. It is a first-class soap.

To Make Hard Soap with Concentrated Lye or Potash. Take two wooden buckets of hard water to one box; when this comes to a boil add five pounds of grease of any kind (the cleaner the grease the whiter the soap will be), boil slowly until it gets thick, which it will take about a half day; allow it to cool over night; cut in square pieces to dry. When perfectly dry take each piece and wrap it in a piece of newspaper; do so with all you have made, then pack it in a box with a tight cover, set in a dry place, and keep it well covered.

Erasive Soap. Take two pounds of Castile soap and half a pound of carbonate of potash dissolved in half a pint of water. Cut the soap in thin slices and boil it with the potash until it is thick enough to mold into cakes. Then add half an ounce of alcohol and the same of camphor and ammonia. Stir till it begins to cool. When cold cut in cakes and dry in the sun. This is excellent to wash tinware and pantry shelves and to clean grease spots out of carpets and clothing.

Adulteration. Perfumed toilet soap is generally adulterated with ground glass, soluble glass, silex, pipe clay, rotten stone, borax, plaster of Paris, tin crystal, magnesia, pumice-stone and oatmeal and colored with such poisonous substances as vermilion, Venetian red and carmine, ultra-marine green and blue, pot pigment green, copperas, Spanish brown, yellow and scarlet anilines and burnt umber.

Sod, in plowing, is sometimes used in the sense of the unplowed "land," or the "furrow slice." The word also means a turf of grass.

Soda, a mineral alkali: called mineral because it was originally dug out of the ground in Africa and other countries. It is largely prepared from sea-weed. In the mineral kingdom it is abundant as a silicate and in the form chloride of sodium, or salt. Kelp, barilla, and soda ash all owe their value to the carbonate of soda. The uses of soda for laundry purposes are given on page 927. Soda in its various salts is also a useful article in culinary art, in medicine and as a constituent of the soil.

Soda bears the same relation to its metallic base, sodium, as potassa does to potassium, but its basic and alkaline action is rather less powerful than that of potassa. Pure soda is obtained from a carbonate of soda. Glauber's salt is sulphate of soda. Carbonate of soda is prepared by lixiviating the ashes of sea-weed, or from sulphate of soda. The relation of soda to the acids and the nomenclature of its salts are set forth in a chart form on page 1094.

"Soda water" is not just what its name indicates, there being no soda in it. It is carbonic-acid water. Its manufacture is impossible without a reservoir two or three times as strong as a steam boiler. The carbonic acid is made by mixing sulphuric acid with marble dust, and the sirups are only flavoring. These sirups, by the way, are generally drug imitations of the fruit juices.

Soil, the covering or the uppermost stratum of the earth's crust. It is understood by general observers as simply the ground, without any reference to either its depth or constitution or uses; by geologists, as the superficial alluvial or diluvial deposit of the earth, to whatever depth it possesses homogeneity of character; by botanists, as the portion of the earth's surface which supports vegetation, in all its classes and kinds, whether natural or with the aid of culture, and by farmers and gardeners as the portion of the earth's surface which is stirred by the plow or the spade, or otherwise subjected to tillage. The soil, in the farmer's sense, is sometimes of the same depth as the mold, sometimes not so deep, and sometimes deeper.

Classification of Soils. A good classification of soils, together with a simple, fixed, comprehensive, and well defined nomenclature, is essential for enabling farmers to form comparative estimates of the different soils of their own farm or district, to trace the resemblances between these and the soils of other districts; to decide how far any peculiar treatment of one soil may be profitably imitated upon another, to determine the kind and amount of mineral admixture which any soil may require for its proper textural amelioration, and especially to reap fair or full benefit, or even to obtain clear ideas or intelligible hints, from the multitudes of reports of valuable experiments on manures, methods of reclamation, improvements in culture, and other similar subjects, which abound in the agricultural periodicals of the day, and founded entirely on the relative proportions of the four chief constituents of all soils, clay, sand, lime and humus. In this we may begin with those soils which contain little or no calcareous or limy matter, at the outside not so much as five per cent. of the whole mass. These, supposing them to possesss 50 per cent. of clay, are placed under the head of argillaceous soils, and are distinguished into two orders, the first wholly destitute of lime, the second containing less than 5 per cent. of that earth. Each of these orders is then sub-divided into three species, distinguished as rich, poor, and intermediate, according to the proportion of humus or vegetable mold present in them. If the amount of this ingredient be not more than one-half per cent. the soils are called poor, as the fertility of a soil is in all cases influenced by the proportion of this ingredient. If it varies from 0.5 to 1.5 per cent. it is called intermediate; if from 1.5 to 5 per cent. it is distinguished as rich.

The second class of soils comprehends those which contain from 30 to 50 per cent. of clay, and is denominated loamy. These likewise are divided into two orders, the one with, the other without, lime; and again into three species, according to the proportion of vegetable mold present in them.

The third class embraces those soils which contain not more than 30 nor less than 20 per cent. of clay. They are called sandy loams, and are subdivided into orders and species, on the same principle as before.

In the next, or fourth class, under the denomination of loamy lands, are ranged those soils which contain from 10 to 20 per cent. of clay, the remainder, with the exception of the small percentage of limestone and humus they may contain, consisting of sand.

The fifth class, designated as sandy, includes all those soils in which the proportion of clay does not exceed 10 per cent.; and here again the same subdivisions are adopted. Hitherto, the amount of calcareous matter present is not supposed to exceed 5 per cent; but in the next class, that of marly soils, the above ingredient ranges in a proportion varying from 5 to 20 per cent. of the whole.

Marly soils are to be distinguished into five orders, of which the first is called argillaceous, contains about 50 per cent of clay; the second, loamy, from 30 to 50; the third, sandy loam, from 20 to 30; the fourth, loamy sand, from 10 to 20; and the fifth is distinguished by the larger proportion of humus, which exceeds in quantity 5 per cent. of the whole, and is therefore denominated humous marl, which last is divided into three species, viz.: argillaceous, which contains about 50 per cent. of clay; loamy, which contains from 30 to 50 per cent., and sandy, possessing 20 to 30 per cent. of the same ingredient.

We next arrive at that class of soils which contains more than 20 per cent. of carbonate of lime, and which is therefore distinguished as calcareous or marly soil. These are subdivided according to the proportion of clay they may contain; when this earth exists in the proportion of more than 50 per cent. they are to be called argillaceous; when it is from 30 to 50, loamy; when from 20 to 30, they are said to belong to the sandy loams of the calcareous or marl class; when from 10 to 20 to the loamy sands; and when either destitute of clay altogether, or containing at most

only 10 per cent. of it, they are called sandy. Lastly, a calcareous soil, which contains more than 5 per cent. of vegetable mold, belongs to the sixth order, that of humous calcareous soils, of which there are three species, namely: the argillaceous, the loamy, and the sandy, characterized as before, by the larger or smaller proportion of clay present in them.

The last class, that of humous soils, is distinguished in the first place in three orders. The first consists in soluble, mild humus, that is of that description of vegetable mold which is in a fit condition to nourish the plants which grow in it; the second of acid humus, namely, containing a free acid, which by its presence, is highly destructive to most kinds of vegetation; a third order consists of fibrous vegetable matter, such as peat, which though not acid is yet in a condition little fitted for imparting nourishment to plants.

These orders are again sub-divided into argillaceous, loamy and sandy, according to the proportion of clay present in them; and lastly, distinguished in two species, the one containing, the other destitute of, calcareous matter.

To ascertain the proportion of sand and water in any given soil, it is only necessary to spread a weighed quantity of the soil in a thin layer upon writing paper, and dry it for an hour or two in an oven or upon a hot plate, the heat of which is not sufficient to discolor the paper. The loss of weight gives the quantity of water which the soil contained. While this is drying, a second weighed portion may be boiled or otherwise thoroughly mixed with water, and the whole then poured into a vessel, in which the heavy sandy parts are allowed to subside until the fine clay is beginning to settle also. This point must be carefully watched, the liquid then poured off, the sand collected, dried as before upon paper, and again weighed. This will show the quantity of sand in the known weight of moist soil, which by the previous experiment has been found to contain a certain quantity of water. For example, if 20 ounces, dried in the oven, loses 5 ounces of water, and another quantity of 20 ounces, treated in the bottle, leaves 6 ounces of sand, then the 20 ounces of moist are equal to 15 of dry, and this 15 of dry soil contains 6 of sand, or 40 per cent. It would therefore properly be called a "loam," or a "loamy soil." To determine the proportion of lime, when it exceeds 5 per cent., to a half an ounce of the dry soil diffused through a pint of cold water, add a wine-glassful of hydrochloric acid; stir it occasionally during the day, and let it stand over night to settle; pour off the clear liquor in the morning and fill up the vessel with water, to wash away the excess of acid; when the water is again clear, pour it off, dry the soil and weigh it; the loss will amount, generally, to about 1 per cent. more than the quantity of lime present. If the loss exceeds 5 per cent. of the dry soil, it may be classed among the marls; if more than 20, among the limy soils. To determine the proportion of vegetable matter, dry the soil well in an oven and weigh it; then heat it to dull redness until the combustible matter is burned away; weigh it again, and the difference in the two weights will be the quantity of organic matter.

Pure sand will hold 24 per cent. of its own weight of water, calcareous sand 28 per cent., loamy soil 38, clay loam 47 and peat 80.

Clay soils are usually denominated "cold and wet," and above all others they need under-draining. Such soils are greatly improved by coarse vegetable manures, as straw, corn-stalks, chips, etc., which tend to a separation of the particles. The addition of sand is of course beneficial, but this is too expensive for large fields. Lime and gypsum are also valuable additions to clay soils. The plowing of clay lands for spring crops should be done in autumn if practicable, so that the frosts of winter may more thoroughly pulverize the soil. Plowing in the spring should be done when the ground is neither too wet nor too dry. This is very important, as plowing when too wet causes the soil to dry into very hard clods, and when too dry the ground is baked and the work of cultivation is too difficult. The action of the atmosphere will pulverize these masses of earth after a time, but not sufficiently early or thorough for the crops of the season. Clay land is best adapted to most of the grains and to the red and white clovers. They are characterized as strong and lasting soils. Sandy soils are so greatly improved by the addition of clay that it is really remunerative to add a few loads to each acre, which should be done in autumn; harrow it in thoroughly in the spring. It is really better than the same quantity of the best manure. Heavy rollers, to make the sand more compact, are an advantage. Lime, gypsum, clay marls, peat, vegetable manures and ashes, leached or unleached, are also good for sandy land. Sandy soils can never be profitably cultivated till they have acquired sufficient compactness and fertility to sustain a good growth of grass or clover; and when once brought to this condition they are among the most valuable.

Gravelly soils are somewhat like the sandy, but they are much less desirable, being appropriately termed "hungry." They are peculiarly "leachy," permitting the rapid escape of manures, both by evaporation and drainage. They are better for the pasturage of sheep than for any other purpose.

A loamy soil is of course one of the best, if not the best, for general farming. It requires no special treatment except when the clay or the sand in it is too predominant. Marly and calcareous soils are greatly increased in their fertility by the addition of putrescent and vegetable manures. They are particularly durable. Loamy and sandy soils characterize "bottom" lands, and they are the best for crops in all respects except that they are more exposed to untimely frosts than are high situations in the same vicinity. When exposed to overflowing it is safer to keep such land in grass. Peaty soils in their natural state are totally unfit for profitable farming, but when the peat is left exposed to the atmosphere it absorbs nutritious gases, crumbles and becomes a good addition to poor soils. It is especially good for muck

heaps. Peat abounds in nearly all the Northern swamps which are undergoing so extensive drainage nowadays, and becoming the chief places of rich farming. When a swamp has been properly drained, the hummocks, if any, must be cut up with the mattock or spade, thrown into heaps and burned, and the ashes scattered over the surface. This affords the best top-dressing it can receive. Sand or fine gravel, with a thorough dressing of barnyard manure and slacked lime should then be added. On some of these lands, according as they approach ordinary soils in their character, good crops of oats, corn, roots, etc., may be raised, but they are better suited to grasses and clover. Subsequent dressings of sand, lime, manure and wood ashes, or, better still, all combined, may be afterwards required when the crops are deficient or the grasses degenerate.

Soils should also be sufficiently deep and friable, and of the right color. A black soil absorbs a great deal of heat during sunny days, and at nightfall the dew is rapidly formed, which is easily carried down through a loose or friable soil to the roots of the plants. A porous soil also more readily drains itself of superfluous water, and absorbs nutritious gases from the atmosphere. These are carried down both by the air and the circulating vapor or moisture, in the vicinity of the rootlets, which take up the elements as food.

But the best soil in the world may be materially diminished in value by an impervious sub-soil. Tenacious clay, or a "hard-pan" immediately underneath will hold water until it stagnates or sours, and thus entirely ruin a piece of ground, which otherwise would be of the very best quality for cropping. A real hard-pan can not be so altered as to redeem the tract under which it lies; but clays less hard can be drained and broken up by a sub-soil plow. This not only affords an outlet for the superfluous water, but opens up to the access of the crops a great quantity of good mineral plant food, and moisture from below during drouths. The value of the farm may thus be protracted several times in as many years. But in a few cases the sub-soil is too open on account of the superabundance of sand or gravel in its composition. There is scarcely any remedy for this, except to deepen, or heighten rather, the soil above by the addition of manures. It is generally best to pasture such lands.

Books and periodicals give many tables of the analysis of soils and manures, with the chemical principles of successfully treating them together; but if one adopts the general principle to enrich his ground with a compost of all sorts of manures and fertilizers, he will do better than to undertake to carry out a great number of detailed rules.

Renovation. The means of renewing soils are: 1. Manure; 2. fertilizers; 3. rotation; 4. raising clover; 5. summer-fallowing; 6. pasturing. These topics are thoroughly treated in this work; but all intelligent farmers understand their nature and their necessity.

Rotation of plants seems to be a law of nature. Where plants are removed from the soil and the land left to nature, she supplies their place with plants of a different kind. Even manures and fertilizers should be rotated. (See Rotation). Summer-fallowing consists of letting the land rest from cropping, but it is followed in several different ways,—permitting it to run to weeds and grass, pastured or not pastured, and plowed in the fall, plowing it clean all summer, plowing under a crop of weeds or clover once or twice during the season, etc. By all the above means together, moderately poor land can be fully renewed in two or three years, so that it can bear heavy crops for many years, especially if rotation be followed. But agricultural science at the present day has attained such a point that no farmer can be excused for letting his land run down at all, so as to need any renovation.

Soiling, a mode of feeding horses and cattle, in the stable or yard, with grass or other green food, brought to them, as cut in the fields.

Soldering. Soldering is the art of uniting the surfaces of metals by partial fusion, and the insertion of an alloy between the edges, which is called solder, it being more fusible than the metals which it unites. Solders are distinguished as hard and soft, according to their difficulty of fusion. Hard solders usually melt only at a red heat, but soft solders fuse at lower temperatures. In order to join metals, it is obvious that a solder must be used that melts at a lower temperature than the metals to be joined, but it may also be necessary that it approach as nearly as possible to them in point of hardness; and occasionally, as is especially the case with jewelry, similarity of color is an object. The heat requisite for soldering small articles, such as jewelry, etc., is usually obtained by employing a common blowpipe, as by its use a sudden heat may be concentrated on a small point. Where a larger surface has to be heated, the flame of a spirit lamp is used. In working tin plates, the solder is applied and fused by a heated copper tool called a soldering-iron. The surfaces of parts to be joined by soldering must be perfectly clean; and in order to ensure this, as well as to counteract the oxidization which most metals undergo when heated, a flux is used, which neutralizes or removes these otherwise serious impediments, securing a firm joint. For common purposes powdered resin is used as a flux.

To Make Soldering Fluid for Soft Solder. Into muriatic acid put small pieces of zinc until all bubbling ceases; some add 1 ounce sal-ammoniac to each pound of the liquid.

Hard Soldering or Brazing. The alloy used in hard soldering is generally made of equal parts of copper and zinc; much of the zinc, however, is lost in the process, so that the real proportion is not equal parts. The alloy is heated over a charcoal fire, and broken to granulations in an iron mortar. A different proportion is used for soldering copper and iron, viz.: 3 zinc to 1 copper. The commercial name is "spel-

ter solder." The flux employed for spelter solder is borax, which can either be used separately or mixed, by rubbing to a cream, or mixed with the solder in a very little water.

To Make Solder. The mixture of the metals is performed by melting them together in the same manner as for alloys, with the aid of a flux. The metals employed should be pure, especially silver, as silver coin makes the solder too hard.

Solder for Tin. Take 4 parts pewter, 1 part tin, and 1 part bismuth. Use powdered resin when soldering.

Fine Soft Solder. Take 2 parts tin and 1 part lead. Used for soldering tin plates, and tinning copper. Add resin as a flux when melting.

Gold Solder. Melt in charcoal fire 24 grains gold coin, 9 grains silver, 6 grains copper, 3 grains brass.

Silver Solder. Melt as above 2 parts silver, 1½ parts brass.

Sole, of a plow, the horizontal bar at the foot, to keep it running level and steady.

Solvent, able to pay all indebtedness; also, a fluid employed to dissolve a substance.

Somnambulism (som-nam'bu-lism), sleep-walking; a state of sleep in which some of the powers are partially awake, but the consciousness of the subject is entirely suspended. During this singular abnormal condition of the nervous system persons have been known to do a deal of work unaware to themselves, such as changing the articles of furniture in a room, feeding the live stock, milking cows, butchering hogs, etc. The treatment consists in carrying out every measure calculated to promote sound sleep.

Soothing Sirup. The following sirup contains no opiates and will be found as effective as Mrs. Winslow's Sirup: Take 3 drams of compound tincture of lavender, 1 dram tincture of lobelia and 1½ ounces of simple sirup, mix and give ½ to 1 teaspoonful, according to the age of the child.

Sores. For old sores of almost all kinds, the ointments given on page 995 and the salve on page 1111 will be found excellent remedies.

Sore Throat, To Cure. Dissolve one dram chloride potash in half a pint of water, and gargle the throat therewith. A few applications will allay inflammation. Simple "sore throat," such as is occasioned by colds, are best relieved by cold wet compresses to the part, especially during the night.

Sorghum, Sorgho, or **Sorgo**: see Cane, Sugar and Sirup.

Sorrel, the name of several species of acid plants, as the Common (of England), Field or Sheep (common in sandy soils in this country), French, Roman or Garden (of Europe), Mountain or Welsh (rare in the United States) and Wood. The latter, of which there are two kinds, have clover-like leaves, and is sometimes erroneously called "sheep sorrel" in the West. The term "sour sorrel" is very indefinite. All these sorrels abound in oxalic acid and have a similar taste, although the two Wood sorrels belong to an entirely different order from the others. The leaves of these have been used as "greens," and the roots of all except the Wood species have the nature of rhubarb, in medicine; indeed, rhubarb is a sorrel. Sour or yellow dock also belongs to the latter class.

The term "sorrel," as a color of horses, denotes a yellowish or reddish brown.

Soundness, freedom from injury or defect, or, in case of a horse, the absence of everything which impairs now, or may probably impair hereafter, his usefulness. The constitutents of soundness in horses are well defined, both in the phraseology of common life and in that of law; and they afford occasion for a perfect wilderness of disputes in the horse market and render it quite unsafe for an inexperienced person to purchase a horse without the aid of a professional man or without a full written warranty of soundness from the seller. See page 730, under head of Guaranty.

Soup. Soups may be described as decoctions, more or less strong, of animal and vegetable substances, generally of meat with vegetables, and seasoned with salt, spices, etc. They may be made in an infinity of ways; there being no end to the combination of meat, fish, vegetables, spices, etc., with water, that may be made. Meat soups have a basis formed by boiling together meat and water; the soluble parts of the former uniting with the water; this, simmered down to a certain strength, is termed "stock." When this is obtained it is ready to be employed as the basis of any meat-soup, and the soup receives its name according to the vegetables employed, or of the ingredients used in seasoning it. The proportion of meat to water for stock, from which the richest soups are made, is two pounds of meat to a quart of water; for more ordinary soups, one pound to a quart.

Brown soup stock is made of beef-shins and a piece of coarse beef; white stock is made of veal shins and an old fowl of your choice. One shin of veal will make three quarts of good veal stock, and one hind shin of beef will make five quarts of good beef stock. The veal and beef together make the best soup. To make good soup stock rub salt into the skins; put them into an iron pot, in twice as much cold water as you expect to have soup. It must be set on top of the range, and gradually heated up; do not forget to skim it before it comes to a boil. Let it simmer slowly all day. If it boils away too much, add more water. All kinds of bones of roast or boiled meat or poultry, and the liquor beef, mutton or fowl are boiled in, make good soup stock. They should be boiled all day to extract the substance from the bones as well as the meat, then strained into a stone jar or earthen pots to stand until the fat cools, then take that off. If this process is observed, you can always have a good stock to begin with; you can flavor it as you please.

Hard or fast boiling should be carefully avoided in

making soups. It hardens and contracts the fibers of the meat, so that it cannot yield its juices to the water. Gentle boiling or stewing, however, has a contrary effect. The water gradually warming the meat, has a tendency to relax its fibers, and while penetrating into the meat, extracts from it and carries away with it the finest of its flavors, and if the pot be closely covered it does not escape with the steam. To extract the full strength from the meat, long and slow boiling is necessary; but care must be taken that the pot is never off the boil. All soups are better for being made the day before they are to be used, and they should then be strained into earthen pans. When soup has jellied in the pan, it should not be removed into another, as breaking it will occasion its becoming sour sooner than it would otherwise do. When in danger of not keeping, it should be boiled up. Vegetables should never be put into soup stock; it is much better to boil the vegetables in just water enough to extract the flavor, than to boil them in the stock; for if you put the vegetables to boil in the soup, by the time the flavor is extracted from the soup it will be reduced one-half. The fat can be removed after it is cool. Nothing looks more disagreeable at the table than greasy soup.

Barley Soup. Take six pounds of the thick flank of beef, and cover it with six quarts of water, and a quarter of a pound of barley; boil it gently for an hour, skimming it frequently. Then add three heads of celery, two carrots, two turnips cut into pieces, one onion, a bunch of sweet herbs, and a little parsley; boil all together till you find the broth very good. Season it with salt. Then take out the beef, the onion, and sweet herbs; pour the broth into the tureen, and put the beef into a dish garnished with carrots and turnips.

Bean Soup. Take a large knuckle of veal, add to it four quarts of water and one quart of black beans that have been soaked in water over night, and let them boil with the veal four or five hours; also, a small bit of onion and a dozen whole cloves, some salt and pepper; cut three hard-boiled eggs and two lemons into slices and put into the bottom of your tureen, and strain the soup, boiling hot, upon them. If the water boils away, you must keep adding to it, as this recipe ought to make a gallon of soup. It should be of the consistency of pea soup. If you have no veal, the bones of salt pork make a good substitute, but not equal to the knuckle.

Chicken Soup. Boil a pair of chickens with great care, skimming constantly, and keeping them covered with water. When tender, take out the chicken and remove every bone from the meat; put a large lump of butter into a frying-pan, and dredge the chicken meat well with flour, lay in the hot pan, fry a nice brown, and keep it hot and dry. Take a pint of the chicken water, and stir in two large spoonfuls of curry powder, two of butter, and one of flour, one teaspoonful of salt and a little Cayenne; stir until smooth, then mix it with the broth in the pot; when well mixed, simmer five minutes, then add the browned chicken. Serve with rice.

Green-Pea Soup. Take two quarts of green peas, one small onion, and a sprig of parsley cut fine; add two quarts of hot water, and boil slowly for half an hour, then add a pint of small new potatoes which have been peeled and laid in cold water an hour; put in a teaspoonful of sugar and a little salt; boil till the potatoes are done; now add a teacupful of cream or a pint of milk, boil a minute or two, and then serve with small slices of toasted bread or gems cut in halves.

Pea Soup. Soak a quart of split peas in soft water for twelve or fourteen hours, and remove those which float on the top. Then simmer in two quarts of water until tender; put them in a stew-pan; add two quarts of beef stock, about a couple of pounds of shin of beef, any odd meat bones, chopped up, and a slice of fat ham; a head of celery, six onions, three each of carrots and turnips—all peeled and sliced—and seasoning to taste. Simmer the whole for two to three hours, stirring and skimming from time to time; pass all through a fine hair sieve, give it one boil, and serve with toasted bread.

Potato Soup. Eight potatoes, two turnips, four large onions, boiled together (in beef, mutton or poultry water) to a jam and strained through a colander; then add butter rubbed in flour (a little), with cream or sweet milk, pepper, and salt; chopped parsley in the bottom of the tureen; let the soup boil well, then pour over the parsley.

Tomato Soup. Take twelve large tomatoes, peel and chop them; boil them an hour, then stir in a half teaspoonful of soda; when the foaming ceases add two soft crackers, rolled very fine; add a quart of milk, one tablespoonful of butter and boil fifteen minutes. Salt and pepper to taste. If too thick add a little boiling water or milk.

Vegetable Soup. Take a third as much water as you want soup; cut up some onions, carrots and turnips, a little celery, some salt and a little mace. Put this all into a sauce-pan; boil it one hour, add the two-thirds of soup stock. Boil this altogether an hour and a half. If it is not seasoned to your taste, add whatever is required.

Macaroni Soup. The macaroni must be boiled in water for ten minutes, strained and put into boiling stock, in the proportion of half a pound to the gallon; simmer slowly for half an hour, and serve very hot, with grated cheese on a separate dish.

Mock-Turtle Soup. Take about ten pounds of shin of beef, cut it into small pieces, and fry the lean parts a light brown; put the rest of the beef (*i. e.*, the fat part) into a stew-pan with boiling water, and stew it for eight hours, with a bunch of sweet herbs and two onions; when cold take off the fat. Then get half a calf's head with the skin on, half boil it, and cut it into small square pieces and put them, with the lean beef and the soup, into the same pot, and let them stew altogether till quite tender. Thicken it with a

very little flour; add a little pounded mace and cloves, and a grate of nutmeg, two spoonfuls of mushroom catsup, and pepper and salt to taste. A wine glass of sherry or white wine improves it. It should be served with egg balls and lemon.

OX-TAIL SOUP. Take two tails, divide them at the joints, and soak them in warm water. Put them in a soup pot with two quarts of cold water. Skim it carefully. When the meat is boiled to shreds, take out the bones, and add a chopped onion and carrot. Use spices and sweet herbs, or not, as you prefer. Boil it three or four hours.

OYSTER SOUP. To each dozen or dish of oysters put ½ pint of water; milk, 1 gill; butter, ½ ounce; powdered crackers to thicken. Bring the oysters and water to a boil, then add the other ingredients previously mixed together, and boil from three to five minutes only. Each one will choose to add salt, pepper, etc., to his own taste. Keep about the above proportions if you should have to cook for an oyster supper, for parties, etc.

Another. Boil the liquor with chopped celery and a little butter. When it boils up, add half as much milk as there is liquor. Have the oysters ready in a dish upon a slice of toasted bread, and when the liquor boils up again, pour it over them.

Spade, a hand implement used for digging. It comprises a number of varieties, yet even inclusive of these is everywhere so well known as to require no description.

Spaniel, a family or breed of hunting dogs. See page 333.

Spanish Fly (CANTHARIDES), an insect ground into powder, and mixed with lard or oil, making what is familiarly known as a blister. The powder is of a grayish-brown color, interspersed with shining green particles, which are the fragments of the feet, head and wing cases. The Spanish fly is, besides its blistering qualities, a very valuable internal medicine, a powerful tonic and alterative. In veterinary practice it has been used with success in the cure of glanders in the horse. In the same diseases where they were free from the tubercles they have been cured with Spanish fly, gentian, copper, and the sulphate of soda.

DOSE. Spanish fly is given to the horse in five-grain doses once a day only, and mixed in cut or soft feed. Horses are more easily affected by the Spanish fly than mares. Blisters of Spanish fly are made as follows: Powdered Spanish fly, 1 dram; hog's lard, 6 drams; mix and apply by the hand, rubbing into the part to be blistered; wash off the part next day, oil or lard it for a week, and the swelling will leave when the inflammation has gone out of the part. An excellent application for the removal of a splint, or soft tumors about the legs of horses is made as follows: Tincture of Spanish fly, 1 ounce; oil of croton, 20 drops; well rubbed into the part. It acts like magic, that is, if the tumor can be removed by any means.

ANTIDOTE FOR POISONING BY SPANISH FLY. The effects of poisoning by Spanish fly are acrid taste, burning heat in the throat, stomach, and belly, bloody vomitings, colic, purging, retention of urine, convulsions, death.

Treatment. Give large draughts of olive oil, thin gruel, milk, starch enemas, linseed tea, laudanum, and camphorated water. The poisonous effects are to be counteracted by emetics, cathartics, bleeding and opiates by the stomach and rectum. Animal charcoal is claimed to be an antidote. Some eminent physicians recommend the officinal solution of potassa, given in 30-drop doses, as an effectual remedy in strangury from blisters.

Spanish Fowl, a breed of domestic fowl: see page 529.

Spanish Needle, a troublesome weed, most common south of latitude 40° North. The almost omnipresent "beggar-ticks" of the North are congeners of the true Spanish needle and are scarcely distinguishable from it. For an illustrated account of Spanish needle lice, see pages 858–9.

Sparrow, the name of several species of perching birds, well-known by their almost ceaseless *chip-chip*.

EUROPEAN HOUSE SPARROW. This is by far the most celebrated of the whole sparrow family, and is probably the one referred to in the New Testament—"not even a sparrow shall fall to the ground without your Heavenly Father's notice." It is sometimes called simply European sparrow, and is also well known by the appellation "English sparrow." It was introduced into this country from England many years ago, apparently for the purpose of adding to our list of insect destroyers; but so far it seems to confine itself to cities, where it subsists exclusively upon street garbage. So far as these sparrows range, they drive out all our native song-birds, and from their prolific power it is feared they will spread all over the country, substituting their useless omnipresence for all the beautiful songsters that have educated our childhood's ears to the sweetest sentiment which nature affords. Moreover, if they take but few or no insects, after they have driven out all the birds that do take them, we shall sorely repent of having ever encouraged their introduction into this country. That they *are* worthless is settled by the fact that carefully calculating England has for more than a generation paid a premium for their death.

CHIPPING SPARROW. This is a very common little bird throughout North America, not sojourning in cities. It does not drive away other birds, being native on this continent. Its song consists of six or seven notes, rapidly uttered. Its beak and forehead are black, crown continuous chestnut, black and white striping about the forehead and eyes; the sides of the head and neck and the rump are ashy, while the upper part of the back is covered with black and brown streaks. Its four or five eggs are greenish blue, marked with dark brown spots, laid in slender

nests, which are built of grass and hair, on apple-trees or low bushes.

Field Sparrow. This is found almost throughout North America. It has a red beak, crown and back a dusky red streaked with blackish, builds its nest on the ground at the foot of a small bush or on branches near the ground, where it lays four to six eggs, of a grayish rusty color.

Other sparrows, of less note, are Townsend's, Brewer's, Fox-colored, Slate-colored, Swamp, Song (four species), Black-chinned, Tree, Black-throated, White-throated, Golden-crowned, White-crowned, Yellow-winged, Lark, Spotted, Beaked, Nootka and Savannah, besides a large number of finches, buntings, snow-birds, etc., all of which belong to the sparrow family.

Spavin, a variety of disease affecting the hock joint of the horse: see pages 728, 805–6.

Spaying, the destroying of the ovaries of heifers, bitches, young sows and other female animals, in order to prevent conception and promote fattening. It is usually done by making an incision into the mid-flank on the left side, with a lancet or sharp knife, cutting off the ovary and stitching up the wound. The part should be so dressed as to exclude the air; and the animal should be kept warm and quiet for two or three days after the operation. The spaying of heifers is practiced far less now than formerly, not on account of any failure of its object, but because the great improvement in the breeds of cattle has correspondingly enhanced the value of breeding cows. See page 304.

Spearmint, a very popular, spirituous-aromatic herb, found in some gardens. Its properties are about the same as those of peppermint, being a stimulant, sedative, carminative, etc. For medicinal purposes the volatile oil is preferred. Fresh sprigs of spearmint are used to make the celebrated "mint julep."

Species, a class of plants or animals resembling each other in essential characteristics, and capable of indefinitely continued fertile reproduction through the sexes. In these days of advanced science, however, myriads of the lower forms of life are found to have no sex, and the lines between vegetable and animal life become completely obliterated. Among inanimate objects the word denotes a group of most nearly allied specimens. A genus is a more ideal classific term, comprising one or more species. Classification continues upward or more general through family, order, class, branch and kingdom; and all these terms are also prefixed by the modifier *sub*.

Speed. The steady increase in speed, both trotting, pacing and running, since "Boston Blue" accomplished his (then) wonderful feat of trotting a mile in three minutes at Boston, Mass., in 1818, is a significant commentary on the excellence of the present method of breeding and training the horse. Speed has increased so rapidly since that date that it would require a volume to enumerate all horses that have made a record better than "Boston Blue" made. In fact, many of our common road horses can trot a mile as quickly as was done by this pioneer trotter. In the following list we give the name of every horse which has a record as a trotter of 2:30 or better, with the year in which the performance was made and the number of heats each animal has trotted in 2:30 and better, up to the season of 1882. Wagon records of 2:35 or better are treated as equivalent to harness records of 2:30 or better. We also give the names and best record of those horses who have trotted over one mile and up to 100 miles. This driving at long distances at speed is a practice that is greatly deprecated by humane admirers of this noble animal and cannot be too strongly condemned by all. We are glad to note that of late no special attempts have been made to surpass the records of several years ago, and it is hoped that there will never be any further need of recording a longer list of this long-distance speed. Four horses have trotted 20 miles within an hour, and several others have tried it and failed. Black Joke, the horse that trotted 50 miles in three hours and fifty-seven minutes, was severely injured by it. Conquerer, which trotted 100 miles in less than nine hours, died the same day.

In the following tabular statement of the record of all horses that have trotted one mile in 2:30 or better, the date given is the year in which their best time was made, and the figures to the right of the year indicate the number of times the animal has trotted heats within 2:30.

	Yr.	No. of Times.
2:10¼		
Maud S	1881	35
2:11¼		
St. Julien	1880	60
2:13¼		
Rarus	1878	185
2:14		
Goldsmith Maid	1874	332
Trinket	1881	56
2:14¾		
Hopeful	1878	137
2:15		
Lula	1875	56
2:15¼		
Smuggler	1876	44
2:15½		
Hattie Woodward	'80	24
2:16¼		
Lucille Golddust	'78	37
2:16½		
American Girl	1874	150
Darby (Jno. Murphy, Jr.)	1879	92

	Yr.	No. of Times.
2:16¾		
Charley Ford	1880	100
Occident	1872	27
2:17		
Gloster	1874	39
2:17¼		
Dexter	1867	87
Piedmont	1881	41
So-so	1881	11
2:17½		
Edwin Thorne	1881	32
Santa Claus	1881	36
2:17¾		
Hannis	1880	76
2:18		
Dick Swiveller	1879	41
Edwin Forrest	1878	30
Great Eastern	1878	30
Josephus	1881	19
Judge Fullerton	1875	104
Kate Sprague	1881	21
Nettie	1871	51
Proteine	1879	52
Red Cloud	1874	46
Robert McGregor	'81	36

	Year.	No. of Times.
2:18¼		
Lady Maud	1875	33
Lady Thorne	1869	106
Lucy	1872	62
Midnight	1878	38
Monroe Chief	1880	61
2:18½		
Col. Lewis	1878	21
Slow Go	1877	23
2:18¾		
J. B. Thomas	1881	11
Nutwood	1879	36
Patchen (Orwell Boy)	1880	16
2:19		
Albermarle	1878	23
Alexander	1881	24
Alley	1879	46
Bonesetter	1879	88
Cozette	1876	66
Edward	1878	20
Graves	1878	20
Kitty Bates	1880	12
Wedgewood	1880	56
2:19¼		
Bodine	1875	66
Comee	1877	71
Croxie	1878	16
George Palmer	1869	32
Keene Jim	1880	11
Parana	1880	27
2:19½		
Driver	1880	129
Moose	1880	38
Thomas L. Young	'75	27
Troubadour	1881	20
Will Cody	1880	42
2:19¾		
Adelaide	1878	67
Camors	1874	35
Clingstone	1881	1
Daisydale	1880	18
Dick Wright	1880	40
Fanny Witherspoon	1881	9
Flora Temple	1859	99
John S. Clarke	1881	24
2:20		
Annie W.	1881	25
Belle Brasfield	1879	37
Capt. Emmons	1880	42
Elaine	1880	11
Etta Jones	1879	16
Fleety Golddust	1884	12
Frank	1877	15
Humboldt	1881	17
John H	1878	76
2:20		
Little Fred (Iowa)	'77	54
Mambrino Gift	1874	17
May Queen	1875	25
Nancy Hackett	1878	7
Orange Girl	'80	20
Prospero	'77	19
2:20½		
Amy	'79	28
Fanny Robinson	'79	7
Henry	'71	1
Lucy	'80	39
Martha Washington	'77	12
Mazomanie	'78	50
Sheridan	'80	18
Silverton	'81	43
William H	'81	60
2:20¼		
Voltaire	'79	52
2:20½		
Chance	'79	3
Glendale	'80	13
Gov. Sprague	'76	15
Lida Bassett	'79	18
Noontide	'80	23
Richard	'78	26
J. P. Morris	'81	11
Irene	'80	24
Sam Purdy	'76	30
2:20¾		
Huntress	'76	61
Lysander Boy	'77	2
Mountain Boy	'68	29
2:21		
Banquo	'77	12
Castle Boy	'74	19
Castleton	'79	11
Clementine	'75	31
Doty	'78	21
Gazelle	'72	20
Gen. Garfield	'75	12
Gen. Grant	'76	15
Indianapolis	'78	12
King Phillip	'77	9
May Bird	'77	69
Powers	'78	40
Scott's Thomas	'78	22
Susie	'76	44
Lady Pritchard	'78	9
Lucille	'78	26
Richards		
Phil Thompson	'81	3
White Stockings	'77	20
Wild Flower	'81	1
2:21¼		
Dan Smith	'80	23
Hambletonian Bashaw	'80	20
Hambletonian Mambrino	'78	16
Independence	'81	6
Jersey Boy	'80	52
Kansas Chief	'76	57
Kentucky Wilkes	'80	12
Mambrino	'79	16
Pilot R	'81	19
2:21½		
Abbottsford	'78	19
Black Cloud	'80	23
Jay Gould	'72	20
Music	'75	23
Woodford Mambrino	'78	20
Steve Maxwell	'80	43
2:21¾		
Charley Champlin	'81	19
Molsey	'75	10
Rosalind	'72	6
Rose of Washington	'79	19
2:22		
Bateman	'81	42
Bella	'75	31
Blackbird	'64	5
Brigadier	'81	47
Calmar	'81	39
Chickamauga	'78	36
Commonwealth (Dred)	'76	29
Dame Trot	'78	15
Emma B	'79	46
George Wilkes	'68	56
Helene	'81	23
Joe Brown	'76	40
Little Gipsy	'77	56
Mambrino Dudley	'81	8
Molly Morris	'75	31
Mystic	'75	8
Oakland Maid	'76	16
Von Arnim	'79	11
Wolford Z.	'78	29
2:22¼		
Big John	'81	6
Dictator	'79	25
Grafton	'75	11
Hannah D	'76	32
Jennie Holton	'77	1
Lady Rolfe	'80	4
Sensation	'75	45
Thorndale	'76	10
Woodford Chief	'77	10
2:22½		
Badger Girl	'76	26
Blackwood, Jr.	'76	16
2:22½		
Capitola	'81	3
Chestnut Hill	'79	19
Convoy	'80	10
C. W. Woolley	'78	8
Deception	'77	26
Dick Moore	'80	25
Elsie Good	'79	37
Gibralter	'81	8
Honest Harry	'77	50
Jenny	'72	18
Joker	'75	41
Little Sioux	'81	7
Mattie	'78	11
Nancy	'81	16
Romero	'81	17
Scotland	'77	27
Sweetheart	'81	6
Tanner Boy	'77	28
2:22¾		
Flora Belle	'72	19
Palma	'80	4
Young Bruno	'74	19
2:23		
Alcantara	'80	11
Blue Mare	'77	18
Bonner	'75	16
Bonner Boy	'79	9
Buzz Medium	'81	10
Clifton Boy	'78	42
Commodore	'79	16
Ethel	'78	20
Eureka	'81	6
Fred Hooper (J. Ellis)	74	33
Hector	'80	1
Hugh McLaughlin	'81	1
Idol		
Jim Irving	75	8
John R	'81	12
Kate McCall	'81	10
Katie Middleton	'79	12
Kilbourn Jim	'72	12
Lady Banker	'75	3
Lady Mac	'77	16
Lady Palmer	'79	9
Lew Scott	'79	82
Lady Turpin	'75	14
Minnie R	'81	15
Oceana Chief	'79	9
Pickard	'81	10
Proctor	'76	2
Robert Lee	'81	10
Scott's Chief	'79	2
Thomas Jefferson	'75	39
Unknown	'75	8
Trampoline	'78	36
Victor	'81	9

	Year.	No. of Times.
2:23		
Volney	'79	12
Wildair	'78	12
2:23¼		
Argonaut	'80	27
Belle Echo	'81	9
Blackwood Prince	'81	9
Dan Voorhees	'76	19
Fearnaught	'68	4
Fred Casey	'80	13
Frank Reeves	'76	14
Gen. Butler	'62	46
Lady Snell	'75	14
Nerea	'75	9
Phil	'78	3
Post Boy	'79	18
St. James	'73	42
Sciola	'79	37
Tolu Maid (Nettie C.)	'80	11
Trio	'76	8
Unalala	'81	23
W. H. Allen	'72	25
Wizz		
York State	'75	5
2:23½		
Annie Collins	'76	40
Belle H	'79	9
Blanche	'75	40
Fashion	'81	2
Geo. M. Patchen	'60	34
Gloster, Jr	'79	8
Goldfinder	'81	14
Grey Cloud	'80	3
Iron Age	'80	19
Jewett	'79	4
Jim	'81	6
Knox Boy	'80	5
Lady Vorhees	—	6
Lizzie 2d	'80	1
Marion	'76	9
Mary Russell	'78	14
Nancy		
Rhode Island	'68	14
Rosa Wilkes		
Shepherd Boy	'77	4
St. James		
Tariff	'81	7
2:23¾		
Abe Edgerton	'78	13
Billy Barr	'70	16
Billy Ray	'76	4
Damon	'77	9
Frank J. (Milton Day)	'75	6
Harry Clay	'77	2
Major Lord	'79	11

	Year.	No. of Times.
2:24		
Breeze	'76	6
Brother Jonathan	'73	30
Champion, Jr.	'77	4
Dan Bryant	'77	6
Defiance		
Dr. Lewis (Leander)	'78	37
Del Sur	'81	4
Empress	'81	11
Frank Wood	'74	9
Geo. B. Daniels	'74	21
G. T. Pilot		
Glide	'79	7
Grey Salem	'79	15
Harry Gilbert	'79	10
Hotspur	'79	46
James Howell	'74	8
Jessie Hayes	'79	9
John W. Conley (Beppo)	'73	7
John Morgan	'64	6
Joseph A.	'72	16
Kirkwood	'69	6
Lady Star (Capitola)	'76	40
Lucy Fleming	'79	10
Magdallah	'79	15
May Howard	'76	39
Mambrino Kate	'78	10
Middlesex	'79	4
Neome	'78	6
Nettie Burlew	'76	7
Nil Desperandum	'78	16
Orient	'75	12
Potol G. T.	'78	12
Sadie Bell	'78	12
Sooner	'78	9
Tommy Gates	'79	22
Tommy Dodd	'80	3
Wild Lily	'77	19
2:24¼		
Abdallah Boy	'81	11
Amy B.	'76	11
Belle Oakley	'81	30
Big John		
Calamus	'80	10
Carrie	'76	13
Crown Point		
Dick Taylor	'77	5
Draco Prince	'71	16
Flora F.	'81	9
Forest Patchen	'81	16
Jimmy Stewart	'81	4
John Hall	'80	21
Lady Foxie	'80	46
Leontine	'80	4
Lucy Fleming		

	Year.	No. of Times.
2:24¼		
Major Allen (Locust)	'71	7
Monarch Rule	'77	24
Observer	'75	25
Vanity Fair	'75	9
2:24½		
Big Soap	'80	13
Black Frank	'78	11
Bonita	'81	1
Brown Dick	'75	5
California Damsel	'63	5
Carbolic	'80	4
Corisande	'78	6
Crown Point	'80	11
Dispatch	'79	7
Fred Douglas	'79	12
George	'80	2
George	'74	4
Hylas	'76	6
Kate Hall	'79	3
Loafer	'78	12
Laura Williams	'77	4
Magenta	'77	9
Monarch, Jr	'76	21
Myron Perry	'71	24
Pilot Temple	'71	44
Planter	'76	15
Prince Hartford	'63	11
Randall	'74	9
Sea Foam	'75	21
Sleepy John		
Stonewall	'80	8
Wilbur F.	'80	12
Windsor		
2:24¾		
Albert	'75	3
Bashaw, Jr.	'68	28
Blondine	'79	3
Chicago	'68	41
Col. Dawes	'78	2
Dan Donaldson	'81	10
Ella Wright	'74	—
Elwood Medium	'81	7
Florence	'81	27
Galatea	'81	6
Grey Chief	'80	11
Lady Mills	'78	5
Silas Rich	'68	14
2:25		
Æmulus	'79	21
Allie West	'75	3
Anodyne	'77	11
Aulinda	'81	8
Barney Kelly	'77	38
Bill Thunder	'76	5
Cairo	'78	15
Chas. Henson	'79	3

	Year.	No. of Times.
2:25		
Charley B.	'79	5
Charley Mac	'77	15
Chicago Maid	'78	6
Commodore Vanderbilt	'66	5
Crown Prince	'73	31
Dave C.	'81	2
Echora	'81	8
Ella Earl	'79	34
Elsie Groff	'81	15
Everett Ray	'74	14
Frank Munson	'79	33
George H.	'79	9
Gold Note	'80	9
Golden Girl		
Hiram Woodruff	'77	9
Joe Ripley	'77	51
John W. Hall	'75	4
John Hall	'78	3
John Taylor	'76	1
Jubilee Lambert	'75	2
Lady Lockwood	'65	1
Lady Martin	'81	10
Little Mary	'76	7
Lady Moore	'81	1
Lady Thorne, 2d	'81	6
Maggie C.	'81	10
Modoc	'78	15
Mohawk, Jr. (Clark's)	'72	8
Ned Wallace	'76	18
Nelly Irwin	'74	50
Pat Hunt	'77	12
Queechy Maid	'78	1
Reliance	'79	2
Result	'78	14
Ripon Boy	'73	12
Robert B. Thomas	'79	15
Rolla Golddust	'79	4
Tom Hendricks	'81	1
Tom Keeler	'77	60
Tommy Gates		
Valley Chief	'80	16
Vanity Fair		
Vulcan	'77	23
2:25¼		
Adelede Clark	'77	8
Amber	'80	18
Barney	'78	2
Brown Dick	'59	12
Clover (Brightwood)	'81	28
Eva	'75	8
Faugh-a-Ballaugh	'77	9
George K.	'81	3
George Treat	'76	2
Golden Girl	'80	13

	Year	No. of Times.
2:25¼		
Joe (Triumph)	'71	5
Johnny Gordon	'80	4
Lewinski	'77	33
Lumps	'80	9
McLeod	'81	3
Onward	'81	3
Red Line	'79	1
Rienzi	'80	6
Rosa Wilkes	'81	6
Star	'79	11
Stella Blake	'81	2
Susie Parker	'75	7
2:25½		
Alta	'80	11
Andy Mershon	'77	4
Annette	'79	5
Ashley	'81	8
Barkis	'81	6
Bradley, J. J.	'71	13
Byron	'71	14
Chas. E. Lowe	'71	7
Chieftain	'80	16
Derby (Dutchman)	'72	5
Dream	'78	7
Early Rose	'81	6
Effie Deans	'76	1
Embassador	'81	1
Ethan Allen	'60	11
Ethel Medium	'81	9
Gray Mack	'69	9
Hill, H. C.	'74	3
John Grant	'80	3
Kate Campbell	'74	87
Lady Groesback	'78	5
Lady Sherman	'81	5
Leda	'79	9
Lyman	'80	10
Mambrino Belle	'80	8
Membrino Genl.	'78	11
Mountain Quail	'78	30
Myrtle	'79	10
Nonesuch	'71	15
Onaway	'81	18
Rockingham	'62	5
Sam. Bruno	'75	4
Sir Walter	'80	3
Spotted Colt	'65	11
Sue Grundy	'81	15
Wagner Bashaw	'81	22
2:25¾		
Camors	'80	4
Col. Russell	'70	7
Ella Madden	'76	14
Fred Crocker	'80	2
Harry Harley	'71	9
Honesty	'81	1
Jerome	'80	8

	Year.	No. of Times.
2:25¾		
Katie Jackson	'77	3
Lady Brownell	'81	2
Steinway	'79	1
White Cloud	'76	5
2:26		
Ada Paul	'78	7
Alfred (Little Alfred)	'80	3
Alice West	'79	2
Amboy	'78	8
Almont, Jr.	'81	4
Belle of Portland	'61	3
Belle Strickland	'70	12
Big Fellow	'74	7
Billey	'80	7
Billey Platter	'75	3
Blanch Amory	'80	2
Capt. Jack	'77	17
Clara G.	'71	3
Columbus Hambletonian	'80	3
Cooley	'66	10
Confidence	'77	9
Dick Jamison	'74	5
Enigma	'76	3
Eva	'81	1
Executor	'81	7
Fearnaught, Jr.	'80	4
Foxie V.	'78	32
Frank Ferguson	'77	8
Geo. H. Mitchell	'77	1
Granville	'76	15
Harry	'79	7
Harry Conklin	'79	5
Harry W. Genet	'71	13
Hattie Arnold	'80	3
Highland Mary	'80	4
Hogarth	'77	3
Jacksonville Boy	'77	6
Joe Bunker	'80	4
Jewess	'77	11
Kitty Cook	'76	4
Lady Daggett	'78	9
May Queen	'67	5
Mill Boy	'81	10
Mohawk Jr (Halls)	'77	2
Nelia	'78	15
Parrott	'79	4
Peace	'78	8
Phil Dougherty	'79	17
Prospect Maid	'80	4
Richmond	'78	6
Russell	'76	3
Sadie Howe	79	7
Schuyler	77	13
Sleepy Bill	'76	2
St. Charles	'77	4
Surprise	'70	12

	Year.	No. of Times.
2:26		
T. A	77	5
Tacky (Polly)	'67	10
Tattler	'68	1
Tom Britton	'77	7
Warrior	'79	8
W. K. Thorn	'68	12
Young Sentinel	'77	13
2:26¼		
Aldine	'81	6
Bay Whalebone	'71	4
Billy Hoskins	'70	1
Black Mack	'71	1
Capt. Herod	'80	4
Coaster	'76	3
Dakota Maid	'78	10
Deucalion	'82	4
Dora	'80	11
Duroc	'80	11
Frank F	'81	8
Frank Palmer	'75	7
Green Charley	'79	3
Hazor (Atwood)	'76	22
Kitty D	'74	10
Lady Blanchard	'72	4
Lady Emma	'64	16
Lady Monroe	'79	3
Lady Suffolk	'44	8
Lucrece	'81	3
Lydia Thompson	'72	13
Magnolia	'74	10
Mary Davis	'74	7
Phyllis	'81	9
Queen of the West	'71	2
Royal John	'71	12
Susie	'81	4
Sweet Brier	'77	12
Timothy	'80	9
2:26½		
Alexander Button	'81	3
Arthur	'81	8
Ben Flagler	'72	11
Billy Boy	'81	4
Cyclone	'81	4
Duke	'75	3
Gen. Howard	'76	6
Gen. Tweed	'76	8
George Judd	'76	2
Grand Duchess	'72	6
Frank Kernan	'77	2
Honest Dutchman	'72	6
Joe Green	'73	3
License	'70	13
Lily	'78	2
Maggie S	'76	7
Mambrino Boy	'76	3
Mamie M	'81	8
Matthew Smith	'71	3

	Year.	No. of Times.
2:26½		
McCurdy's Hambletonian	'79	10
Mila C (Mila Caldwell)	'73	8
Modesty	'78	4
Morrisey	'72	11
Myrtle	'80	3
Nellie Walton	'75	6
North Star Mambrino	'72	10
Orange Blossom	'75	2
Parole	'80	6
Phil Sheridan (Wis)	'81	6
Phil Sheridan	'74	5
Prince Allen	'73	3
Rose Medium	'78	5
Royal George	'74	9
Russian Spy	'78	7
Small Hopes	'77	6
Startle	'77	2
Star of the West	'72	2
Tommy Norwood	'81	4
Uncle Dave	'80	3
Vivandiene	'77	8
Wellesley Boy	'74	12
Westfield	'73	2
2:26¾		
Belle of Lexington	'81	3
Charley Green	'72	12
Corbin Bashaw	'81	8
Enchantress	'81	6
George H	'80	3
Gilbreth Knox	'69	2
Gus	'80	8
Herod	'76	5
Little Fred	'69	4
Lou Whipple	'77	8
Parkis	'74	7
Rachel	'71	12
Red Cross	'79	6
Taylor	'80	7

Mile heats in 2:27 to 2:40 were deserving of mention many years ago, but such has been the progress of special breeding that they have now dropped out of notice.

We close this record by the best time made with miscellaneous distances, which are indeed of equal value with mile-heats in trotting, especially from a utilitarian point of view.

TWO MILES—TROTTING.

1831—Top Gallant, Philadelphia, to saddle, 5:19¾.
1840—Edwin Forrest, Philadelphia, May 6, to saddle 5:05.
1847—Lady Suffolk, Long Island, to saddle, 5:03.
1852—Lacony, Long Island, to saddle, 5:02.
1853—Lady Franklin, Long Island, wagon, 5:11.
1859—Flora Temple, Eclipse Course, L. I., Aug. 16, in harness, 4:50½.
1860—Geo. M. Patchen, Union Course, L. I., June 14, 4:53¼.
1865—Dexter, Long Island, to wagon; 4:56¼.
1867—Dexter, Fashion Course, L. I., in harness, June 14, 4:51.
1870—Dreadnaught, Fleetwood Park, N. Y., June 29, in harness, 4:59½
1872—Tennessee, June 11, in harness, 5:00.
1880—Steve Maxwell, Rochester, N. Y., 4:48½.

THREE MILES—TROTTING.

1827—Screwdriver, Philadelphia, to saddle, 8:02.
1832—Columbus, Long Island, to saddle, 8:00.
1839—Dutchman, Hoboken, N. J., to saddle, 7:32½.
1841—Lady Suffolk, Philadelphia, to saddle, 7:40½.
1853—Pet, Long Island, to wagon, 8:01.
1864—Stonewall Jackson, Long Island, in harness, 7:39.
1872—Huntress, Brooklyn, in harness 7:21¾.

FOUR MILES—TROTTING.

1836—Dutchman, Long Island, under saddle, 10:51.
1869—Longfellow, to wagon, 10:34½.

FIVE MILES—TROTTING.

1863—Lady Mac, to wagon, 13:43¾.
1874—Lady Mac, in harness, San Francisco 13:00,

TEN MILES—TROTTING.

1844—Fanny Jenks, in harness, 29:59.
1853—Prince, Union Course, L. I., Nov. 11, in harness, 28:08½.
1858—Julia Aldrich, San Francisco, in harness, 29:04½.
1860—Capt. McGowan, Cincinnati, in harness. 28:11½.
1868—John Stewart, Boston, to wagon, 28:02½.
1878—Controller, San Francisco, in harness, 27:23¼.

TWELVE MILES—TROTTING.

1830—Top Gallant, Philadelphia, 38:00.

FIFTEEN MILES—TROTTING.

1874—Girder, San Francisco, 47:20.

TWENTY MILES—TROTTING.

1848—Trustee, Union Course, L. I., in harness, 59:35½.
1855—Lady Fulton, Centerville, L. I., in harness, 59:55.
1855—Trustee, Union Course, in harness, 59:35½.
1865—Captain McGowan, Boston, in harness, 58:25.
1868—John Stewart, Fashion Course, L. I., in harness, 58:30.
1868—John Stewart, Boston, to wagon, 59:23.

FIFTY MILES—TROTTING.

1835—Black Joke, Providence, R. I., in harness, 3h, 57m.
1846—Ariel, Albany, N. Y., in harness, 3h, 55:40½.
1855—Spangle, to wagon, 3h, 59:04.

ONE HUNDRED MILES—TROTTING.

1845—Fanny Jenks, Albany, N. Y., May 5, 9h, 38:34.
1846—Fanny Murray, Albany, N. Y., May 15, 9h, 41:26.
1850—Kate, Centerville. L. I., June 7, 9h. 4 : ¾.
1853—Conqueror, Centerville, L. I., Nov. 12, 8h, 55:53.

ONE MILE—PACING.

1855—Pochahontas, Long Island, 2:17½.
1868—Billy Boice, Buffalo, 2:14½.
1879—Sleepy Tom, Rochester, 2:13½.
1879—Sleepy Tom, Chicago, 2:12¼.
1871—Little Brown Jug, Hartford, Conn., 2:11¾.

TWO MILES—PACING.

1850—James K. Polk, Philadelphia, 4:57½.
1853—Hero, Long Island, 4:56½.

THREE MILE PACING.

1843—Oneida Chief, 7:44.
1847—James K. Polk, 7:44.

FASTEST RUNNING RECORD.

½ mile—Olitipa, Saratoga, N. Y., 1874, 0:47¾.
¾ mile—First Chance, Philadelphia, 1876, 1:15.
⅝ mile—Bonnie Wood, Saratoga, 1878, 1:02¾.
1 mile—Ten Broeck, Louisville, Ky., 1877, 1:39¾.
1⅛ miles—Bob Wooley, Lexington, Ky., 1875, 1:54.
1¼ miles—Charley Gorham, Lexington, Ky. 1877, 2:08½.
1¼ miles—Mollie McCarthy, San Francisco, 1879 2:08½.
1½ miles—Tom Bowling, Lexington, Ky., 1874, 2:34¾.
1⅝ miles—Ten Broeck, Lexington, Ky., 1875, 2:49¼.
1¾ miles—Courier, Louisville, Ky., 1877, 3.05¼.
1¾ miles—One Dime, Lexington, Ky., 1879, 3:05¼.
1¾ miles—Irish King, Louisville, Ky., 1879, 3:05¼.
2 miles—Ten Broeck, Louisville, Ky., 1877, 3:27½.
2⅛ miles—Aristides, Lexington, Ky., 1876, 3:45½.
2¼ miles—Preakness and Springbok, Saratoga, 1875, 3:56¼.
2½ miles—Aristides, Lexington. Ky., 1877, 4:27½.

3 miles—Ten Broeck, Louisville, Ky., 1876, 5:26½.
4 miles—Ten Broeck, Louisville, Ky., 1876, 7:14¾.

DOUBLE TEAM TROTTING.

The first gentleman's team race took place Jan. 7, 1836. It was for a stake of $100 each, winner to receive the entire stakes; two miles and repeat, on Centreville Course, Long Island. It was won by Mr. G. T. Wilson's team, Jerry and Blackbird, in straight heats, beating Dutchman and mate, Yankee Doodle and mate, and three other teams. Time, 6:27, 6:30.

The next remarkable team race was made by the famous Lady Suffolk and Rifle in 1842, over the Hunting Park Course, Philadelphia, when they distanced Hardwood and Apology the first heat, two miles in 5:19. This feat stood long on the books as the best of its kind. Hiram Woodruff, in commenting upon it, states that notwithstanding Mr. Bonner's team twenty years afterwards surpassed this performance, its excellence should not be lost sight of, as the team had had no practice together. From the year 1842 until 1856, driving in double harness does not appear to have been much in vogue. There was a match between Lantern and Whalebone vs. Stella and Alice Grey, June 5, 1855, at the Union course, Long Island, which was easily won by Lantern and mate; time, 2:46¼, 2:42½.

Nov. 3, 1856, Lantern and Don beat black mare Belle of Saratoga, and black gelding John Irving, over the Union Course, Long Island, a match race $2,000 time 2:43¾, 2:41½, 2:42½.

Nothing worthy of note occurred with teams from 1856 until the fall of 1859, when Hiram Woodruff and Capt. Rynders took the Widow Machree and Frank Temple to Boston, and were beaten by Ad Carpenter's Telemachus and Nellie Holcomb. The first two heats were won by Hiram's team, and it is said Dick Doree bet $100 to $5 nine times in succession on the Widow and mate, who lost the next three heats in 2:42, 2:44½, 2:44. William Whelan's team was distanced in the third heat.

The notable team race of the following year was at Louisville, Ky., where Miller's Damsel and John Watts defeated Bolly Lewis and Ike Cook in straight heats—time, 5:30½, 5:19½.

Another race of this year is entitled to be mentioned as it appears to be the first one in which 2:40 was beaten in a race of mile heats. Horace Jones' team Putnam and mate, beat Jim and mate.

The year 1862 marks an epoch in team trotting. Mr. Robert Bonner drove his world-renowned pair, Lady Palmer and Flatbush Maid, to a road wagon, in public, over the Fashion Course, L. I., one mile, in 2:26, May 10th, and on the 13th of the same month, under similar conditions, they were driven by him two miles in 5:01¼, the second quarter of the second mile in thirty-three seconds. On both occasions they were taken out of his private stable untrained and unprepared for such trials. The mile event remained unbeaten by any gentleman driver until Mr. Vanderbilt drove Small Hopes and Lady Mac in 2:23, and the two-mile performance stands the best of its class until the present day.

Dan Mace subsequently put Ethan Allen and Honest Allen together and they beat Simon Bound's Toronto Chief and mate on Fashion Course, L. I., at the annual fair, in 2:33—last half in 1:15. It is also a duly accredited performance by many gentlemen who were present, that Ethan Allen and Honest Allen were driven by Dan Mace, at private trial, as a team, in 2:25 and repeated in 2:23.

The next event in the annals of team-trotting was on June 11, 1867, when Mr. Joseph Harker's team, Bruno and Brunette, driven by John Lovett, trotted to road-wagon over the Fashion track in 2:25¼. This very creditable mile belongs to the category of private trials.

The year 1865 developed some very good team races. A black mare called Jessie Wales was found to be a very clever performer to the pole. She got into the hands of B. S. Wright, and as he was always quite a match-maker, he kept the boys busy finding teams to beat her and mate. These team races were continued with unflagging zeal and varying success, until the year 1871, when it was ascertained that George Wilkes and Honest Allen had all other teams at their mercy. Herewith is appended a summary of the best records of each year during this period:

Date.	Place.	Time.	Team.
1867, Sept. 20.	Boston, Mass....	2:32	Jessie Wales & Ben Franklin.
1868, July 31..	Buffalo, N. Y....	2:32¾	Medock and Nabocklish.
1869, June 16.	Boston, Mass....	2:33	Honest Allen & Myron Perry.
1869. June 16.	Boston, Mass....	2:32	Rubber Ben and Lady Walton.
1869, Sept. 30.	Milwaukee, Wis.	2:31¼	India Rubber Ben and mate.
1869, Sept. 30.	Boston, Mass....	2:29¾	Jessie Wales & Honest Allen.
1869, Oct. 5...	Cranston, R. I...	2:30	Blk. Harry & Belle Strickland.
1870, May 31..	Brooklyn, N. Y.	2:29	Kirkwood and Idol.
1870, June 9..	Boston, Mass....	2:32½	Kirkwood and License.
1870, July 21..	Brooklyn, N. Y.	2:30	Kirkwood and Honest Allen.
1870, June 22..	Cranston, R. I...	2:27¾	Jessie Wales and Darkness.
1870, June 22..	Cranston, R. I...	2:28½	Kirkwood and License.
1871, July 4...	Boston, Mass...	2:28	Geo. Wilkes & Honest Allen.

Subsequent to this nothing of note ocurred till 1877, when Mr. W. H. Vanderbilt drove Small Hopes and Lady Mac a mile to road-wagon on Fleetwood Park track in 2:23.

In 1877 the technical record was also beaten by Gen. Cobb and Lulu McCord trotting a third heat at San Francisco, Cal., in 2:26½.

For three years no team succeeded in beating this record, until June 10, 1880, W. H. Doble drove Nigger Baby and Mollie two heats to beat 2:27, at Belmont Park, Philadelphia, and gained a record for them of 2:26½, 2:25½.

For four years, although often attempted by both professional and amateur reinsmen, no team was found able to beat the 2:23 of Small Hopes and Lady Mac, until Sept. 23, 1881. Mr. John Shepard, of Boston, drove his new team, Mill Boy and Blondine, at Beacon Park, a mile to his road-wagon in 2:22, and, being, for a valuable consideration, over one of the National Association tracks, it now stands the best time on record.

The owners of New York teams were anxious to

maintain Gotham's supremacy and were not content to let all the glory center in the Hub. Mr. Foster Dewey's team, Boston and William H., showed 2:23 and 2:22¼. Mr. T. C. Eastman drove Capt. Jack and Glendale in 2:24. Mr. Vanderbilt let Dan Mace commence driving William H. and Lysander, and they on two occasions trotted in 2:20. But Mr. Frank Work's team, Swiveller and Edward, capped the climax Sept. 27: when driven by Dan Mace, they trotted at Fleetwood Park to a top-wagon in 2:19½.

Spelling Reform. A consistent mode of spelling in the English language would save the people not only several years of the most precious time of their youth, but also an infinite amount of vexation through life. We may say that the difficulty of learning any system is in direct proportion to the square of the number of its rules, including the cross-rules and exceptions which generally characterize "systems" that have grown from chance, instead of being invented by sensible thinkers. Thus, for example, a system of short-hand which has three times as many rules, cross-rules, etc., as another system, would be three times three, or nine, times more difficult to learn, such is the law of memory. Now, what is called the "spelling reform" simply proposes to dispense with the scores of rules and thousands of exceptions which exist in our orthography; and the reform is actually inaugurated, as it is taught to some extent in many of our modern school-books and practiced by hundreds of the newspapers. Of course there is opposition, as there always is to any good thing that might be proposed; but, fortunately for this cause, there is almost perfect unanimity among the scholars of the land in favor of the immediate adoption of a compromise but transitional system of reformed orthography. The following sentence gives an example of what can be done without at all interfering with legibility among even the most plodding class of readers:

"Tho I laft at ur tho'ts az u exprest them last nite, I dout not u wer rite, az u alwayz hav bin in such matrz. Meny pepl in this naborhood wer, sum yearz ago, and ar stil, ov our opinion."

The above example is not perfectly phonetic; but after the people became familiar with this style they could the more easily glide into a strictly phonetic system, which necessitates the use of three or four new characters. This is thought by many to be far the greatest educational reform of the age.

Spices. All the substances classed as spices are the produce of tropical climates only; none of our native plants, and no plants that come to maturity in the open air in this climate, possess sufficient aromatic flavor to be reckoned among the spices. The most valuable of these natural productions were originally found in the islands situated in the Indian Ocean, called the Spice Islands, or Moluccas, and were probably conveyed from them in the most distant ages. The spices which the queen of Sheba presented to Solomon were unknown in Palestine, and probably came from Ceylon or some of the islands to the east.

The delicious aromatics of tropical regions were highly prized by the ancient nations; and, besides spices, we read of frankincense and myrrh, from the East, as ranking among their most esteemed luxuries. The wealthy Romans indulged in these to an extravagant degree. As navigation and the means of intercourse between distant nations improved, from the facility of transport, they found their way, as articles of traffic, to countries very remote from the places of their production.

The foreign spices in common use in the United States are pepper, cinnamon, cloves, nutmeg, mace, ginger and allspice. Black pepper is the fruit of a species of climbing vine, a native of the East Indies. (See Pepper.) Cinnamon is the inner bark of a tree, a native of Ceylon and several Oriental countries, as China, Borneo, etc., but it is now cultivated in the West Indies and South America. Cloves are the fruit, or rather the calyx of the unexpanded flowers of the clove tree. The tree is a native of the Malacca Islands. The clove is described "as a tree of noble height, somewhat like the bay, and composing by the beauty of their form, the luxuriance of their foliage, and the spicy fragrance with which they perfume the air, some of the most delightful objects in the world." The nutmeg is also a native of the Spice Islands. The tree is not unlike the pear tree and bears fruit all the year round. The exterior part of the shell is a pulpy substance; within this is a thin shining black shell surrounded by membranous layers, which constitute another of our spices, the mace, and within this shell is the nutmeg. Ginger is the tuber of a plant which is a native of the mountain Gingi, in Hindostan: whence the name. It was carried from India to South America and the West Indies. Allspice is the berry of a handsome tree that grows to the height of 20 feet in the last named countries. It combines the flavor of cinnamon, nutmeg and cloves, and hence known as allspice.

We wish to remark that any and all of the spices that are ground in factories and sold throughout the country, both in bulk and in small packages, are invariably impure,—at least none have ever been analyzed and found free from adulteration. Therefore the only way to obtain the pure article is to purchase the unground.

Spider, an eight-legged animal akin to insects in its general appearance, but, as science now restricts the terms, is not a true insect. Spider bites are poisonous; for remedy, see Bite of Rattlesnake, etc., page 101 The term "spider" also denotes a skillet or frying-pan.

Spigot (spig'ot), a pin or peg used to stop a faucet, or to stop a small hole in a cask of liquor.

Spinach, early greens, something like beet tops. For summer use sow in early spring, in drills eight inches to one foot apart, covering the seed one inch deep. A succession may be obtained by sowing at intervals of two weeks. For very early spring use,

sow in August, and protect during the winter by covering with straw. The varieties are the Round-seeded Savoy, the New Zealand, the Prickly-seeded, the Round-leaved and the Extra Large Round-leaved. The Prickly-seeded is the hardiest and best for early fall sowing, and the Round-leaved is the best summer variety.

To Cook Spinach. Wash and clean the spinach thoroughly from grit, then boil it in salt and water; press the water entirely out of it and chop it as fine as powder. A quarter of an hour before serving put it into a saucepan with a piece of butter mixed with a tablespoonful of flour and half a tumblerful of boiling water, some salt, pepper, and nutmeg, and let it simmer 15 minutes. Serve with hard-boiled or poached eggs on the top. Some serve also with drawn butter.

Spit, in horticulture, a spadeful of earth.

Spleen, a spongy, honey-comb-like organ comprising numerous little ones and multitudes of minute vessels, and lying along the left side of the stomach of some of the higher order of animals. It is one of the few organs whose precise function has as yet baffled scientific research; but has been supposed to serve as a reservoir for any excess of fluid which the stomach receives and does not immediately require for any purpose of digestion. It is sometimes very much enlarged, and has even been known to be ruptured; but does not appear to be often or seriously the seat of disease.

Splenic Fever, the modern name of Texas fever, a cattle disease; see page 238.

Splint, a small bony enlargement on the fore-leg of the horse; see page 806.

Sport, a freak or extraordinary form of a plant or animal which lasts for only one generation and does not constitute a variety.

Sprains and Bruises. To treat these, apply warm-water compresses or hot fomentations of bitter herbs and vinegar. When the pain and swelling are considerably reduced by these means, apply arnica liniment, or some of those recommended on page 944 of this volume, or some of the preparations prescribed for rheumatism, page 1099. Some prefer to use arnica from the first, and this is advisable when there is no inflammation.

Spray, of ornamental trees, the twiggy or leafy expansions of the outermost branches. A "spray drain" is one made by laying under the earth the spray of trees, which keep passages open.

Spring, a natural fountain. The more perennial or constant the flow of a spring, the deeper in the earth is the source; but this has nothing to do with its purity. Springs from deep sources are often too mineral for ordinary use, and those which run only during wet seasons give nothing but surface water, which also is more or less impure, sometimes very deleterious, or even dangerous.

Squash. Squash vines, as well as all other vines of the order, delight in a warm and rich soil. Prepare the ground by thoroughly pulverizing; manure at the rate of ten to fifteen wagon loads to the acre, working it just under the surface with the cultivator or gang plow; plant in hills nine to ten feet apart for running varieties, and five or six feet apart for bush sorts; work some fine rich manure into each hill; leave two plants to the hill; keep well covered with plaster or air-slacked lime in early stages of growth; wire-gauze cages may be used to keep off the bugs; or, the common striped squash bug may be kept away by frequently throwing dust at them as they appear on the vines; cultivate frequently until the runners are well started; to provide against bugs, freezing etc., plant two or three times as many as will finally be wanted.

Varieties. *Hubbard.* The standard winter squash.

Boston Marrow. A standard fall squash, of a rich orange color and very productive.


Early White Bush Squash.

American Turban. Decidedly the best of all fall squashes.

Butman. A comparatively new variety similar to the Hubbard, of a bright, grass green color, intermixed with white; flesh is of a lemon color and very fine grained.

Marblehead. Light blue, with remarkably delicious flesh.

Summer Crook-Necked. Early; fine for summer use.

White Early Bush. The earliest sort.

Cambridge Marrow. Earlier than the Boston Marrow; the skin has a remarkable deep, orange color, which renders it very attractive; popular with market men; quality hardly up to Boston Marrow.

Cocoanut. A half-bush variety of small size, but remarkably heavy and very prolific, fine-grained and very rich, having a chesnut-like flavor; worth raising as a parlor ornament.

Yokohama. Has the flavor of the crook-necked class, but is finer-grained and much superior in quality.

Mammoth Yellow. Has been grown to weigh from 100 to 300 pounds.

Canada Crook-Necked. The small well-known excellent kind.

Large Winter Crook-Necked. The old standard sort and one of the best of keepers; cross-grained.

Round Warted Marrow. Medium size, flesh orange and of good quality, skin bright red, covered and netted with gray warts.

Bush Scallop. Of this there are two kinds, the yellow and the white; both early and fine squashes.

Other kinds are advertised by seedsmen.

To Cook Winter Squash. Cut it in pieces, take

out the seeds and pare as thin as possible; steam or boil until soft and tender. Drain and press well, then mash with butter, pepper, salt and a very little sugar. Summer squash may be cooked the same way; if extremely tender they need not be pared.

Stable. See article Barn.

Stack, a large quantity of hay, wood, straw or corn piled up in a circular or regular form. See article Hay, page 645.

Stag. In natural history the stag is the male of the red deer or hind. It is also sometimes applied incorrectly to a colt or filly. As we understand the term, it is only used to denote a male animal castrated after he has attained near or full maturity. Frequently applied to animals of the ox kind, which are castrated at such an age as to preclude their gaining the full size of an ox. In commercial parlance, used to designate an outside irregular dealer in stocks, not a member of the exchange.

Staggers, a serious nervous disease of the horse: see page 806. Also, a similar disease of the pig, for which see Swine.

Stains. To remove stains of various kinds and from various articles we append the following practical directions. See also Gloves and Silk.

Methods of Removing Various Stains. Fruit-stains, wine-stains, and those made by colored vegetable juices, are often nearly indelible, and require various treatment. Thorough rubbing with soap and soft water; repeated dipping in sour buttermilk, and drying in the sun; rubbing on a thick mixture of starch and cold water, and exposing long to sun and air, are among the expedients resorted to. Sulphurous acid is often employed to bleach out colors. It may be generated at the moment of using, by burning a small piece of sulphur in the air, under the wide end of a small paper funnel, whose upper orifice is applied near the cloth. Coffee and chocolate stains require careful soaping and washing with water at 120°, followed by sulphuration. If discoloration has been produced by acids, water of ammonia should be applied; if spots have been made by alkaline substances, moderately strong vinegar may be applied; if upon a delicate article, the vinegar should be decolorized by filtering through powdered charcoal.

The Effect of Acids and Alkalies upon Different Colors. The effect of acids upon blacks, purples, blues (except those produced by indigo or Prussian blue), and upon all those shades of colors which are produced by means of iron, archil, and astringent substances, is to turn them red. They render yellows more pale, except those produced by annotto, which they turn to an orange color.

Alkalies turn scarlets, and all reds produced by Brazil or logwood, to a violet color; they turn green (upon woolen cloths) to yellow, and they give a reddish cast to the yellow produced by annotto. The effect of the perspiration is the same as that of the alkalies.

Spots occasioned by acids are removed by alkalies, and vice versa.

To Remove Fruit Stains. Spots caused by fruit are removed by sulphurous acid, or what is still better, by water acidulated with a little muriatic or oxalic acid, or salt of lemons; but care must be taken not to apply this liquid to colors that it will injure. A lighted sulphur match held under the stain will produce sufficient sulphurous acid.

To Restore the Color to Garments. Chloroform will restore the color of garments, where the same has been destroyed by acids.

When acid has accidentally or otherwise destroyed or changed the color of the fabric, ammonia should be applied to neutralize the acid. A subsequent application of chloroform restores the original color.

Spots produced by hydrochloric or sulphuric acid can be removed by the application of concentrated ammonia, while spots from nitric acid can scarcely be obliterated.

To Remove Alkali Stains from Garments. Spots produced by alkalies, such as soap-boiler's lye, soda, ammonia, etc., can generally be made to disappear completely by the prompt application of dilute acetic acid and a good deal of water.

To Remove Stains of Wine, Fruit, etc., after they have been long in the linen, rub the part on each side with yellow soap; then lay on a mixture of starch in cold water very thick; rub it well in, and expose the linen to the sun and air till the stain comes out. If not removed in three or four days, rub that off and renew the process. When dry it may be sprinkled with a little water.

To Take out all Stains Which are not Metallic. Mix two teaspoonfuls of water with one of spirit of salt (muriatic acid); let the stain lie in it for one or two minutes; then rinse the article in cold water. This will be found particularly useful in removing stains from white napkins.

To Remove Common Ink Stains. Ink stains may be readily removed from white articles by means of a little salt of lemons, diluted muriatic acid, oxalic acid, or tartaric acid, and hot water; or by means of a little solution of chlorine or chloride of lime. When the stain is caused by ink manufactured with logwood, a red mark remains, which may be removed by the application of a little chloride of lime. All strong acids and alkalies tend to injure the fabric; therefore, immediately the stains are removed, the spots should be well and repeatedly rinsed, in cold water.

To Remove Marking Ink from Linen. Dip the garment in a solution of 1 ounce cyanide of potassium in 4 ounces of water. After a few hours the stain will be obliterated. This is very effectual, but the mixture is highly poisonous, and should be carefully removed.

Ink Stains from Carpets. Ink stains can be removed from a carpet by freely pouring milk on the place, and leaving it to soak in for a time; then rub it

so as to remove all ink, and scoop up remaining milk with a spoon; repeat the process with more milk if necessary; then wash it off completely with clean cold water, and wipe it dry with cloths. If this is done when the ink is wet the milk takes all stains out of woolen materials instantly; but when it has dried, a little time is required.

Stallion. It is not our intention in this article to treat of the value of certain kinds of sires in the production of different grades of horses, nor of the importance of pure blood in the stallion, nor to discuss the power of the sire in transmitting his characteristics to the offspring, for these subjects have been thoroughly treated in the article Breeding, and on page 697 of the article on Horse. We only wish in this connection to discuss the training, care and management of the the stallion used as such, or devoted to service, and his potency at different periods in life to beget offspring, etc.

In reference to the training of a stallion during his colthood, the remarks made on page 700, under head of Care of the Colt, and those on page 702 and subsequent ones, under head of Breaking, are equally applicable to the colt designed to be kept as a stallion. Special training should begin, however, from the time it is intended to keep the colt as such, or any way as early as at the age of one year. It will require considerable time, a large stock of patience and close watching, to train the animal properly; but if this be done ample reward will be received for the labor, by his future usefulness and enhanced value as a sire. In beginning to train him he should be exercised in a close yard, first at the end of the halter, and at length without bridle or halter rein, and made to advance, to back, to circle, to describe the figure 8, to rear and come down at the word of command, to kneel, to sit on his haunches, to down, and, especially to come instantly to his keeper at the word of command.

His care and keeping should be of the best possible and his daily exercise enough to keep his mucles firm, certainly not less than eight miles a day during the season of service. However well trained the stallion, when it comes to actual service, there is always a time when he may refuse to obey. Then he must be made to do so at whatever cost, and to accomplish the object, the whip may be used to any extent sufficient to conquer him. Cut sharp and strong, but with temperate judgment. Do not rain a succession of blows. This will only make him fight. A few well-directed blows will generally suffice, if they are sharp and cutting. Do not be afraid of drawing blood. If it can be done at the first stroke, so much the better. Give him time to think before you strike the second time. Give him the order you wish him to execute. If there is the least hesitation, strike again, and so on until he is conquered. If he has been properly trained previously, he will handle nearly as easy as a gelding. If not, he may become a brute, dangerous for any man to handle. Above all, a stallion once trained, never intrust him to an incompetent keeper, and never allow a valuable one to be ridden during the season of hard service. If he travels from one station to another, or is otherwise exercised, it should be with a leading rein, the rider being on another horse.

The remaining portion of this article was written by Mr. J. H. Sanders, editor of the *Breeders' Gazette*, Chicago, Illinois. It appeared in that journal during the early part of 1882, and is so thorough, plain, and practical that we present it almost bodily. It is certainly one of the finest and most satisfactory articles on this subject yet published; and as Mr. Sanders is excellent authority on all matters pretaining to the breeding of stock we can safely present this as a standard article.

Grooming, Feeding and Exercising. The most frequent mistake made by inexperienced persons in the management of a stallion, and even by many who ought to know better, is the endeavor to have him in fine show condition by the time the season opens. To this end various drugs, nostrums, and roots are recommended; the horse is kept carefully housed, and closely blanketed; he is loaded with fat; his muscles become soft and flabby for want of exercise, and, although he may come out of the show yard at the opening of the season, looking "as sleek as a mole," and apparently in the very pink of condition, he is in reality not nearly so well fitted for service in the stud as he would have been had this fitting-up process been entirely dispensed with.

It may be laid down as a general rule, that a healthy horse needs no medicine whatever to put him in condition for the stud. The whole secret of successful preparation lies in a few words. Let him be well and regularly fed on healthy, nutritious food, with plenty of exercise every day, to keep his muscles firm and hard, and let him be well groomed, so that his coat may present a fine appearance. The skin should be kept thoroughly clean, by occasional washing and frequent brushing and rubbing. The mane and tail should be especially looked after, with reference to cleanliness of the skin. If very dirty, soap may be freely used in the cleansing process; and when this is faithfully attended to, there will be but little danger of having a fine tail or mane ruined by rubbing.

The food should mainly be good, sound oats—nothing is better; but this should be varied by an occasional ration of corn or barley; for horses, like men, are fond of variety in their food, and an occasional change of diet is conducive to health. Wheat bran as an invaluable adjunct to the grain ration, can never be dispensed with. It is the cheapest, safest, and best of all regulators for the bowels, and it is especially rich in some of the most important elements of nutrition. No specific direction as to the quantity of food can be given. Some horses will require nearly twice as much as others; and the quantity that may be safely given will depend somewhat upon the amount of exercise in any given case. Some horsemen recommend feeding three, and others four, times a day; but in either case no more should ever be given than will

be promptly eaten up clean. If any food should be left in the box, it should be at once removed, while the quantity at the next time of feeding should be reduced accordingly. As a rule, it will be safe to feed as much as the horse will eat with apparent relish; and then, with plenty of exercise, he will not become overloaded with fat. The hay, as well as the grain feed, should be sound, and free from mold and dust, and the stall should be kept clean, well lighted, and perfectly ventilated.

The amount of exercise to be given will vary somewhat with the condition and habit of the horse. If he is thin in flesh, and it is thought best to fatten him up, the exercise should be lighter than it otherwise would be; and, on the other hand, if there is a tendency to become too fat, this may be corrected by increasing the amount of exercise that is given. Draft horses should rarely be led or driven faster than a walk in taking their exercise, and will require much less of it than the roadster or the running horse; a moderate "jog" daily will benefit them. We are clearly of the opinion that in no one particular is there more faulty management on the part of lazy grooms and stable hands than in the matter of exercising stallions while doing service in the stud. They should not be walked nor jogged so long that they become jaded or wearied, but should have enough of it daily to keep the muscles hard and firm, the appetite good, and to prevent them from laying on an undue amount of fat. No draft horse, under ordinary circumstances, should have less exercise than three miles a day, and the roadster and running horse may safely have five miles, which in some cases should be increased to eight or even ten.

The point to be aimed at in the stable management of the stallion is to so feed, groom, and exercise as to keep the horse to the very highest possible pitch of strength and vigor. The idea which prevails among many stable grooms that feeding this or that nostrum will increase the ability of a horse to get foals, is sheer nonsense. Anything that adds to the health, strength, and vigor of the horse will increase his virility or sexual power, simply because the sexual organs will partake of the general tone of the system; and, on the contrary, whatever tends to impair the health and vigor of the general system, will have a deleterious effect upon the sexual organs. A healthy horse needs nothing but good food, pure air, plenty of exercise, with due attention to cleanliness and regularity in feeding and watering; and when all these things are attended to properly, the drugs and nostrums that stable lore prescribes as "good for the horse" would better be thrown to the dogs.

The Stall. For the use of stallions we like a box stall not less than twelve by eighteen feet, without any manger or rack whatever for the hay, and with a box snugly fitted in the corner for the grain. Many prefer that the feed boxes should be entirely detached from the stall, to be removed as soon as the horse is done eating. The hay is put on the floor, in one corner of the stall; and thus there is nothing—no projections, boxes, racks, mangers, sharp angles, etc.—upon which a spirited, restless horse may injure himself. If, in addition to these precautions, the sides of the stall be lined all around—doors and all—with stout boards, standing out at the bottom about one foot from the wall, and sloping upward and towards the wall for a height of three and a half feet, you will have a stall in which it will be well nigh impossible for a horse to injure his mane or tail by rubbing. In such a box the horse need not be kept haltered, and the owner may feel assured that the liability to injury is reduced to a minimum.

How to Control the Stallion. While the temper and disposition of the stallon are largely matters of inheritance, yet much depends upon the breaking and management. It is easier to spoil a horse than it is to cure him of bad habits, after these are once formed. If there is any appearance of a disposition to be "headstrong" and unruly, he should never be led out except by a bridle that will enable the groom to exercise the most perfect control over him. The one that we have found most effectual is made by taking an ordinary "snaffle" bit, with rings of moderate size, and with the head-piece made in the usual way; get a blacksmith to attach a well-polished, round, iron bar to the right-hand ring, by means of a small link connecting the bar and the ring; to the other end of the bar attach the usual sliding rein used on stallion bridles. Put the bridle on the horse in the usual way, and then, with the right hand on the bar, and the left on the bridle-ring next to you, press the bar back and the ring forward until the bar will pass through the ring in the left hand. This bar should be made just as long as it can be to admit of its being passed into the other ring in this manner; and the bit and rings should be so adapted to the size of the mouth and under jaw that, when a little pressure is brought to bear upon the rein attached to the end of the lever formed by this iron bar, the rings of the bit will be brough within an inch of touching each other. The leverage given by this appliance, when well fitted, will enable any one to hold the most unruly and headstrong horse in check. It is not necessarily severe when the horse behaves himself; and when he is not disposed to do this, he can very suddenly be brought back on his haunches by a moderate touch on the rein. When the bar is not needed, the rein to which it is attached may be passed over the head and down through the ring on the other side, instead of under the jaw. We have described this device fully, because it is cheap, simple and effective, and yet it does not appear to have been extensively used.

How to Prevent Accidents. It requires some skill and good deal of patience to teach a stallion how to behave himself properly when brought out to serve a mare. He should never be allowed to go upon her with a rush; but he should be led up on the near side of the mare, to within about ten to fifteen feet of her, and made to stand with his head towards the mare, about opposite her head; and, when he is ready, he

should be led towards her and made to commence the mount when at her side, instead of going, for a rod or so, with his fore feet sawing the air, as is often the case. By observing these directions, there will be but little danger of injury to the stallion by a kick from the mare when he is mounting, especially if a good man is at her head to prevent her from wheeling towards the horse when he approaches. The danger to the horse is always greatest when he is coming off, because many mares will kick then that will stand perfectly still when he is mounting. To obviate this, it is always better for the groom who holds the horse to seize the mare by the bits with his left hand at this moment, and bring her head around towards him by a sudden jerk as the horse is coming off.

But in most cases, indeed in all cases where there is not an absolute certainty that the mare will stand perfectly quiet, the hobbles should be used, and then there can be no danger. To make these, prepare two straps of very strong but soft harness leather, two inches in width, and long enough to buckle comfortably around the mare's hind pasterns. The buckle must be strong and well made; and in each of these straps there should be sewed a strong, flattened ring. Next, prepare a collar piece of two-inch leather, and about as large as an ordinary horse collar, so that the mare's head will readily pass through it; to this collar fasten, securely, two stout straps, each an inch and a half wide, and just long enough to pass down between the fore-legs, and reach the straps on the hind-legs; attach stout buckles near the ends of these straps, but far enough from the ends to leave room to adjust them to different-sized mares; buckle these straps to the hind-legs, and buckle up short enough to effectually prevent the mare from kicking, if she should be disposed to do so. All this can be adjusted in a moment's time, and by its use all danger from kicking is avoided.

When Mares Should be Tried. A point upon which there is a great diversity of opinion is, when and how often a mare should be tried after she has been served by a stallion. A mare will almost invariably be "in heat" on the ninth day after foaling, if she is healthy and has received no injury in giving birth to her foal; and in most cases it is best that she should receive the horse at that time, if it is desired that she should be kept for breeding purposes. We can remember when it was almost universal custom to try mares every week after they had been served, but that is not the present practice of most experienced horsemen. The rule that now receives the most general sanction is, not to try the mare again after service before the lapse of two weeks. We have taken a great deal of pains during the past four years to ascertain the views of prominent, intelligent, and experienced breeders upon this point, and we find them with very great unanimity agreeing that after the ninth day from foaling there is no regular period for the return of the heat; neither is the period uniform in duration. Some mares will appear to be in heat nearly all the time, while with others it recurs but rarely, and lasts but a very short time; consequently, if the mare, after service, goes out of heat within a few days, she should be re-served when she comes in again, even if that should be within nine days. But should the period not pass off, she should not be served again under eighteen days. As a rule, it is best to try the mare again from two weeks to eighteen days after service; and then, if she refuses the horse, she should be tried every week for some four weeks; and, if she fails to come in within that time, it will be reasonably certain that she is in foal. She ought to be closely watched, however, for some weeks afterward, because in some cases mares will pass over a period of one or two months, or even longer, without any appearance of heat, and yet not be pregnant. Again, there are other mares, and they are more numerous than one would suppose, that will appear to be in heat and will freely receive the horse when they are in foal, and even almost up to the time of foaling. Such mares are always very annoying, both to their owners and to the keepers of stallions.

For convenience in trying mares, it is best to erect the barrier parallel to and about four feet distant from a solid fence or wall, so that the mare will be compelled, when behind it, to stand with her left side toward the horse; and the barrier should be so substantially built that it cannot be kicked or pushed down. In many cases the only barrier used is a strong pole fixed about three and a half feet from the ground; but it is much safer and better to build up the space to that height, close and solid, with strong material of some kind, so as to lessen the danger from kicking or striking. This may be conveniently done by setting three posts firmly in the ground, about five feet apart, and nailing strong oak or other hardwood boards to these posts, on both sides, from the ground up to the required height, and then capping them over with a board of the same material. When trying the mare keep the horse well in hand, by the use of the bit previously described in this article, if necessary, and don't let him get his nose further back than to the mare's flank. If the stallion is a very valuable one, and is expected to do much service, it will be best to have another horse of but little value for a teaser, but when the service required is but light it will work no injury to the horse to let him do his own teasing. Occasionally a horse will be found to have such an aversion to a certain mare that he will refuse to serve her. In such a case it is well to bring into the same enclosure another mare that is in heat; and, when his amorous desire is aroused by her presence he can usually be made to serve the one that he had formerly refused.

The Number of Mares to be Served. The number of mares that a stallion may safely be permitted to serve during a season has long been a subject of discussion among horse breeders. It is generally held that the two-year-old stallion will be all the better for not serving any mares at all, that a three-year-old should be limited to fifteen or twenty services, and that a four-year-old should not go beyond twenty of

thirty. There can be no question that the use of the procreative powers by the unmatured horse tends to retard his physical development, and as a general rule it may be stated that there is no horse but what would be the better for absolute continence until he is fully matured.

But while this is unqestionably based upon sound physiological law, and is the true theory of perfect physical development in the male, there are advantages attending the earlier use of the stallion, to a moderate extent, that perhaps more than compensate for all the damage that may result from it. It is very desirable, at the earliest possible stage in the life of a stallion, to ascertain what his qualities as a foal-getter are likely to be, and with this object mainly in view we consider it wise to let the two-year-old serve a few choice mares,—merely enough to show the character of his get. We should, with the same object in view, permit him as a three-year-old, to serve a rather larger number, which may thereafter be increased with each succeeding year, until he is fully matured, when if properly taken care of with reference to food and exercise, one hundred mares may be safely served during the season. With the young stallion that is to serve but a few mares, we should perfer that these should all be served within the space of a few weeks—say two or three a week until his limit for the season has been reached—and then let him be withdrawn entirely from the breeding stud. He will soon forget all about it—will cease to fret after mares, and will have nothing to do but to grow until the next season. But when it comes to doing business with the stallion, he should rarely be permitted to serve more than twice a day; and even this should not be kept up for any great length of time. One a day during the season is better; but the groom cannot always do as his judgment dictates in this matter. If the horse has had a period of comparative abstinence, he may, if convenience demands it, serve three times in one day for a few days in succession; but this should not be kept up long, and a season of comparative rest for recuperation should follow this extraordinary demand. In the great breeding studs of Germany under government direction, it was long held that from 15 to 20 mares was enough for a stallion during the season; but the number has gradually been increased without perceptible detriment, until now the number frequently exceeds 100.

The number of mares that a horse serves during a season appears to have but little effect upon the percentage of foals begotten. We have no statistics bearing upon this subject in this country, but such as we have from the books of private keepers of stallions abundantly prove this position. The books of stallion service of Rysdyk's Hambletonian show the remarkable result as given in the following table, which gives the extraordinary large showing of 1,331 foals begotten by a single horse out of 1,930 mares served—an average of 69 per cent. of foals to mares served. His average of mares served from the time he was three years old up to the year of his death (not including 1868, when he did nothing) was about 83 mares per year.

Years.	Age.	No. of mares covered.	Per cent. of foals.	No. foals dropped
1851	2 years	4	.....	
1852	3 years	17	76	13
1853	4 years	101	78	78
1854	5 years	88	70	62
1855	6 years	89	72	64
1856	7 years	87	73	64
1857	8 years	87	72	63
1858	9 years	72	75	54
1859	10 years	95	70	66
1860	11 years	106	68	72
1861	12 years	98	69	68
1862	13 years	158	70	111
1863	14 years	150	61	92
1864	15 years	217	67	148
1865	16 years	193	67	128
1866	17 years	105	71	75
1867	18 years	72	58	42
1868	19 years	None (sick).		
1869	20 years	22	81	18
1870	21 years	22	72	16
1871	22 years	30	80	26
1872	23 years	30	80	24
1873	24 years	31	65	20
1874	25 years	32	75	24
1875	26 years	24	8	2
Total		1,930		1,331

The statistics of horse-breeding in Saxony, from 1856 to 1862, inclusive (seven years), also confirm the position above advanced. The returns for 1856 show that the stallions that served 90 to 100 mares each, produced a greater percentage of live foals than those that served any other number, except those that served from 30 to 40. In 1857, those that served over 110 mares each produced 25 per cent. more foals than those that served a less number. In 1858, those that served 60 to 70 mares got a larger percentage of foals than any other, except one that served less than 10. In 1859, the highest percentage belonged to those that served 50 to 60 mares. In 1860, the highest belonged to those that served over 90 mares; while those bred to 10 or less stood lowest. In 1861, those that served 80 to 90 mares lead, while those below 20 show the smallest percentage of foals. In 1862, 60 to 70 was the most productive, while those below 10 were the lowest in the percentage of foals produced. From this data, as well as from the general results in this country, so far as we can approximate them, it is safe to conclude that the number of mares served has no influence on the percentage of foals got, and that a horse properly treated may serve from 80 to 110 mares in a season with as large an average percentage of foals as one limited to less than half that number.

Effect of Age Upon the Fertility of a Stallion. Another point upon which there has been much discussion is, the effect which age has upon

the fertility of a stallion; and here again we are left without any official statistics of horse-breeding in our own country, and will resort to those of Saxony. For the years above quoted, 1856 to 1862, inclusive, we find the returns disclosing the following state of facts: In 1856, the average get of the stallions aged 6, 19, 12, 14 and 18 respectively, and in the order named, was the highest; while those aged 8, 9, 17, 16, 5 and 7 were the lowest. In 1857, those aged 4, 20, 14, 7 and 8 got the largest percentage, in the order named, while those aged 5, 9, 18, 17, and 6 were the lowest; and those aged 21, and 22, got more foals than those aged 5, 6, 9, 10, 17, and 18. In 1858, the highest average was produced by stallions aged 9, 10, 5, 6, 8, 14, 16, 20, and 22 years, and the lowest by those aged 18, 19, 4, 3, 13 and 7. In 1859, the percentage was nearly uniform for all ages. In 1860, those aged 17, 18 and 19, led the columns; while those aged 4, 12 and 9 were last. In 1861, the percentage was quite uniform. In 1860, a stallion aged 20 begot twice as large a percentage as one aged four; one, aged ten, stood the highest, while 16, 6 and 4 stood at the bottom of the list. The table above given of the get of Rysdyk's Hambletonian also shows that in his case age appearently had nothing to do with his fertility. Hence we conclude that, as in the number of mares served, so in the matter of age, the reproductive powers of the stallion appear to be almost entirely a matter of condition, and that age has no effect whatever upon the percentage of foals from a given number of services.

Effect of Age Upon the Quality of the Get of the Stallion. There has also been much speculation as to the comparative value of the foals got by a given stallion at different periods of life. The statistics of European horse-breeding throw but little light upon this subject, but our own turf and trotting statistics furnish us with abundant evidence to prove that here also the age of the sire has no effect.

To illustrate this point we give the following list of celebrated running horses, among the most distinguished, either as sires or performers, that have ever been produced in America, with the age of the sire and dam. The age of sire is given at the time of copulation, and that of the dam at birth of foal. The list is taken at random, from names that suggested themselves to us on account of their reputation either as sires or performers, and without reference to what the figures might show:

Name of Horse.	Sire Age.	Dam Age.	Name of Horse.	Sire Age.	Dam Age.
Sir Archy	27	9	Olitipa	18	10
American Eclipse	9	12	Spendthrift	17	15
Lexington	16	14	Duke of Magenta	24	8
Boston	18	19	Parole	18	11
Fashion	7	10	Harry Bassett	17	8
Duroc	28	6	Longfellow	13	12
Wagner	17	7	Preakness	16	14
Grey Eagle	6	11 or 12	McWhirter	6	9
Tom Bowling	19	13	Bramble	21	8
Ten Broeck	6	10	Fellowcraft	11	9
Aristides	18	5	Sensation	23	9
Foxhall	5	7	Iroquois	24	11

And the following with reference to celebrated trotters and trotting sires:

Name of Horse.	Sire Age.	Dam Age.	Name of Horse.	Sire Age.	Dam Age.
Rarus	13	10	Smuggler	8	....
St. Julien	14	8	Lucille Golddust	10	...
Goldsmith Maid	4	8 or 9	Huntress	9	12
Alexander Abdallah	2	....	Voltaire	4	12
Volunteer	4	4	Prospero	3	7
Hopeful	9	....	Dame Trot	4	8
Dexter	8	10	Elaine	8	12
Lady Thorne	11	....	Walkill Chief	15	7
Lucy	6	...	Orange Girl	21	13
Nutwood	5	5	Abbottsford	8	12
Maud S	9	9	Indianapolis	4	12
Hannis	10	...	Woodford Mambrino	18	8
Mambrino Gift	6	7	Wedgewood	5	16
Scotland	15	10	Rysdyk's Hambl'tn	23	...
Trinket	4	10	Mambrino Chief	18	....
Lula	14	9	Darby	10	6
Clingstone	9	6	Piedmont	6	11
Daniel Lambert	9	11	Edwin Thorne	7	11

Of the foregoing, Prospero, Dame Trot and Elaine have the same sire and dam; Nutwood and Maud S. are full brother and sister; Mambrino Gift and Scotland are both out of Waterwitch—the former by a six-year-old trotting sire and the latter by a 15-year-old Thoroughbred. Woodbine at eight years old produced Woodford Mambrino by a horse of 18, and when herself 16 she produced Wedgewood by a five-year-old stallion. Hambletonian got Dexter, his best son, at eight years old; Nettie, his next fastest by the record, when he was 16; and Orange Girl, who comes next, when he was 21. Volunteer got St. Julien (2 : 11¼) at 12 years, Gloster (2 : 17) at nine, and Huntress (2 : 20¾) at seven.

Percentage of Foals to Mares Served. Still another question of great interest to horse-breeders is this: What is the actual average percentage of live foals that a given stallion will get under average circumstances? In other words: What percentage of foals must a stallion get to entitle him to be classed as a reasonably sure foal-getter? And upon this there is often much loose assertion without any real array of facts to back it up. It is to the interest of stallion-keepers to make the largest possible showing in this respect, hence they often talk at random, and not unfrequently misstate facts. Perhaps in most cases actual falsehoods are not stated, but the parties do not care to know the exact truth, lest they may be compelled by self-interest to state an untruth. Hence they find it convenient never to make an exact estimate, and content themselves by saying, "Oh, he got nearly everything with foal." Now, from a very extensive correspondence with reliable breeders who keep accurate accounts of results, as well as from our own observation, based upon an experience of thirty years with many different horses, we are decidedly of opinion that the average indicated in the table of the get of Rysdyk's Hambletonian is considerably above the general average of stallions in this country.

But this question is removed beyond the realms of conjecture by the recorded results in the government breeding studs of Germany. There, the highest percentage of mares in foal was at the great Trakehnen establishment, in 1860, when the average was 80.2, and this is also the highest average throughout the entire series of years. But the average runs as low as 40 per cent., in 1874, at Wickrath, with only 33.3 per cent. of live foals, while several localities report

as high as 62.6 of live foals. The average result obtained from this great number of stallions and mares for so long a period, may safely be accepted as establishing a general law or rule that can be depended upon under like circumstances.

Taking the entire career of all the establishments reported from 1859 down to 1874, with an average of over 1,000 stallions and 42,000 mares per year, as above stated, we find the results as follows:

Average percentage of mares in foal	67.7
Average percentage of live foals dropped	53.3
Average percentage of mares aborted or miscarried	4.8
Average percentage of mares dying or not accounted for	9.6

[In this connection the table showing the number of stallions and the number of mares served at each of these German establishments, with the average percentage of mares in foal, and average percentage of live foals, is given in the *Gazette*.]

If the foregoing statements may be accepted as the general rule, we may state that the average stallion will make as much money for his owner by standing at $10 the season, as he will at $14.75 to insure a mare with foal, or $18.75 to insure a living foal; and that a horse that can show 53 living foals to 100 mares served, is an average foal-getter. Whether these figures will apply exactly to horse breeding as managed in this country or not is of course not definitely known; but they are so nearly in accord with the results of our own experience and observation that we have no hesitation in accepting them as substantially correct.

Management of the Stallion after the Season Closes. The condition of the stallion for the next season's business will depend largely upon the manner in which he is kept from the close of the present one until the next season commences. In most cases the period from the first of October to the first of March is one which the stallion is not called upon to do duty in the stud, and usually but little is done after July 1. It is a period of rest; of recuperation from the drain upon the functions of the sexual organs which service in the stud has required; but it should not be a season of pampered and overfed indolence, as is too often the case. When it is convenient to do so, the very best possible treatment that can be resorted to during this period is to put the stallion at light work. If a draft horse that has been—as they all ought to be—broken to work, let him be driven moderately alongside of a quiet mare or gelding, and worked regularly up to the first of February, and fed enough grain to keep him strong and healthy, but not fat. Oats will be much better food for him than corn; but if it is found that he is becoming too thin, or if the work is relatively heavy, corn may be used part of the time with good results. If the stallion is a trotter or a roadster, by all means drive him on the road. If you can use him regularly as a business horse, so much the better; and, as in the case of the draft stallion, feed him enough to keep him strong and hearty, and work him right along, as though you intended that he should earn his living. This we are satisfied from experience is the best treatment for stallions of any breed, and will result not only in bringing the horses to the beginning of the next season in better condition than any other, but the probabilities are that a horse so treated will get more and better foals than one that is not worked during this period.

But in very many cases, and especially in large breeding establishments, and with thoroughbred stallions, the course recommended above is practically out of the question. The next best thing, then, if the horse must perforce remain in comparative idleness during the period mentioned, is to provide him with a large paddock—the larger the better always—and let him have the run of it at all times during pleasant weather, stabling him only at nights and during storms; and, when kept under these conditions, it will be best to dispense almost entirely with grain food of all kinds. A run to grass during the late fall, if it can possibly be provided, will be one of the best things that can be had; but this will rarely be the case. The main reliance in most cases must be good hay; but when it can be had, we very greatly prefer corn fodder, as it furnishes a complete change of diet from what the horse has been accustomed to, a change that will prove highly beneficial to the general health of the horse. It reconstructs him, as it were, and makes a new horse of him, after a few months of such treatment; and is certainly the next best thing to the run at grass, before recommended. But while he is kept on this food, due attention must be paid to his bowels, lest he should become constipated, a condition that can usually be prevented, or remedied, should it occur, by the use of an occasional bran mash.

The necessity for this change in diet from grain to coarse and bulky food, like hay or corn fodder, is increased in proportion to the degree of confinement to which the horse must be subjected. There is nothing that will so soon destroy the health and vigor of the horse, and especially of his genital organs, as close confinement and high feeding; and the man who expects to keep his horse in show condition the year around will find that he has undertaken a difficult job. It will work in some cases for a year or two; but, like constant indulgence in intoxicating liquors in man, it will, in the end, sap the strongest constitution. A strong, vigorous animal may be able to withstand the deleterous treatment for a few years but it is only a question of time with the best.

Stamens, the male organs of a flower. There are generally a number of them, growing in a circle around the pistil or ovary and just within the corolla, or circle of petals. They consist of cells of a fertilizing powder, called "pollen," which matures in time to fructify the pistil when the latter has arrived at the proper stage. These cells, with their contents, are called "anthers," and they are nearly always elevated upon stems, called "filaments." Some flowers have no stamens, some have no pistil, and some have neither. The

number and character of the stamens are important marks in the study of botany.

Starch, a proximate vegetable principle contained in most plants, and especially abundant in the various grains, such as wheat, rye, barley, oats, rice, maize, etc.; in other seeds, as peas, beans, chestnuts, etc.; and in numerous tuberous roots, as those of the potato, the sweet potato, etc. The common starch is procured from wheat; when pure is very insipid, or without taste, and of a brilliant snow white. It will not dissolve in cold water, or when below 160°, but in water between that point and 180°, it thickens into a semi-transparent paste, which is the state in which it is employed in stiffening linen. The method of preparing it for this purpose is described on page 907.

Starch constitutes one of the principal nutritious constituents of all the farinaceous vegetables used as food. Under the name of corn starch a variety of starch obtained from the meal of corn is much used for nutritive purposes. Potato starch is prepared in various forms, generally, however, to imitate more costly substances, such as those made from arrow-root and sago.

Steam, the hot, elastic vapor of water. A notice of its many economical uses, and of the mighty achievements which have been effected by it in modern times as a motive power, and of the vast accessions of convenience and produce, and wealth which it now brings to man in traffic and manufacture, would possess surpassing interest, but does not belong to the design of our work.

Steel is an artificial combination of iron with carbon, though somewhat different from that which composes cast iron. When steel is made red-hot it is soft, and can be hammered and rasped into any shape; but if suddenly plunged, in its heated state, into cold water, it instantly becomes extremely hard. Files are made in this way. Steel is likewise brittle, but elastic; is susceptible of a better polish than iron, and is then less liable to rust than iron. To make it fit for edged or cutting instruments, it is "tempered." Great skill is required in these processes, by which different kinds and grades of steel are made, for various purposes. Thus, we have "cast," "shear," "silver," "blistered" and "Bessemer" steel and "wootz."

Steer, a young bullock or ox.

Stem, the part of a plant which rises from the root, and sustains the foliage, flowers and fruit. In some plants it is wanting; in others it is identical with the mere flower stalk; and in the others, it bears only part of the foliage, the rest being radical; but in all the more perfect ones, or indeed in the great majority of all sorts of phænogams, it comprises a great mass of important organism intermediate between the root and the inflorescence.

Stencil, a thin plate of metal, leather, or other material, or card-board, or even paper, with letters, patterns or figure work cut through them, for painting the same upon the flat surface to be marked. On the farm the principal use of the stencil is in the branding of sacks, barrels, boxes, etc., containing products for shipment.

Step-ladder, a ladder with steps instead of rounds, or a portable stairs. They are generally made self-supporting by a pair of standards hinged upon the upper end and extending to the ground.

Stew, to boil slowly. The word, however, is often applied to certain articles, cooked even with rapid boiling; as "stewed oysters," "stewed apples," etc.

Stifle Joint, the lower joint of the hind leg of a horse. It comprises the tibia, or lower bone of the thigh, and the patella or knee-pan; and it is much strengthened by some of the tendons of the strongest muscles of the upper part of the thigh passing into and over it, and co-operating with its own proper ligaments to give it force and tension.

Still: see Distilling.

Stings: see Insect Bites; and for stings on horses, see page 808.

St. John's-wort, a persistent, half-shrubby weed, which is common in some sections of the older Northern States. There are several species, all of which have willow-like leaves and clusters of yellow flowers.

Stock. The live-stock interests of the agricultural industry of our country has developed into immense proportions, and is constantly enlarging. The introduction of improved breeds of cattle, sheep and swine has made the business profitable, and our large area of cheap land, by enabling us to produce meats at comparatively small cost, has made us formidable competitors of European stock-raisers in their own markets. The breeding, raising and fattening of live stock, especially in the West, have been reduced to scientific exactness, and are in the hands of men who are more than ordinarily intelligent and enterprising. No industry pertaining to the farm is at this time upon a more solid basis, or more carefully prosecuted. The speculative spirit which at one time controlled the business, so far as improved breeds were concerned, has given way to sound commercial principles, and the animal sells for what it is worth, and not for what fashionable, not to say foolish, caprice asks for it. The result is that our fine imported cattle, hogs and sheep, or their descendants, instead of being confined to those farms whose owners have more money than judgment, are very generally scattered over the country, and are within the reach of the humblest farmer in the land. It is not the lack of money but the want of enterprise that in these days shuts the gate of any stock yard against the entrance of the best breeds. The markets of the world are open to and eager for American meats, and ordinary wisdom suggests to us that our interests lie in the direction of furnishing what the markets call for. Farmers can not sell scrub stock to advantage, even at home, and it is thoroughly unmerchantable in Europe. To compete with the fine meats of England we must produce the very best and

produce it at a less cost than they can do it there; and this farmers of this country can do. English stock-raisers are jealous of the American product, simply for the reason that it is as good as theirs and can be sold cheaper. They do not hesitate to say that our cattle kill as well as theirs, and their only hope of saving themselves from ruin is to induce their government to place such restrictions upon the sale of American meats as to seriously embarrass our shippers.

There were reported to be in the United States January 1, 1882, thirty-three million, two hundred and thirty-four thousand, five hundred cattle, thirty-eight million, one hundred and twenty-six thousand swine, and thirty-four million, seven hundred and sixty thousand, one hundred sheep,—figures of such dimensions as to create profound astonishment, and yet they are small as compared to what the future will produce. Our country is a new country, and but very partially settled. Millions of acres are yet untouched by an implement, and even unpressed by a human foot. From ocean to ocean and from Canada to the Gulf of Mexico, every foot of farming land will some time be occupied, while in the older sections of the country, the population will double, treble, and perhaps quadruple. There is no doubt whatever that this country will yet contain a population equal to the present entire population of the globe. The world is pouring its intellect and its muscle into the Republic of the West, and it will continue to do as long as it remains "the land of the free and the home of the brave," and as long as America furnishes better inducements for labor than is furnished in the crowded, and in some cases, exhausted communities of the Old World. We have most thoroughly treated of all the different kinds of stock under their respective heads, and under those of Breeding and Feeding Animals, to which we refer the reader.

Stock Farmer, a farmer whose business mainly consists in rearing live stock.

Stomach, one of the principal organs of digestion. It is a musculo-membranous reservoir, continuous on the one side with the œsophagus, and on the other with the duodenum. It owes its digestive powers to an acid liquid, the gastric juice, which is secreted by innumerable follicles in its internal coat, and the action of which upon the various elements afforded is similar to prolonged boiling in water. Such is the power of this fluid that it is capable, even out of the body, of converting food into chyme; and if the stomach be deprived of the vital principles which enables it to resist its action, it will eat away the stomach itself.

Stook, a small stack of grain as first set up in the field, commonly called "shock" in the West and South. Both these words are also used to denote the action, as, "to stook," "to shock."

Stool, in an agricultural and horticultural sense, signifies the collection of stems springing up from one root or seed, as wheat, raspberry, etc.; also, the root or stem of a tree or plant cut off near the ground, from which shoots spring up.

Storm: see Weather.

Stove. This form of furnace, as we may term it, has within the last half century come into almost universal use throughout Christendom; and, as it has become almost a necessity in housekeeping, we call attention here to the most important practical points concerning it. Whether for cooking or for heating a room, most persons have stoves with which they find some fault, and in which they could make some improvements. Probably the chief reason is, they buy stoves which are cheap—cheap because they are faulty. Many stoves are purchased at "second-hand," or at least *as* "second-hand," so classed on account of their defects. These stoves often appear as good as new; but, although some of them are worth as much or more than their purchase money, their owners or the other members of the household often wish the stoves had not been bought. It is almost impossible for one to so inform himself in "stove science" as to be able to select infallibly a good stove by mere ocular inspection.

THE DRAFT. A good draft is secured more by a proper form of the chimney than of the stove. The two essential principles for insuring a good draft are: first, that no part of the flue, or smoke channel, should be any smaller than any point below it; and, secondly, that there should be no lateral apertures to the flue. Have the whole length of the smoke channel as large as the throat at the stove, or slightly larger as it ascends, and have no leaks into it from the external air, and you have a good draft. The rear part of any stove, as well as the pipe and chimney, should be as nearly air-tight as practicable.

DAMPER. No damper should be so arranged or worked as to cut off the free upward flight of the smoke and heavy gases. Carbonic-acid gas, for example, is much heavier than smoke, and a damper in the stove-pipe even partially closed will press out such gas into the atmosphere of the room. Only three per cent. of carbonic-acid gas in the air we breathe is sufficient to destroy life in a few minutes. One can distinguish it by its heavy and oppressive odor. No damper should be allowed in the stove-pipe at all; it is not the place for it, nor indeed anywhere above the fire. All "damping" should be done by cutting off the draft in front, or by letting in air above. By the latter process one must be careful not to so weaken the draft that the deadly gases cannot be drawn up. Dampers are required for both cooking stoves and heaters, to turn the current of heated air through the base of the stove.

LINING. The chief fault in "brick lining," especially in a second-hand stove, is its liability to fall in or tumble down. It is difficult, if not impossible, to so adjust the pieces that they will stand much hard usage. Some stoves, as the self-feeding base-burners, have not the disadvantage of wanting brick lining. When one wishes to renew the lining of a stove, he can get the proper material at the hardware stores and apply it himself. The process is very simple, and directions accompany each package.

HEAT-FENDER. Working much over a heated cooking-stove is both disagreeable and unhealthful. The best method of guarding against this exposure is to have a ventilating shaft over the stove and extending like a chimney up through the roof. What is called the "Hite Heat Fender" is a large shaft which comes down to the floor all around the stove, made neat and ornamental like a piece of furniture, and with a door on one side, which is opened only when it is necessary to attend to something on the stove. Inside of this shaft-base pegs are put up all around, containing all the utensils, cloths, etc., necessary to be used about the stove,—an arrangement far more convenient than the ordinary system.

TO MEND CRACKED STOVES. Mix equal parts of wood ashes and salt into a paste with water and fill in the cracks; it will soon get hard and close the crack with what is known as a rust joint. For cast iron that is not heated, a cement is made of fine filings of cast iron wetted with a solution of sal ammoniac and made into a paste with flower of sulphur.

OIL-CLOTH FOR STOVES is better than zinc. While it is fully as effectual in protecting the carpet or floor underneath against heat, it is much easier to keep bright and clean. Wash it with warm suds, then with warm milk and water, wiping with a soft cloth.

STOVE POLISH. To polish a stove, mix the carburet or polish with water to the consistence of thick mortar, put it on the stove when the latter is cold, with a woolen cloth or brush, and while it is drying brush it rapidly with an old broom. This is hard work, but it produces the most satisfactory results. Peddlers sometimes bring to the house an apparently new sort of polish which is easy to apply and requires no rubbing; but after he is gone the polish seems to work no better than other kinds. There are at least three causes of this, two of which may be considered "tricks of the trade," namely: 1. The peddler makes his exhibit by applying his polish only to those exposed parts of the stove legs, hearth, etc., which have been worn smooth and bright by shoes rested on them, while on the rougher portions the new composition does not apply any better than other kinds, if so well. 2. The peddler may have his packages different from one another, or the tops only of all of them finished off with good polish, or at least with that kind of substance which is good for effecting a sale. 3. Most kinds of stove polish lose their quality with age.

Some housekeepers succeed in keeping their cook-stoves a shiny black all over by rubbing them with grease and never allowing them to become hotter than is necessary for good cookery; and the best cooking, in fact, is done by a moderate fire.

When a stove is set away in the spring, to remain unused until fall, it should be rubbed all over with kerosene, to keep it from rusting.

IN STARTING A COAL FIRE be sure to clean all the ashes out of the grate. If you have hard wood with a little soft wood to start it, you had better use no paper, for it chokes the draft. Light your wood and when it is well going put on the coal. Be sure your coal is clean, and put on only a little; when that is quite red add more. But the secret of keeping your fire good all day is not to overload it. As soon as the fire is started in the kitchen, empty what water may have been left in the kettle from the day before and fill with fresh water, place it over the warmest part of the stove until it boils, and then remove it further back. Shut up the front and back drafts so as to get the good of it. Watch your fire from time to time: it will no more take care of itself than a baby will. Before adding more coal clear away the ashes from the grate. In self-feeding hall stoves be very particular not to have any paper or chips of wood mixed with the coal, for they heat without burning and generate carbonic acid gas, which is neither pleasant nor wholesome.

OIL AND GASOLINE STOVES. These are great conveniences where but little cooking is required, especially in hot weather. Considerable care is required to prevent filling the room with kerosene vapor and a sooty odor from the oil (or kerosene) stoves. Good fresh oil should be used, the wicks kept evenly trimmed, and the whole stove, inside and out, kept clean. By this means, most of the foul odor will be prevented. Gasoline stoves are much neater, but they yield an odor,—not, however, quite so disagreeable as that from kerosene. But gasoline is much more dangerous to handle. All such volatile oils are safe enough in the hands of those who fully understand their nature, but the latter is especially hazardous to the unskilled, and it is from the use of it that most of the dreadful accidents occur. See Kerosene.

Stover, fodder, and all kinds of provisions for cattle.

Strainer, see page 974.

Strangles, an eruptive contagious fever of the horse, characterized by swelling in and about the bones of the lower jaw, and known as distemper. See Distemper, page 759.

Straw, the stalk or stem of certain species of grain, pulse, etc., chiefly of wheat, rye, oats and barley. The word also means the stalks of these and certain other species of grain after they are cut and threshed. It is in the latter sense that we treat the word in this article.

The value of straw to the farmer is governed by a variety of circumstances. He may realize considerable from the sale of it if he be near a city where it is used for bedding, packing, filling mattresses, etc. Comparatively few farmers, however, are thus located, and therefore must dispose of the straw in some other way; but it never should be burned. It certainly may be disposed of to a far greater advantage, even in a new country. Remember that the virgin soil will not always retain its strength and vigor under any usage, and the wise farmer would guard against its exhaustion, by constantly supplying the plant food consumed by each crop.

Where straw is cut before it is too ripe it is of value as food, especially for store cattle. In Germany it is

valued at more than half the price of the best hay. But to secure the best results in feeding straw some material rich in albuminoids must be fed with the straw, such as oil-cake, shorts, middlings or clover hay. The straw alone does not contain enough of the albuminoids to secure the complete digestion of the carbohydrates which it contains. If the straw is fed with substances rich in albuminoids, the manure will be as rich as that made from hay.

As a fertilizer straw has a manurial value in itself. If we compare moderately rotted stable manure and wheat straw in regard to their contents of the three most valuable manurial elements, nitrogen, potash and phosphoric acid, we find that, weight for weight, the manure and the straw have nearly the same value; the manure contains more water and the straw more vegetable matter, but in other respects their value is nearly equal. The straw is more bulky and difficult to cover, but once placed beneath the soil and decomposed there is a positive addition to the available plant-food in the soil. Whether it would pay, however, to handle it for this manurial value or not must be determined by the surrounding circumstances and conditions. Wherever the soil is deficient in vegetable matter, the straw may be of great value when plowed under, by the large increase of vegetable mold formed by the decay of the straw. In sandy and gravelly soils the organic matter of the soil is soon exhausted, unless renewed by plowing up green sward or turning under long manure, straw, corn-stalks, etc. By the decay of such materials under the soil we promote the decomposition of mineral substances in the soil, as well as increase the vegetable mold.

Strawberry. The name of this favorite fruit is said to be derived from an ancient custom of putting straw beneath the fruit when it began to ripen, to prevent it from being polluted with the soil, and its botanical name *Fragaria* alludes to the delicious fragrance of the fruit. Strawberry plants are great favorites in many parts of the world. Their stoloniferous habit is so curious, their green, low-spreading foliage so beautiful and refreshing to the eye, their elegant and charmingly scented blossoms so grateful to the smell, and their handsome and brilliant fruit, so luscious, that they are only to be known to be admired. See page 546.

1.—*Forest Rose.*

Propagation and cultivation. A warm sandy loam, or new land, moist and exposed to the sun, but well drained, is the best situation for this plant. It may be either a hill sloping to the south, or bottom land near a deep channel of running water. A close protection by a board fence on the north side hastens the development and maturity of the fruit. A piece of land facing the north will produce late crops. When wild berries do better in the shade it is not so much on account of the shade as of the moisture, mellowness of the soil, and retreat from the tread of roving animals. Ashes, lime and salt are good fertilizers, but leaf-mold or bog earth constitutes the best manure. Plaster and animal manures produce large plants and strong runners, but little fruit. To produce the very highest results Mr. Pardee recommends sprinkling the ground two or three times each spring with a solution, in six gallons water to each bed, of a quarter of a pound each of sulphate of soda and potash, and nitrate of soda, with one and a half ounces of sulphate of ammonia.

Late in the fall or very early in the spring is the best time for transplanting; late summer and early fall are just as good when the weather is cool and wet. Watch the plants that they do not dry out. The strawberry must always have moist ground.

Select the most vigorous runners and take the earth up with them if possible unbroken. If the plants have come from a distance, as is generally the case, or if by other means the roots have been freed from earth dip them in mud just before setting them in the ground. In planting them press the mellow earth around them, leaving the plant the same depth in the ground as it originally grew. For garden cultivation they are generally set eight to ten inches apart in the rows for small varieties, and twelve to eighteen inches for the larger kinds; the rows about eighteen inches apart. For field culture the rows, of course, must be about three feet apart, for the purpose of horse cultivation. Where frequent renewal is practiced, however, cultivation with a horse is not necessary. Strawberries need constant mulching from the very start. In setting out the plants, water them thoroughly and cover the whole ground with straw, tan-bark shavings, wild grass in which there are no ripened seeds, green rowen or other material equivalent, to the depth of two to four inches between the rows and hills, and an inch or two on the hills. Corn-stalks, especially if cut up with a machine, make first-class mulching. Saw-dust, or other material which packs closely, is not good, as it sours the ground.

2.—*Sharpless Seedling.*

Young plants should be freed from all the old or decayed portions before they are set in the ground, some varieties doing better set in hills or sharp ridges, but most doing better when set in the general level. What is called the "matted row" is more convenient than the "single hill," some varieties, however, yielding so much more by the latter plan as to render it remunerative. Raising the new sets in pots before transplanting is growing into favor, for, although somewhat troublesome, a full crop is realized the first year after planting.

In watering plants of any species during a dry season, never follow the practice of "little and often," but give them a thorough soaking about every week or ten days when the sun is not hot upon them. In cultivating with the hoe do not break the ground within six or eight inches of the plant, as that breaks their most valuable roots. But if all of the previous conditions are attended to, very little cultivation will be necessary further than to keep down the weeds, and when fruit is required, the runners cut off. A band of iron about ten inches in diameter, sharpened on one edge and fixed on the end of a stick is the best instrument for the rapid cutting of runners; but if only the light manures mentioned are used, the runners also will be very light. The best time for forking or spading between the rows is immediately after the season of bearing; but during the season the plants are set the ground can be carefully hoed and raked close to the plant, as there are no surface roots to be injured.

In general strawberry plants should be renewed every three or four years, varying from three to six or eight years according to the nature of the variety, as described below. It is best also to take new ground for new plantations; old beds should be planted to corn or potatoes a year or two, and supplied with lime, ashes and salt. The most convenient system of constant renewal is that of encouraging the setting of the best runners as they grow in the bed, and of digging up the old plants.

Strawberry plants cannot be multiplied from the seed, as there is nothing certain about it. Acres might be sowed with the seed and not a berry obtained worth cultivating, but in good rich soil a plant will put out runners so that fifty good, thrifty plants may be obtained the first season after planting, and twenty-five hundred the second year.

It is always remunerative to give winter protection, which is done by covering the bed, after the ground is frozen, with two or three inches of fine mulching or five or six inches of heavy. This, of course, should be mostly removed in the spring, enough only being left on the ground to keep it moist and prevent weeds from growing. Fresh straw, or any other light material which will not pack close to the ground is best for winter protection.

"Forcing" strawberry plants is sometimes practiced in the older countries, but as no one in this section of the world cares to practice the art, we omit the directions for the process here.

Insects and Disease. Fortunately the strawberry is not subject to any disease except the apparent one of a microscopic parasitic fungus, by which the fibers of the roots are affected and the plant becomes brown and the berries are stunted, deformed and pallid. Remedy: uproot the plant and burn it.

The greatest mischief-makers among strawberry plants are the leaf-roller, the crown-borer, white-grub and the strawberry slug. The leaf-rollers are the larvæ of the moths which stitch the leaves up into rolls by a fine web and also eat them. They pupate (go into the chrysalid state) in the same leaf and appear as a reddish-brown moth in July. A second brood comes in September. The crown-borers work in the crown of the plant, and a brown, meal-like saw-dust is the sign of their presence. For the last two mentioned pests no reliable remedy is proposed. The white grub is the larva of a saw-fly. To kill him the earth may be worked up in the latter part of the season and hogs, chickens or birds allowed access. A thin layer of ashes on the ground is also recommended. The strawberry slugs perforate the leaves with minute holes, and when not feeding they are rolled up underneath the leaves in the form of a ring. There are two broods of them in a season. Remedy same as the last, or shake the larve to the ground and kill it. A sprinkling of powdered white hellebore over the plants is a sure remedy.

Varieties. For many years the Wilson's Albany was the king of strawberries in the West; but it was always marketed before it was fully ripe and while it was quite sour, the question of introducing a sweeter and better flavored variety for the market was brought up, and recent efforts have resulted in bringing into public notice many new and promising candidates. The leading berry for the West now seems to be the Charles Downing; but for special purposes there are many other new varieties found to be worthy of cultivation, and we now proceed to enumerate them, with a brief description of each, omitting some varieties which do well in some places in the East, but not regarded by horticulturists as general standard varieties.

Agriculturist. Large but variable in size, oval conical, dark crimson, the sweetest of all strawberries; flesh dark red and firm, ripening about June 10 in the latitude of Iowa, very good as dessert but not for shipping; plant requires a loamy or light soil, and is rather too tender for the climate of the Northwest; not self-fertilizing.

America. Large, round conical, purple crimson but lacks color, medium texture, ripens the first week in June, productiveness variable, very good for dessert, rather poor for market; not self-fertilizing.

Bidwell. Very large, long conical, necked, bright scarlet, medium texture, ripens the second week in June, but not well at the tips; very good for dessert, fair for shipping; self-fertilizing; a promising new variety.

Black Defiance. Very large, oblong conical, perfect in form and holds its size well, firm, dark crimson, best as dessert, good for market, early, but is a shy bearer; ripens the second week in June; requires a

loamy or heavy soil; this variety is self-fertilizing.

Boston Pine. Large, round conical, dark crimson, medium texture, ripens the second week in June, very good as dessert, poor for market, self-fertilizer, and one of the best for fertilizing other varieties.

Boyden's No. 30. See Seth Boyden.

Burr's New Pine. Medium size, round conical, bright crimson, ripens the second week of June, soft, best as dessert, poor for market; plant hardy; not self-fertilizing.

Captain Jack. Uniformly medium size, round conical, bright crimson, firm, next to the best for dessert and market, ripening the second week of June and holding on until late; requires light or loamy soil; foliage splendid; self-fertilizing.

Centennial Favorite. Very large, highest flavor, with pleasant aroma; plant a good grower, healthy, immensely productive and self-fertilizing.

Champion. Large, round conical, dark crimson, firm, very good for dessert and market, ripening the second week in June; not self-fertilizing.

Charles Downing; Uniformly large, round conical dark scarlet, medium texture, delicious flavor, good as dessert and best for market, but scarcely firm enough for distant markets; ripens the second week in June. adapted to all kinds of soil, does better in matted rows or beds and is not infested by the borer. Compared with the Wilson's Albany it is more productive, stands the hot sun better, does not heave so much by freezing and is therefore easier to mulch.

Cinderella. Good grower, very productive, berries good size and quality.

Col. Cheney. Large, round conical and coxcomb in form, bright crimson, medium texture, needs a little more firmness for distant markets, ripens the second week in June, good dessert and best market; late; best on loamy or heavy soil; not self-fertilizing.

Colfax. Small, uniform size, covered with a thick purplish bloom, sour, and of little value on some soils.

Continental. Large but not of uniform size, firmest texture of the strawberries, sweet, late; could be shipped a thousand miles.

Cowing's Seedling. Very large, round, oblong conical, bright crimson, medium texture, first quality as dessert, very good for market, ripens in the second week of June, requires a very light soil; self-fertilizing.

Crescent or *Crescent Seedling.* Uniformly large, conical, dark scarlet, fair dessert, very good market, soft, delicate flavor, looks polished and waxy; lasts longer than any other variety; any kind of rich moist soil; not sufficiently self-fertilizing; does better in matted beds and rows.

Crystal City. Very early, medium size, fair in quality but not rich in flavor, moderately firm.

Cumberland Triumph. Very large, round, oblong conical, bright crimson, very good dessert and market, of medium texture, ripens the second week in June; self-fertilizing.

Downer's Prolific. Medium size, average shape, bright scarlet, firm, early, very good dessert and market; vigorous; self-fertilizing.

Duchesse. Large, round, oblong conical, bright crimson, firm, very early, very good dessert and market; prefers heavy or loamy soil.

Duncan. Large dark red, firm, earliest of all, very good dessert and market; self-fertilizing; plant vigorous.

Early Scarlet, Large Early Scarlet. Berry small, round oval, soft, ripens at the average time, very good dessert and fair market; self-fertilizing; matted bed or row; nearly superseded in Michigan by newer and larger varieties.

Edward's No. 14. One of the best flavored berries raised.

Endicott's Seedling. Originated by Geo. W. Endicott, Villa Ridge, Ill., and is worthy of further trial.

Essex, Durand's Beauty. Very large, conical, brilliant dark crimson, very good dessert and market; firm, not productive; self-fertilizing; produces scarcely any runners; requires hill culture.

Forest Rose. Very large, common form, bright crimson, very good dessert and market, firm, early; self-fertilizing; a very promising new variety; should have a heavy, moist soil.

French, or French's Seedling. Large, long, coxcomb-form, bright scarlet; soft but very good for both dessert and market, excellent flavor, medium vigor, very productive; second week of June; self-fertilizing.

Glendale. Very large, long, bright scarlet, firm, good dessert and market, late, very promising, self-fertilizing.

Great American. Very large, round conical, dark crimson, fair dessert and very good market, soft, variable, ripens about June 10, requires extra culture and then commands extra prices in the market; self-fertilizing.

Green Prolific. Large, oblong, bright scarlet, soft, very good dessert, fair market, ripens about June 10, but holds on well, berries often imperfect, plant hardy, vigorous and productive; not self-fertilizing; surpasses all in maintaining itself against the weeds; a very popular Western berry; cultivated on the matted row or bed system.

Hovey's Seedling. Very large, oblong, bright scarlet, fair dessert and market, firm, late; generally vigorous and productive; not self-fertilizing; requires cultivation in hills; an old standard variety, but going out of use.

Jucunda. Very large, oblong, bright scarlet, firm, fair dessert, very good market, late; plant vigorous; more profitable when grown in hills and in a strong, stiff soil; at the North it succeeds in sandy soil; in most places it is superseded by hardier and more productive varieties; self-fertilizing.

Kentucky. Very large, oblong, bright scarlet, firm, sweet, very good dessert and market, plant vigorous, prefers light soil; best late berry; not self-fertilizing.

Lenning's White. Large, oblong, whitish red, juicy, soft, best dessert, poor shipping; flavor of pine-apple

CHARLES DOWNING. CRESCENT.

and buttery; seeds reddish, not deep; ripens about June 12; unproductive; self-fertilizing.

Maj. McMahon. Uniformly large, dark crimson, firm, beautiful, very good dessert and market; rather late; stems short; self-fertilizing.

Marvin. Very large, long, bright crimson, firm, very good dessert, best shipping, late, self-fertilizing.

McAvoy's Superior. An old standard berry for many years but now superseded.

Michigan. Uniformly large, pale crimson, very good dessert, too soft for shipping, rather late; plant vigorous, productive, in extremely large stools with heavy, dark green, healthy foliage; self-fertilizing.

Miner or *Miner's Prolific.* Large, crimson, good, rich, soft, firm (as the Downing), plant vigorous and productive; self-fertilizing.

Monarch of the West. Long, very large, dark crimson, firm, very good dessert, good market, June 10, ripening slowly at the tips, very productive; self-fertilizing; either a loam or a heavy soil.

Necked Pine. Medium size, long neck, light scarlet, tender, sprightly, highly-flavored; self-fertilizing.

Pioneer. Medium firmness, good, rich, sweet flavor, large, holding out well in the latter part of the season; plant a medium grower, foliage a delicate light green.

President Lincoln. Somewhat irregular in shape, good, rich, sweet flavor, stems long and the fruit is held well up from the ground; vines medium growers and bearers; most of the fruit is of immense size.

President Wilder. Large, oblong, bright scarlet, firm, late, best dessert, poor market; self-fertilizing; heavy soil.

Prouty's Seedling. Cultivated in hills; this is a promising variety.

Russell's Prolific. Very large, coxcomb-form, scarlet crimson, soft, good dessert, too soft for remote market; ripens about June 12; not self-fertilizing; now nearly abandoned.

Seneca Chief. Very large, coxcombed, dark crimson, firm, very good dessert and market, late, very productive and vigorous; self-fertilizing; strong soil.

Sharpless. Very large, oval, coxcombed, bright red, firm, rich juicy, very good dessert and market, middle of June; vigorous, hardy, productive; self-fertilizing.

Shirts. Very large, long, bright crimson, very rich in color, very good dessert, best market, firm; self-fertilizer.

Spring Dale. Very large, dark scarlet, medium texture, best dessert, poor market, not firm, of superior flavor, late, not self-fertilizing, a promising variety in the West.

Seth Boyden; Boyden's No. 30. Large, oblong, bright crimson, firm, very good dessert and market, middle of June and late; vigorous, productive, self-fertilizing, but rusts badly in the West; prefers very moist soil and cultivation in hills.

Star of the West. Large, sub-acid, soft, but can be shipped from 100 to 200 miles, oblong, dark crimson, productive, rather late; more reliable than Monarch of the West; a luxuriant grower; quality good; self-fertilizing.

Triomphe de Gand. Large, oblong, bright red, firm, average time too late, best dessert and market, rich and excellent flavor; self-fertilizing; hills in heavy soil; an old standard variety, now being neglected.

Wilson's Albany. The most common berry of former years; should be cultivated in matted beds and rows, in light soil, and the fruit should not be picked until it is soft, if for home use.

Windsor Chief. Large, bright crimson, fair dessert and market, firm, but not sufficiently so for distant market; one of the most profitable varieties for home market; June 10; rapid grower and profuse bearer; not fully self-fertilizing.

Wizard of the North. A new and promising variety.

Stringhalt. An affection of the hind leg of the horse. See page 809.

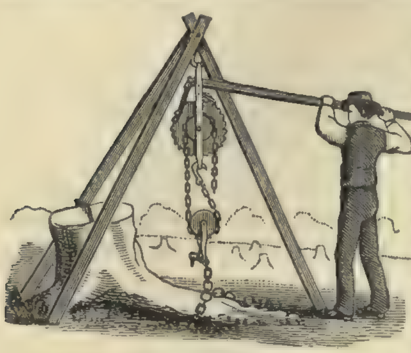
Stubble, the stalks of corn or grain left by the reaper. As to the best methods of disposing of the surplus straw and stubble of the farm is a vexed question with many farmers. Some burn it, and others feed it, thereby obtaining manure with which to enrich the ground. The nutrition extracted from the soil by the constant gathering and reaping of crops must be replaced, and a question open for debate, is, whether the heading of wheat, oats, rye, etc., thereby leaving a stubble in the field consisting of the entire stalk, minus the head, and the leaving of the entire corn-stalk, and plowing them under, is not better than gathering them and burning or feeding. After the grain and ear are gathered, the stock can be turned upon the fields, and all animal manure, together with the manure afforded by the decay of the remaining stubble or stalk, will be thoroughly utilized.

Stud, a small piece of timber or joist inserted in the sills and beams, between the posts, to support the beams or other main timbers; often called "studding." A stud is also a kind of nail with a large head, inserted in work chiefly for ornament; an ornamental knob; an ornamental button or catch for a shirt bosom, not held in its place by being sewed; in machinery, a short rod fixed in and projecting from something, sometimes forming a journal; a stud-bolt. The last mentioned has threads on both ends, to be screwed into a fixed part at one end and receive a nut upon the other; called also "standing bolt." For stud-horse, see Stallion.

Stump, the stool of a felled tree, or the standing part of a fractured or fallen tree; or any clubbish, lumpish, or basal remnant of a fractured, cylindrical, organic body.

To the farmers of wooded countries, the stump, although an "eye-sore," should not prove a formidable barrier to the clearing and cultivation of the soil. The manner of grubbing the stump out with the ax, as practiced by the early settlers of most new coun-

tries, has been superseded by inventions and discoveries, until at the present time it may be made a comparatively easy task. The stump puller, a modern invention, is now used for this purpose. We give an illustration of one made by E. Over, Indianapolis, Ind.


Stump Puller.

It is simple in construction, strong and durable and has immense power. Twelve pounds at the end of a nine-foot lever will raise 2,000 pounds.

The tripod consists of three pieces, 4-inch square oak, each ten feet long, and the lever is nine feet long and tapers towards the end. The chains used are made of ⅞ and ¾ round iron. Pins are made of steel. To raise a stump easily, the main roots should be cut and the chain applied to one of them, thus making a lever out of the root and greatly assisting in the work.

In addition to the stump puller, there are other methods of extracting stumps with different chemicals. One of the most successful methods is as follows:

In the autumn bore a hole one or two inches in diameter, according to the girth of the latter, and about eighteen inches deep. Put into it two or three ounces of saltpeter, fill the hole with water and plug it up close. In the ensuing spring take out the plug and pour in about a half gill of kerosene oil and ignite it. The stump will smoulder away without blazing, to the very extremity of the roots, leaving nothing but the ashes.

St. Vitus' Dance, called chorea (pronounced co-re′a) by the profession, consists of irregular and involuntary motions of one or more limbs and of the face and trunk. It is a nervous disease, generally brought on before the age of puberty,—often by too close confinement at school. When it affects the muscles of the face it gives rise to quite a variety of most strange grimaces and contortions. When any motion is attempted to be made, various fibers of other muscles act which ought not; and thus an effect contrary to that intended is produced. It is not a dangerous malady, although it may run into epilepsy and then prove fatal.

TREATMENT. In connection with a nervine tonic give the following preparation: black cohosh 2 ounces, skullcap 1 ounce, assafetida ½ ounce. Pulverize and digest in a pint of alcohol for six days and then pour off the tincture carefully. *Dose.* The dose is a teaspoonful every three hours. The tincture may be obtained at the drug store, which should be fresh. Of this, give 1 to 20 drops. The tonic above referred to is either lady's slipper, valerian or nux vomica. The dose of the extract of the two former is from 3 to 5 grains. The tincture nux vomica should be taken as follows for a considerable time: Put 4 to 6 drops in a glass of water and take a teaspoonful every hour. In the treatment of this disease the bowels should be kept open.

Styptic (stip′tic), an astringent drug which has a tendency to stop the flow of blood from a wound or bleeding sore.

Sub-soil, the earth immediately beneath the upper, or richest soil; it is generally of a lighter color. Sub-soiling is the process of loosening the sub-soil by a plow without any mold-board to turn it. See Fig. 14 of the article on Plow. Trench plowing (see Fig. 13 of same article) is sometimes called sub-soiling, but wrongfully so. In this the sub-soil is thrown up and mixed with the surface, while the sub-soil plow only loosens it without inverting it.

The value of land greatly depends upon the sub-soil, in fact, almost as much as it does upon the upper soil. If it be wet and full of stagnant water the land is of but little value, until it is under-drained; if it be hard and rocky, the surface soil dries too quickly, and if it be too light, water and fluid manure may drain away.

Succotash, green corn and beans boiled together, sometimes with meat. Shave the green corn from the cob, cut an equal quantity of beans into inch lengths, stew them together half an hour, pour off most of the water and put in cold milk; when hot, add butter, rolled in flour, season with salt and pepper, and simmer five minutes.

Succulent (suk′u-lent), juicy. Herbs are succulent plants, and very juicy or watery kinds are more succulent than the others.

Suckers, the shoots from the roots of plants and trees near the stem.

Sudorific (su-dor-if′ic), a medicine producing sweat. It enters the circulation, acts on the subcutaneous vessels, and augments the energy of the cuticular glands which secrete the sweat. No known substance acts safely as a sudorific in the horse; but either a mixture of ipecacuanha and opium, or a mixture of emetic tartar, opium, and ginger, beneficially increases his insensible perspiration. See the article Perspiration.

Suet. The fat situated about the loins and kidneys of sheep, oxen and some other animals. It is harder and less fusible than the fat of other parts of the same animals, or than that of the same parts of other animals; but it differs from these fats, and even from the softest hog's lard, chiefly in consistency, and, like them, is composed almost entirely of stearine and elaine, or ultimately of carbon, hydrogen and oxygen. See the articles Oil and Fat. The suet of sheep and oxen when melted out of the membranes which envelope it, forms tallow, and is largely used in the manufacture of soap and candles; and when

fused it concretes at a temperature of about 100° Fahr.

Sugar, and a class of substances nearly allied to it by chemical combinations, constitute the chief mass of the vegetable kingdom, existing more or less in almost all vegetables, but abundantly in ripe fruits, and in the roots of the beet, carrot, etc. It is procured most plentifully, as is well known, from the juice of sugar cane. These allied substances above referred to are chiefly starch, woody fiber and gum, which in one sense are different forms of sugar. Starch and gum are convertible into sugar, and the latter is convertible into alcohol. They are all composed of carbon, 72 parts by weight, hydrogen 8 to 14 parts and oxygen 64 to 112. They are often termed the non-nitrogenous elements of food, and said to serve for the generation of heat in the animal body, and not for the formation of muscle.

There are several species of sugar, which agree in having a sweet taste, but which differ in other respects. Cane sugar, or common sugar, which is seen in its purest state when crystallized in white sugar candy, and in refined sugar, sugar from the beet root and the maple tree, is the same as that from the cane. Sugar from grapes contain less carbon than cane sugar, and is not so sweet. It requires two and one-half times as much of this sugar to sweeten to the same degree as cane sugar. It cannot be made to crystallize distinctly, but solidifies in grains. It dissolves less rapidly than cane sugar and gives a more fluid sirup. Sugar of malt agrees with this, and also the sugar of honey, of raisins, figs, and many other sweet fruits.

Sugar of Milk has the same constituents as grape sugar and in the same proportion, and passes into the latter when in contact with acid, and then it ferments. It is much used by homœopathists, both domestic and veterinary, in the form of powder, but oftener in the form of globules or small pellets for holding medicines in convenient shape for administration. Molasses is the best form in which to give sugar to animals, and it is useful in cases of sick cows, mixed in a drench.

Cane Sugar. The manufacture of sugar from the Southern cane is a complicated process we need not describe here, as it is the business only of skilled workmen in the South.

Maple Sugar constitutes the pleasantest and probably the purest sweet which we can obtain for the table. The season for drawing and crystallizing the sap is in early spring, when the bright sunny days and clear frosty nights give it a full and rapid circulation. The larger trees should be selected, and tapped by an inch auger to the depth of an inch or more, but not through the alburnum, the hole inclining downward externally, into which should be driven a wooden spout to carry off the sap into vessels. The latter should be stoneware, gourds or some such material as will not give a foreign color or flavor to the sap; for when perfect cleanliness is observed, and no oxides are allowed to enter the sap, the sugar will be of a light brown or cream color. Some think it is a better way to "box" the trees by cutting with a gouge a narrow channel slanting upward three or four inches long, an inch or so into the wood of the tree, and inserting a galvanized iron spout below, as in the auger method, as it will draw an equal or greater amount of sap and sooner heal over. When the sugar season is over, if holes are bored, they should be closely plugged, and the head cut off evenly with the bark, which will soon grow over the wound. If carefully managed, several borings or small cuts may be made in a large and thrifty tree the same season without any apparent injury to it.

The sap may be boiled in a potash kettle, set in an arch in such a manner that the edge of the kettle is defended all around from the fire. Of later years, evaporators of lighter metals have come into use, somewhat like the sorghum evaporators, which indeed do better work and in connection with large groves are cheaper than kettles. During the process of boiling, keep the surface well skimmed. At night leave fire enough under the kettle to boil the sap nearly or quite to sirup by the next morning; then strain through a flannel cloth, if sweet enough; if not, boil again until it becomes sirupy, and then strain it into the tub and let it stand until the next morning when it should be "sugared off." It may be clarified by the whites of eggs well beaten, in the proportion of five or six eggs, one quart of new milk and a spoonful of saleratus to 100 pounds of sugar, all well mixed with the sirup before it is scalding hot. Keep a moderate fire direct under the caldron until the scum is all raised; then skim it off clean, taking care not to let it boil so as to rise in the kettle. In sugaring off, leave it so damp that it will drain a little, and then let it remain in the kettle until it is well granulated. It may then be put into boxes, made smaller at the bottom, that will hold 50 to 70 pounds, having thin pieces of boards fitted in, two or three inches above the bottom, which is bored full of small holes, to let the molasses drain through; this should be kept drawn off by a tap through the bottom. Upon the upper surface of the sugar in the box, place two or three thicknesses of damp cloth, and over that a board well fitted in so as to exclude the air. After it has done, or nearly done draining, dissolve it and sugar it off again, going through the same process in clarifying and draining as before.

Care should be taken not to let the sap remain in tanks until fermentation commences before boiling. During the warmer days, therefore, when the sap flows more freely, the work of evaporation must be correspondingly increased.

Sorghum Sugar. In making sirup, the juice should be filtered carefully through reeds or straw, and the sirup reduced to about 225° to 228° Fahr. or until the steam escapes in labored puffs. For sugar, the sirup should be reduced until it looks "short and crispy," and free from all appearance of viscidity or "ropiness," and being held up, with spoon or ladle, breaks, leaving a thin thread, which draws upward in the form of a cork-screw. To secure crystallization, pour the sirup, after it has been properly run from the evapora-

tor, into sugar coolers (boxes made of wood, 24 by 48 inches, and six in depth, will answer), placed in a warm room, filling the first to the depth of one and a half inches, then the second and third. Continue pouring into them by turn until all are filled. Stirring occasionally is found to favor a more thorough granulation. The temperature of the room should be kept regularly at 90° day and night; on no account should it be allowed below 75°. There is no patent way of making sugar; it is a product of nature, which we can but assist at best. Good sirup reduced to a right consistency will generally grain.

Some years ago a gentleman in Wisconsin "had almost whole barrels of sugar" from Amber cane without his making any effort to granulate. It was from a variety called at that time "Black Empire." It appears that, to produce the surest and most satisfactory results, certain varieties should be selected and cultivated in a certain way. It is certain also that some localities and some kinds of weather are more favorable to the sugar-producing capacities of cane.

Corn Sugar. Sugar can be made from the juice of the stalks of common field corn, and even at a fair profit; but the term "corn sugar" has been lately applied to "glucose," which is now so extensively manufactured. See Glucose.

Beet Sugar. Good sugar is made from certain varieties of beet, as Lane's Imperial, Vilmorin's Improved French White and the White. Immense quantities are made in Europe and shipped to this country. The beets can be raised just as well in this country, and were it not for the late rush of the glucose enterprise beet-sugar making would be a large interest here in a few years. After the juice is expressed, the residue constitutes good food for live stock. Beets can be preserved in pits for many months, so that one can take his leisure for the manufacture of their juice into sugar.

Adulteration. The adulteration of sugar of the lower grades has been practiced in almost all countries, and the adulterants used have been numerous; and it is probably as extensive to-day as ever. Most sugars are adulterated, mostly with flour or glucose. But even those brands that are considered pure, because "refined," are often more deleterious to health than glucose, on account of the metallic oxides and salts which necessarily become diffused through the sugar in the various processes of the refinery.

Sugar of Lead, acetate of lead: see page 911.

Sulky, a two-wheeled carriage for a single person. It was originally constructed somewhat different from what it is at present. It was a light, two-wheeled carriage, with one seat, in the form of a chariot, but the seat so contracted that one person only could sit on it. It received its name from the proprietors' desire of riding alone. Sulkies are now only in general use on the race course, the farmers in no sections having any practical use for such vehicles.

Sulky plows and cultivators are those furnished with a seat so that the operator can ride. See page 1040.

Sulphur, called also brimstone, is an extremely inflammable substance, dug out of the earth in various countries, especially in Italy and Sicily, and considered as a volcanic production. It occurs also in combination, as a constituent of both binary and ternary compounds. The sulphides of iron, copper, lead, zinc, antimony, arsenic and mercury are well-known minerals. Sulphur is one of the simple bodies or elements, and is therefore incapable of analysis, although, as above stated, it combines with other bodies and thus forms new compounds. Sulphur forms an essential part of animal tissues, and exists to a considerable extent in those of vegetables, even uncombined.

Sulphur is kept in the drug stores in three forms, flowers of sulphur, milk of sulphur and sulphur vivum. In veterinary practice it is chiefly used for skin diseases, in the form of an ointment. It is believed by many persons to be a great preventive for diseases and distempers in all animals, and is one of the ingredients of an incongruous mass often recommended as a preventive for cattle diseases. Whatever may be its medicinal virtues, it certainly has no prophylactic effects mixed with tar, etc. The simple ointment of sulphur is made as follows: One part of the flowers, or sulphur vivum, mixed with four parts of the lard. In winter, when lard is hard, oil should be used instead, thus forming a liniment of sulphur more easy of application.

Dose. Sulphur, as a laxative for horses and cattle, should be given in doses from one to three ounces, and administered in gruel, in the form of a drench. For dogs, the dose is one to two drams.

Sumac. The common smooth sumac is considerably used by dyers, and by tanners of light leather. It is, however, much inferior to the Sicilian. It is not cultivated in this country. The Venetian sumac is the fringe tree or burning-bush, an ornamental tree. In England it is called "young fustic," and is much used in the arts. The sumac is an astringent, in its physiological effects, and can be made to take the place of galls. The harvesting consists simply in cutting off the young branches with the leaves and seed cones attached, in clear weather, drying them thoroughly without exposure to either sun or dew, and packing them in bales of about 160 pounds for market.

The season for picking sumac commences with the first of July and ends the last of September, or with the first frost, for this turns the leaf red, and then it is worthless. The stems, except the leaf stems, have no strength, and should not be gathered. They are full of pith, and if ground they only absorb the strength of the leaf and depreciate the value of the article. Sumac should be gathered in this way, viz.: Break off the parts of the bush containing the leaves, but do not gather the blossoms or berries. Cure it under shelter to preserve its color and strength; when

it is dry put it in bulk, and when dry and windy days set in spread it out in beds as you would wheat or oats, on a clean plank floor. Then thresh it with a flail, when the leaves and stems will break up fine, and rake out the large stems and throw them away. In drying, before threshing, it should be frequently thrown over with a pitchfork to let the air get to every part of it. Remember to take out all the sticks, stems and berries. Care must be taken to have it thoroughly dry before packing, to avoid spontaneous combustion. Good ventilation should always be secured after it is packed.

Medical Properties and Uses. The bark, leaves and powder which cover the berries, possess valuable astringent, tonic, detergent and diuretic properties. The decoction forms an excellent wash for ulcers and old sores; it also forms a valuable gargle in mercurial sore mouth, sore throat, etc., and may be used with great advantage as an application in tetter and many cutaneous diseases. Taken internally it produces a tonic effect upon the skin, and may be employed with advantage when that organ is in a relaxed and debilitated condition. It may also be used with advantage in strangury and in bowel complaints. The bark of the root is esteemed of value as an antiseptic; and, made into a poultice, is almost unequaled as a remedy for old ulcers.

Poison Sumac: see Poison Ivy and Sumac.

Summer Fallow, a fallow made during summer, or the warm months, to kill weeds.

Summer Savory: see Savory.

Sunburn, a discoloration or blistering of the skin caused by exposure to the sun. The usual means for whitening the skin is to keep it covered closely for a few days, or, more specifically, to bathe it in sour buttermilk (sometimes mixed with corn-meal) before retiring at night, permitting the milk or dough to remain on during the night. Hygienically, no person should be ashamed of a skin merely made tawny by the sun.

To Remove Sunburn. Take 2 drams of borax, 1 dram of alum, 1 dram of camphor, ½ an ounce of sugar candy and a pound of ox gall. Mix and stir well for ten minutes, and stir it three or four times a day for a fortnight. When clear and transparent, strain through blotting paper and bottle for use.

Sun-Dial, an instrument to show the time of day by means of a shadow in the sunlight. A straight rod fixed perfectly erect can be used for casting the shadow, but the respective hour and quarter-hour points must be ascertained and marked by a time-piece. To indicate the early and late hours of the day, the plate upon which the marks are made should be deeply concave, and the top of the rod made the guide. Or, if this rod be inclined to the north so as be at right angles to the rays of the sun at noon, the whole shadow on the concave plate can be made a perfect guide to local sun time from sunrise to sunset. See Dial.

Sunflower. The common garden sunflower is sometimes cultivated as a field crop,—the leaves for stock, the seeds for poultry and the stalks for fire kindling. Planted in swamps, it is imagined by some to absorb the miasma and render the air healthier. Medicinally, the seeds of the sunflower are diuretic and expectorant, used in decoction or sirup, either alone or with other agents, in ordinary doses. The large yellow flowers growing wild on tall weeds so abundantly in August and September are of several species of wild sunflower.

Sunstroke, a sudden prostration caused by heat and intemperance, the symptoms resembling those of apoplexy. Take the patient at once to a cool place nearest at hand, loosen the clothes about the neck and waist, laying him down with his head a little raised, and apply the coldest water or pounded ice to the head for an hour or more, or until relief is obtained. Apply mustard or turpentine to the feet and legs. Meanwhile send for the doctor, as you cannot safely do more without his advice. When a person sinks down on a hot day, the true way to ascertain whether he has sunstroke is to feel of his breast: if it is hot he has sunstroke; otherwise, not.

Suppuration, collection and discharge of pus ("matter") in a diseased part. See Pus.

Surcingle, a belt, band or girth which passes over a saddle, or is fastened to it, to bind it fast to a horse's back. In horseback riding it is important to have a girth of strong material, convenient and safe fastenings, and to always see that it is properly adjusted.

Surfeit, a skin disease of the horse: see page 809.

Swamp, moist and soft land akin in character to a marsh or bog, but differing from both in producing shrubs and trees.

Swan. This elegant and graceful bird has long been partly domesticated, and is generally found in all the parks of cities. They are of no great practical value to the farmer, but their snow-white color and easy grace in the water makes them favorites wherever introduced. They are long-lived, sometimes even attaining the age of one hundred years. They lay from seven to eight eggs, and the young may be easily raised. When incubating they are sometimes dangerous to approach, since they fight desperately, and are very powerful; a blow from their wings has been known to fracture the leg of a man.

To Clean Swan's Down, immerse the fur in a pan of white flour, and, after shaking it around in the flour, take it out and shake out the flour or hang it in the wind. Or, sprinkle flour through it, or rub in flour; then shake off; repeat until clean.

Sward, the grassy surface of land; that part of the soil which is filled with roots of grass, forming a kind of mat; turf.

Sway-back, having the back hollow or fallen in, whether naturally or the result of injury or weakness: said of horses and other animals.

Sweat: see Perspiration.

Swedish Movements, the practice of medical treatment which consists of rubbing, kneading, spatting, pinching, shaking, rotating, etc., in various degrees, and in various ways, according to the indications of the case. Some physicians give scarely any other treatment in most chronic complaints, claiming that it assists cure, while medicines always hinder it. A few, however, add a little drug medication, or at least appear to, to their movement processes.

Sweeny, atrophy of the muscles of the shoulder of the horse. See page 810.

Sweep, to brush over a surface with a broom; also, a pole pivoted on a high post for drawing water from a well. To sweep well with a broom is an art to be learned by practice, in conjunction with a natural sense of mechanical fitness or adjustment. The best way to sweep a bare floor is, not to sprinkle it, but to wet the broom in water, shake off the surplus water, and sweep with it thus prepared, renewing the wetting every three or four strokes of the broom over the floor. By this method not only is the dust more effectually prevented from rising, but is far more thoroughly cleaned from the floor, always leaving the latter as neat as if scrubbed with a mop, but not wet, as no water should be allowed to run off the broom upon the floor. Sprinkling a dusty floor always fastens down more or less of the dirt to the floor, in spots and streaks. This is a valuable hint to those who have the care of churches, school-houses, etc.

To sweep a carpet with a broom, make very short motions, with a slight upward direction, as if to pitch the dirt along instead of dragging it; and do not dig away at every splinter or bit of paper until you remove it, but stoop down and pick it out with the fingers. Often a person can go over a carpet without a broom, picking up the visible objects here and there, the time requiring but a minute or two, and by this means alone make the carpet appear as if well swept. This method, indeed, is always to be preferred, unless there is dust or much fine stuff to be removed.

In sweeping with a broom, always take advantage of the wind, or out-door current of air, by opening windows and doors on opposite sides of the room, so that as much dust as possible will be carried out of doors. Most women neglect this very important precaution.

Carpet-sweepers are now to be had at the stores. In using one, always bear down upon it gently. They do not wear out a carpet like broom-sweeping.

Sweep Power, a horse-power operated by the horses walking in a circle, as opposed to the tread power.

Sweet Basil, a highly aromatic sweet herb, the flavor of which resembles that of cloves. It is a low, hardy annual from India. The two principal varieties are the Larger and the Bush. It is used chiefly by French cooks in soups and a few other dishes.

Sweet Bay, or Small Magnolia, is a shrub or small tree growing wild in the Atlantic States. In the far South it is evergreen. The flowers are globular in form and white and the leaves are white beneath.

Sweet Bread, the pancreas of an animal used for food. The following are directions for cooking:

Stewed. Wash, remove all the bits of skin, soak in salt and water an hour, then parboil; when half cooked take from the fire, cut in small pieces, stew in a little water till tender; add a piece of butter, a teaspoonful of salt, a teaspoonful of flour, and boil up once; serve on toast very hot.

Fried. After laying in salt and water, put them in cold water a few minutes, then dry in a cloth thoroughly, fry them with little strips of salt pork; or dip in beaten egg, and roll in bread crumbs, and fry in hot lard; or draw little strips of salt pork through the sweetbreads with a larding-needle, fry till the pork is crisp, then dip in beaten egg and roll in bread crumbs and fry them; pour over a half a cup of rich cream, stir in one teaspoonful of flour and let it boil up for a few minutes and serve hot.

Broiled. Parboil after soaking in salt and water then rub well with butter and broil; turn often, and dip in melted butter to prevent them from becoming hard and dry.

Sweet Brier, a popular and well-known variety of rose.

Sweet Cicely (sis′e-ly), a common plant in the woods of this country, the roots of which are sweet-aromatic. Children sometimes dig and eat the root, but sometimes mistake some other plant for it and become poisoned. There are two species, the Hairy and the Smoother.

Sweet Clover, or Melilot, is a well-known bee plant. See page 273.

Sweet Fennel, is cultivated in kitchen gardens for its sweet-aromatic foliage and for its seeds, which afford a delightful flavoring for many culinary preparations. The leaves, being of a beautiful form, are much used in garnishing. In a warm climate the leaf-stems can be blanched like celery, and eaten as a salad.

Sweet Gum, a large, beautiful tree in low grounds, more common South, with fine-grained wood, gray bark, forming corky ridges on the branches, and smooth and glossy, star-shaped leaves, which are fragrant when bruised and turn to a deep crimson in autumn. A fragrant, turpentine-like juice or balsam exudes from the trunk when wounded.

Sweet Marjoram (mar′jo-ram), cultivated in some kitchen gardens as a flavoring herb. The leaves are dried, and pulverized when wanted for use. In many of the culinary recipes in this work this herb is mentioned. There are several other species of marjoram, but they are of no consequence, especially in this country.

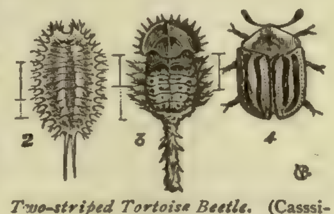
Sweet Potato. This nutritious vegetable belongs

to the South as much as the Irish potato belongs to the North. It is propagated universally from sets. These are either small potatoes raised for this purpose from summer cuttings of the vines in the previous year, or the cullings of the general crop carefully wintered in dry sand, etc., or the young shoots of large or small wintered tubers, started at the opening of spring in a hot-bed or box to furnish sets for the season. When four or five inches long the shoots are ready for planting, and should be carefully taken off and set out as they successively attain this size. Rich, warm, and if possible sandy soil must be chosen, and at the time of corn-planting the hills should be carefully prepared, at four feet apart each way, or ridges, raising them as high as convenient and mixing in plenty of rich compost, unless the whole has been well manured. It is absolutely necessary that the ground be well drained, for of all vegetables this is the most intolerant of standing water.

About the time of the first corn-hoeing, and after the ridges are well made up, and the top leveled off with a rake, set the plants. To those who know nothing whatever about cultivating the sweet potato, we may say, that the sets when they arrive will be tender-looking shoots, six inches or more in length; they should have a good cluster of fibrous roots at the bottom, and each have several leaves, those at the top being young and tender as in any other growing shoot. As soon as the sets or plants are received, mix the moist loamy soil at hand with water, to form a thin mud, about like cream; then put in the roots of each plant—one at a time, and gently work it about until every fiber of the root is covered. As each plant is dipped, or "grouted," as it is called, lay its roots against that of the preceding, until the roots make a mass as large as the double fist; press the roots together; dip the whole mass in the mud again, and then with ordinary soil put upon the mass, as long as it will stick, make a compact ball of earth that completely covers the roots. In this condition, the plants will keep until the ground is ready for planting. If the tender tops of the sets are bruised or injured, carefully pinch off whatever will not recover, but no more. In planting, if the earth around the roots has so dried that the plants cannot be separated without breaking the fibers, wet the ball of earth until they will separate readily. The plants are to be set upon the top of the ridge, 15 inches apart.

If there are several hands to do the work, let one with a dibble—a stick somewhat larger than a broom-handle, blunt-pointed—make the holes, about six inches deep. It is well to have the dibble 15 inches long, to serve as a measure between the holes. Another hand should place the plants in the holes, while a third, with a watering-pot without the rose, or a bucket of water and a dipper, holds the plant erect with one hand and fills the hole with water with the other. If the soil is light and sandy, the water will carry it to the roots, and no other filling in is needed; but it is well to go over the rows the same day, and where necessary draw more earth to the plant. In planting, observe one thing: Always make sure that the first joint, that is, where the lowest leaf joins the stem, is always placed well below the surface, as this will often insure the success of a very unpromising set. It is well to keep a few sets in reserve, to replace any that may die. If the plants look sorry for a few days after planting, do not be discouraged; so long as any part of the stem remains green, the set is safe.

The sweet potato is not subject to diseases and insects to any serious extent. The adjoining cut figures the stages of a beetle which sometimes infests the vines. The true size of the insect is indicated by hair lines in the figure.



Two-striped Tortoise Beetle. (Casssida bivittata.)
2, larva; 3, pupa; 4, beetle.

Keeping Sweet Potatoes. Sweet potatoes, to keep well, should be selected ones that have been raised in a light soil. They should be dug and put away before the ground is saturated with water from heavy, cold autumnal storms. A heavy rain of short duration need not be regarded as a sufficient reason for concluding that the potatoes, in such case, will not keep. A light soil dries very soon when the rain is past and sunshine succeeds. Potatoes, to keep well, should be dug before frost kills the vines. A light frost, however, that merely kills or blackens the leaves, will not prevent the potatoes from keeping. It is better to pick up the potatoes as dug than to have them exposed to a mid-day sun on a warm day. One hour, or just long enough for the dirt to dry so that it will not stick to the potatoes, is sufficient. After carefully selecting such as have not been cut or bruised, put them in barrels or boxes soon after being dug, without anything among them—no cut straw, no paper, no shavings, no dry leaves, no sand, wet or dry, except the little that may stick to them in picking them up. The barrels or boxes containing the potatoes may be placed in any room in the house, for they will keep within a few feet of the fire, or in a room where there is no fire if the temperature is 50° to 60° Fahr. Fire in the room where the potatoes are placed is considered essential, even in moderate weather, so as to dry up "the sweat," as it is called, produced from the potatoes heating, which they will undergo in a few days after being stored. The most critical time, however, is in severe cold weather, especially when the fire goes out, which is sometimes the case. In the time of such weather it would be well to put some fabric around, under and also over the top of the barrels, etc. Sweet potatoes should never be allowed to become cold (below 40° or 45°), even for an instant. In ordinary times it is not at all important that the potatoes be covered with anything.

In keeping large quantities, so much care can not be taken; but such undertakings are not expected except in warm latitudes.

Sweet-scented Shrub, or California allspice, grows wild in the South, where there are several species. One is cultivated for its fragrant, strawberry-scented blossoms. One species, not fragrant, grows in California, and has red flowers three inches wide.

Sweet-scented Vernal Grass, a species of perennial grass abounding in the older States and giving to new-mown hay that delicious fragrance which is so celebrated.

Sweet Sultana, a composite yellow flower from Asia, cultivated for ornament and for its fragrance.

Sweet Verbena, a shrub from Chili with lemon-scented leaves.

Sweet William, or Bunch Pink, is a true pink, with a flat-topped cluster of variously colored flowers, and is a hardy perennial. Raised in some gardens. Wild Sweet William is a species of phlox, more common East, with purple flowers—sometimes white. Another species of fragrant-flowered phlox, similar to to the last, abounds in the West, and is sometimes called "Sweet William."

The petals of all these flowers have a delicately flavored, sweetish taste, and are often eaten by children.

Swindle or **Humbug.** The meaning of these words is so well understood that they need no definition here; besides, the latter has been defined under its proper heading. We suppose that from the earliest times, and among almost all nations, swindles and humbugs have been known; that one set of men have swindled and humbugged another. But in no nation has the art of humbugging been carried to such perfection and so extensively practiced as in our own. Indeed, to such an extent has this been the case that among all nations the Americans are known as the greatest of swindlers. In this connection we wish to make another statement, equally true, and that is, that no class of people have been so extensively and outrageously humbugged and swindled as the farmers. There are, of course, reasons for this, which we need not discuss here; but it is the object of this article to "show up" many of the swindles and humbugs practiced upon the farming community by skillful but unprincipled men, in such a way that the farmer may be able to protect himself. The farmers who are almost daily beset by sharpers should be posted in all their arts and modes of working their swindling games, so that he may shield himself and family from them. While, of course, we cannot even speak of all the innumerable humbugs met with on every hand, yet we believe any intelligent farmer who will carefully read the following *expose* of some of the leading ones will be able to protect himself from all. In the article on Doctoring, we very thoroughly ventilated some of the patent medicines and quack doctors, which are the greatest of humbugs. In that of Hygiene, under the head of Electricity, page 856, we expose the innumerable electrical and galvanic humbugs now having such a run. In the article on Lightning-Rods we speak of the worthless and expensive rods sold through the country; but in this article we "show up" the mode generally adopted in selling them.

We do not wish to condemn or speak disparagingly of all men or agents who travel through the country; for, like everything else in business, there are the good and the bad. It therefore stands every farmer in hand to qualify himself for distinguishing one class from the other; for, while many itinerant salesmen and agents are real swindlers, others bring to the farmer's home treasures which he can obtain in no other way. Everything should stand upon its own merits.

The general plan of operations in all the schemes practiced upon the farmers is the same; the agents, however, resort to an occasional change of tactics to suit the emergencies of particular cases. They really discern every peculiarity of their intended victims, and take advantage of them so dextrously that it is almost impossible to ward them off. It is the idea of this article to give the farmer such insight into their mode of working as to enable him to shield himself from their ingenious tricks. We will first speak of one familiar to most farmers.

LIGHTNING-ROD SWINDLE. Of all the humbugs under the sun none has so completely swept the board and demonstrated the gullibility of Americans as those which may be classed under this heading. Newspapers have written them up, courts of justice have exposed them in all their trickery, and victimized farmers have cried aloud with mortification and anger, but all in vain. Year after year the lightning-rod men go swarming over the country, gathering in the farmers like shocks of wheat that are ready for the thresher, extracting from them the kernels of value, and leaving nothing behind but straws of lightning-rods and chaff of villainous contracts.

We have discussed the value of lightning-rods and the proper modes of constructing them, in the article on Lightning-Rods, and for the real merits of a good rod will refer the reader to it.

The usual prices of lightning-rods as sold by these men range from 45 to 75 cents per foot, the cost of which is four to nine cents per foot. The trimmings cost $3 each for points and balls, $6 for vanes, $5 for arrows and the price of each brace is equal to four feet of rod. There are many different plans adopted to sell these rods, but in all is some hidden scheme or "twist" which is not discernible until too late to avert trouble.

It naturally requires a peculiar class of men to place the business properly before the farmers, and the firms choose canvassers who have plenty of nerve, an endless amount of cheek, and are glib of tongue. These fellows are good judges of human nature and are well posted in current matters. The canvassing party consists, generally, of two men, one of whom is the agent and the other an assistant, in case of need. They go about in a fine turn-out, and make a pleasant impression on first sight. No suggestion of their

business is in their rig, equipment or manner.

The organization, when ready for business, consists of five buggies, with a canvasser in each, and nearly always a driver (fighting man); one wagon loaded with rods, and two or three men to follow a few days behind and put on the rods. Some firms have their "settler" (who is usually the foreman) go with this wagon, and they help him to fight it out. Others have their settler follow a few days after.

The Canvasser's Piece. When a farmer is found who has a nice place and unrodded buildings, the agent stops and makes himself agreeable. He tells the farmer about the latest news, speaks advisedly of crops and takes great delight in fine stock. He is glad to see such improvements on the place, and believes that the farmer thoroughly understands the business of farming. After paving the way by such means, the agent remarks that he used to live in an adjoining county, and owned a farm there until the spring before, when he had a good offer and sold out; since that time, he has been looking about him for a farm that suited him, with the intention of buying. This farmer's place is the nicest one he has encountered for many a day. So he leads the game on, until he finally says that he has been out of employment so long that he was persuaded to accept a flattering offer from a lightning-rod firm—the same firm that rodded his own house last year—and is now engaged in working the trade up in that section. When he went into the business he had no idea that there was such a prejudice against it as he finds; and, really, he has nothing to say in extenuation of what he hears about the trickery of some agents. His house, however, allows nothing of the sort, and he proposes to do business on the square. He accepted the place more on account of the freedom it gave him to roam about and see the country previous to locating permanently. The idea he had was to make the business a respectable one by demonstrating the actual good derived from the rods as protectors of property. The farmer would admit that there was great danger from lightning. See the trees that had been shivered about the country, and look at the innumerable newspaper accounts of fatal accidents by lightning. Farm buildings are great conductors of the dangerous fluid, and especially so are barns filled with hay. All these chances of injury could be obviated by the judicious erection of rods. Now, some agents were base enough to take advantage of their calling and place unnecessary rods about a house or barn merely to increase their bills. He didn't propose to do anything of the sort. He knew just how many were needed and just where they should go, and did not propose to make use of any but solid arguments to secure trade. It was a fact, the smooth-tongued agent asserted, that the best insurance companies would not take risks on buildings that were not protected by rods; and moneyed men would not make loans on property unless the buildings were provided with them, because the hazard of destruction by lightning was so great the mortgages placed upon such securities were practically absorbed in the landed property itself. Then the agent ended with a peroration worthy of an Ingersoll, in which he depicted the farmer's family shivering with terror during a thunder-shower, while all that agony might be averted by a trifling investment in lightning-rods. It was every man's duty to protect his family as much from the elements as from the hand of the midnight assassin, etc.

All this confidential talk ends in the agent being called upon to make an estimate of the probable cost of rodding the farmer's house. It is usually decided that from $20 to $35 will do the work exactly as it should be done; and the agent, in a burst of sublime generosity toward a fellow farmer, remarks that if the bill exceeds $35 he will pay $5 toward it out of his own pocket, thereby leaving the farmer to infer that the work cannot possibly exceed $35. On the strength of this assurance, the farmer signs the following contract:

THE CONTRACT.

A good lightning-rod properly applied is the cheapest and best insurance known.

———————————, 188 .

Mr. ————, please erect, at your earliest convenience, your lightning-rods on my ——— according to your rules, of which said ——— I am the owner, for which I agree to pay you 67½ cents per foot, and $3 each for points, $6 each for vanes, $5 each for arrows, $2.50 each for balls and $2 each for braces, cash, when completed, or note due on the 1st day of ——— next.

If not paid according to this contract payable at ———.

Guarantee Against Fire. They generally give a guarantee that, if buildings are supplied according to rules of company and are destroyed by lightning, they will pay $1,000; but they always get out of this by contending that, through carelessness, rods were allowed to get off their fastenings or out of repair, and, of course, refuse to pay and contend that a building properly rodded cannot be struck by lightning.

Where the Trouble Comes in. The trouble begins in a few days after the papers are signed, or as soon as the agents get through canvassing in that part of the country.

Two or three men will put in a sudden appearance with a wagon loaded with lightning-rods, and be so overwhelmingly full of business as to be unable to answer a single question. They cannot even look at anything except the house that has been placed at their mercy. If the farmer offers a word, he is coolly snubbed and treated as though he was an interloper, while the brazen fellows awe him into complete docility. Meanwhile the men produce ladders, tools and rods and proceed to literally cover all the buildings on the place with a network of rods. To these are added points, balls, vanes and trimmings wherever they can be made to hang on.

The Way They Get so Many Rods on. The rods are run down the side of the buildings and deep into the ground, while some gangs have the boldness to

lay them in trenches through the yard and away out into an adjoining lot. Every possible means is resorted to to increase the number of feet of rod, because the contract stipulates the payment at so much per foot. The farmer complacently looks on, when he finds that he cannot prevent the men doing as they please, and chuckles to himself over the thought that he is getting all that work for $35. When he speaks to the men about it, they curtly tell him that they know nothing about the price and are simply working under orders.

The "Settler." When the job is done and the men are away from the neighborhood, along comes the "lightning man" of the party. He is called the foreman, and his duty is to collect the bill. He has a fighting man with him, has a fine turn-out, and moves on the farmer as though there was no such a thing as escape from the consequences. He presents a bill like the following:

The Bill. They put on an ordinary building from 100 to 300 feet, running two ground-rods from 9 to 15 feet into the ground; they put on from two to six points and balls, vanes, braces, etc., wherever they can and all they can. Then, of course, barns and other out-buildings make a bill never below $80, and often as high as $500.

LIGHTNING-ROD NOTES.

$—— Post-office——— Date———188

On the 1st day of ——— after date, for value received, I, the undersigned, residing in the township of ———, county of——, State of———, owning the buildings on which the lightning-rods were erected, for which this note is given (said rods being for my individual benefit), promise to pay to ——— or bearer the sum of ——— dollars, with use, payable at ——— at ———.

If not paid when due, payable at Indianapolis, Ind.

Location of residence.

Street, ———; road, ———; distance from post-office, ——— miles; direction ———.

Agents will re-write signature plain on line below.

No. ——

I certify that the within note was taken by me, and that it was signed in my presence by the person who owes this debt, and that no bill is unpaid or receipt given against this note, or any part thereof.

——————— Salesman.

Some States make it a criminal offense to take notes for patent rights or lightning-rods without specifying in the notes that they were given for that purpose.

How Lightning-Rod Notes are Sold. Before the business got in such bad repute, notes brought 75 to 90 cents on the dollar; but now the average is 50 to 60 cents. There are always men in every community who almost eke out a living by buying these notes. When an advance agent strikes a section he almost always goes to one of these men and makes a bargain in advance for the notes he may take. This scalper (who is often a banker) points out the man for him to "go for," and tells him just how to approach and how to manipulate him.

When the farmer looks at that document he realizes what it is to be struck by lightning. The victim assures the collector that the work and rod were to be but $35, and tells how the agent promised he would pay $5 out of his own pocket in case the bill exceeded that sum. The foreman puts on a swagger and says that the canvasser is simply hired just as he himself is, and if he is willing to sacrifice his commissions through friendly feeling there is no law to prevent him doing so. He thereupon credits the farmer $5 on the bill. He then assumes a still more domineering manner, and presents the original contract, which binds the farmer to pay so much per foot for rods, so much for each ball, point, vane and brace. The "rules of the company" were observed, and the farmer is caught fast. If not paid according to contract, at a distant city, which is another kink he had not noticed, they make it payable at their headquarters, which is away off somewhere, and compels the maker of the contract to go there to fight them. There is no use of arguing or refusing to pay, since the clause making the bill payable at a distant point in case of refusal to settle at once only threatens to add costs of a suit in the United States Court to the face of the bill. The agent tells him that he has paid $5 (through the original agent's guarantee), which is credited on the bill, thus binding the whole matter, and there is no possible escape. If the farmer threatens personal chastisement, the big fighting man ambles quickly to the front. There is no help now, and a note is accordingly given in settlement of the account. Rather than become the laughing-stock of his neighbors, the farmer closes the matter out by giving a note offered by the foreman, on the back of which is a property statement. The foreman usually coddles the farmer into making a statement that he is worth more property than he really owns, through some misconception of what he is doing, and thereby catches him a second time, as such a false statement makes the signer liable for fraud.

On every hand the farmer is taken in, and becomes a thoroughly victimized man. The note, with interest, falls into the hands of some money shark, and is crowded to full payment.

The rods on his house usually blow off or become so disarranged as to be a source of constant danger, and the end of the matter generally is that the farmer tears them down in disgust, and denies his family promised luxuries or real necessities for months to come, in order to recuperate his weakened finances.

THE CLOTH SWINDLE. There have been few swindles practiced upon farmers that have been more successful than that which is known as the cloth fraud. Hundreds, and even thousands, of those who flatter themselves that they are too worldly wise to be

taken in by any new-fangled device for raking in the coveted dollar, have it to say that they were most completely fooled by the cheerful cloth agent, and that their notes, in the hands of neighboring bankers or private money-lenders, are the overwhelming evidences of their gullibility, and neglect to keep pace with current events. The cloth swindle is nothing new. It has been long practiced and yet new victims are found.

We must say at the beginning that the cloth agent is a fraud, and one, too, of the very worst description.

The very first move he makes, when he strikes a section that is to be "worked," is to get acquainted with some banker or loan agent in the neighborhood, and from him ascertain who are the responsible farmers whose notes will be negotiable and who will be apt to buy goods of him. He is directed by the banker to this and that party, whose paper he will take, giving $100 for any $150 note that may be presented to him. Having secured the co-operation of the banker, the cloth agent makes the acquaintance of some reputable man of the neighborhood, in whom the farmers have confidence, for the purpose of securing introductions to the farming community. This person is always assured of a certain percentage of the profits. In other words, he is paid, and well paid, by the agent for performing this piece of what we may term very dirty work. Now bear this fact in mind, reader: whenever your friend John Thompson drives up to your house with a cloth agent, and desires to make you acquainted with him, and assures you that the agent has some very good wares to sell—whenever he does this, John Thompson has been bought up, and is to put into his own pocket a portion of the money which the agent is to swindle out of you. When the pair have made their appearance at a farm-house, and the agent, by persuasive words and shrewd maneuvering, has gained access, the family is informed that he has a large quantity of dry goods which must be disposed of at ruinously low prices. He represents the well known firm of so-and-so (some leading dry-goods house of one of the large cities). That firm for some reason has been obliged to economize, and is on the very verge of bankruptcy; in fact, it was caught with an enormous stock of goods on hand, and has resorted to this popular plan of disposing of them. There were in the concern perhaps three hundred salesmen, and these gentlemen have been sent out with goods, and instructed to dispose of them at the very bottom prices!

He (the agent) is one of these salesmen; he has some goods he knows will please the farmer's family. This is the manner in which he paves the way to a sale.

With this he goes to his buggy, which is filled with dry goods, and brings in a large bundle, being assisted, of course, by the farmer's acquaintance, Mr. Thompson, whose mere acquiescence in what the agent has to offer goes farther than anything else in influencing the head of the household to give the stranger a favorable hearing.

Now comes the nice part of the agent's work. Calicoes are displayed and offered for one half less than they can be purchased for at any store. Ginghams, delaines, muslins, sheetings, are thrown in at the same great sacrifice. The wife herself acknowledges that she cannot begin to purchase the goods for the figures the stranger offers them for. After the light goods the swindler produces a piece of broad-cloth. This he flaunts in the eyes of the farmer, assures him it is the finest article to be had for the money, and that his house made a special importation of several thousand yards. On this cloth he puts a certain figure, which eventually proves to be about three times its worth. Convinced that they have secured the first goods at a sacrifice (and they *are* sold for less than market prices), the farmer and his folks are disposed to purchase of the heavier articles, of which they know little, and of course are under the impression that they are securing at the same great discount on actual cost.

Having, during the conversation, informed the farmer that he has been instructed by the house to sell nothing less than a $150 package of goods to any individual, he further conveys the intelligence that payment need not be made under twelve months. He will take the farmer's note and wait on him a year.

So it is that the victim of the sale becomes far more interested than he has hitherto been, and when, a few moments later, the shrewd agent whips out a high-colored shawl, calculated to take the female eye, the farmer is at last nearly convinced that it will be to his advantage to secure a lot of these goods. The women folks "second the motion," and insist upon it that the goods shall not go back with the agent. Seeing that the farmer himself wavers, and is not wholly won, the agent throws in another piece of light cloth, and perhaps a package of handkerchiefs or other small articles, and these are the straws with which to break the bargain s back.

This is too much, and the farmer consents. He signs the note, receives the goods, and the agent drives off with the mutual friend, Mr. Thompson, and the family is left to do what it pleases with the dry goods. It isn't long before the farmer discovers that the broadcloth is shoddy, the worst kind of shoddy. It is cloth pressed, not woven, and composed of the refuse of a woolen-mill, held together by horse-hairs.

He finds that the "India" shawl which he supposed was a bargain, is a damaged article, inferior in quality, no India characteristics about it, and was sold to him for ten times its value.

He finds that his note is in the hand of his city or village banker, or that old Jones, the skin-flint, has it, and he must pay. He learns the agent sold it to the banker or to Jones the very day he sold the farmer the goods, and if he is sharp in inquiry, he will ascertain that the agent was so anxious to get rid of the note that he let it go for $100.

He will find that he is no exception, but that every person in his neighborhood who has bought these goods has been dealt with in the same manner. And, too, he will find that the firm is a myth. The reputa-

ble house whose name the swindler gave never resorts to such ends in selling goods.

Fruit-Tree Swindle. Every farmer, almost, can testify that one of the most successful swindles ever perpetrated on the rural districts is that of selling worthless fruit-trees. It is perfectly natural that the owner of a piece of land should feel a commendable pride in maintaining a fine orchard, and it is singular that with experience in everything pertaining to farm management some farmers get the idea into their heads that the cultivation of fruit is a thing requiring a little or no special preparation or study. If a tree is put into the ground and left there a few years the planter thinks it ought to produce a thrifty yield of just such fruit as the label it bears indicates. He is apt to find out how mistaken has been his confidence in the word of some peripatetic agent. There is no limit to the chance for fraud, and it is increased by the willingness of farmers to accept as Gospel truth whatever may be told by an unknown and unreliable tree-vender.

The canvasser puts in his appearance and represents himself as an agent of some well-advertised house. He warrants the stock he has to dispose of to grow and bear fruit in a very short time. He knows, and so expresses himself, that farmers have been frequently deceived by unscrupulous men and that the climate is not adapted to the propagation of all varieties of fruit; but he proposes, vauntingly, to secure patronage by honest dealing and offering trees specially adapted to meet the requirements of the peculiarities of the section he may be operating in. By these loud and specious protestations he soon secures a favorable hearing, and it is not long before he sells to the very man who was outrageously swindled by a similar dodge, a bill from $25 to $200 worth of scions or trees. Having worked his territory exhaustively and secured every order he possibly can, the agent begins to deliver his wares, which prove to be nothing but common cullings or the cheapest kind of trees purchased wherever he can get them at the lowest figures. Of course the fraud cannot be detected until sufficient time has elapsed to develop the nature of the trees, and long before that time arrives the agent is in some other business, or the Lord only knows where. He can't be reached, and the purchaser of the worthless trees must twirl his fingers and rest content with simply pondering over the general cussedness of mankind. The trees were paid for and delivered; they are good for nothing, as time proves, and the victim is out his money and has no redress. The pecuniary loss is not the most serious one. The farmer has wasted several years endeavoring to cultivate an orchard that is simply worthless.

Some of the agents carry with them specimens of the alleged product of their favorite trees. These fruits are first selected with great care and then placed in small boxes or cases having magnifying glass tops, through which the fruit looks larger and nicer than it really is. Of course the trees sold by means of such exhibits are not of the variety represented, and prove a burden to a man instead of a blessing or a profit.

Whether it be the oily-tongued fellow with florid prints of impossible fruits faithfully depicted between richly-bound lids, or the more humble chap who carries cheap pictures in a portfolio, or the scamp with his jars of preserved specimens—whatever means resorted to by the traveling fruit and ornamental tree peddler, the purchaser is almost sure to be swindled. They carefully steer clear of such families as are well supplied with agricultural and other journals and books. They find few sales among members of horticultural societies.

Patent Medicines. A most important duty of life is to take care of the health. This fact is so well known that it would appear to be a piece of supererogation on our part to dwell at any length on the necessity of doing what nature so distinctly teaches us. What we desire is to impress upon the minds of our readers the importance of giving themselves proper treatment, should they be so unfortunate as to fall victims to this or that disease, and not jeopardize their existence by seeking the advice of quacks or partaking of the nostrums which flood the market and are "guaranteed" to be specifics for every ill that flesh is heir to. With Shakspeare we can heartily exclaim, "Lord, how the world is given to lying!" and the bold truth of the sweeping assertion stands out in everything which originates with these men who turn a "nimble sixpence" into an "accelerated" half-dollar, and by their wits gain a competence at the expense of the gullible and too reliant world.

We have shown up these spurious medicines in the article on Doctoring.

Patent Rights. The very name of patent rights is suggestive of pecuniary losses to the ordinary reader, and awakens a desire to know more of the inner workings of the business, to the end that the insidious assaults of the venders may be warded off.

The same cause which leads to a thousand other troubles influences the purchaser of a patent right, and that is the desire to make money easily and rapidly. There are plenty of men in all walks of life who seek this golden secret, but the broadest field for speculators is among the farmers. The laborious, plodding life led by most of them, aids to enliven the pictures of wealth and ease so graphically drawn by the wily salesmen, and hundreds of farmers have invested their little hoard in some privilege to manufacture a gate or a windmill, or an implement that proved a sorry load.

One reason why so many patent rights fail utterly is because it is the farmer's disposition to give up the moment he encounters difficulty, and wring his hand and weep. The "sell" he so often loudly denounces may be a valuable article in itself, worthy of manufacture, and sure of sale if rightly put before the public. But a man entirely untrained to mercantile life, and above all to the life of a canvasser, cannot sell a patented machine to his neighbors. He has not the gift of tongue which captured himself when the pleasant

agent sold him the right, nor has he a thorough mastery of the art of putting a case to a desired purchaser. The agent assured him that the article would sell on its own merits; and so it would if its merits were but made known. He cannot tell a neighbor, with whom he has associated for years, and who has heard him stammer and sputter in prayer-meeting or some political convention, what the machine really is.

When the farmer contemplates his failure, his morbid mind grows more and more diseased, and he concludes that the article is a swindle at best. So he places the sample as far out of sight as possible, in the barn or garret, and nurses his wrath against patent-right men by being cross to his patient, hard-working wife, and by refusing the children some little pleasure on the ground of his poverty in these hard times. The business failed because the wrong man had hold of it. In some men's hands the investment would have paid well; but the farmer imagined that he could do as the agent did, and was deceived in his calculations. The farmer was, probably, as intelligent a man as the canvasser, but he had not studied for the business. His own forte was to raise cattle, and good ones, too, probably; and were the agent to venture in such a speculation he would ignominiously fail.

Farmers are frequently approached by men who have a remarkable gate patent, or some new plan for fencing. There is an infinite variety of articles offered, but the principle is always the same: the purpose of the agents is to make money out of their patrons. After a farmer has purchased his right to sell or manufacture, the matter is never prosecuted to a profitable issue. But the greatest danger lies in the signing of notes, through some misapprehension of their meaning, or because of promises of agents that no advantage will ever be taken of the act. Advantage is always taken of every possible weakness, and that fact may be counted on with absolute certainty.

Patent Rights of Value are Never for Sale. The reader will bear in mind that a patent with merits will never be for sale except to the most intimate friends of the patentee. He may not be able to manufacture his patented article, and takes in friends to furnish the necessary funds. No man ever came around to you to sell an article that a manufacturer thought there was merit enough in to manufacture and put on the market. The things for sale are those that look big; but there is a missing link somewhere.

FRADULENT NOTES. We present a *fac-simile* of a contract made by swindlers with farmers, for the sale of various kinds of agricultural machinery. The fraud has been perpetrated on a great number of worthy people, who certainly ought to have known better than to attach their name to any document of such character. A man whom we will call B. Johnson calls upon a farmer, named John Smith. Johnson introduces himself as the general agent of a first-class seeding machine. He talks Smith into agreeing to act as a sub-agent for his section of the country, under the impression that he will reap a rich financial harvest from the sale of the machine. Johnson says he only asks $10 for establishing the agency, the same to be paid only after he (Smith) has sold $275 worth of the seeders. Smith feels that this is a splendid opportunity, and he signs the "contract," which is as follows:

[SWINDLING NOTE.]

Cleveland, Ohio, June 10, 1880.

One year after date I promise to pay B. Johnson or . bearer, ten dollars, when I sell by
order Two Hundred and Seventy-five Dollars . worth of Seeding Machines
for value received at ten per cent. per annum, . said ten dollars when due is
payable at Cleveland, Ohio. John Smith . Agent for B. Johnson.

Witness: John Thompson.

This is apparently innocent enough: a contract simply to pay $10 *when* machines to a certain value have been sold. Surely there is no great risk in an arrangement of that kind.

Now, this contract is nothing less than a note of hand that binds the maker to pay $275 with 10 per cent. interest on the order of B. Johnson, one year from date. That is what it is; and when Smith signed it he placed himself under obligation to pay that amount. The contract is so worded that when cut in two where dots are it is divested of the nature of a contract and is made a pure note of hand. Try the experiment. Place a sheet of paper over the right-hand end, where dots are, and then see if you could consent to sign such a contract.

ADVERTISING DODGES. Certain papers contain numerous small advertisements calling for small sums of money or stamps in exchange for information that will lead to the rapid accumulation of wealth. All imaginable devices are resorted to to catch the eye of the public. Every illustrated newspaper, story paper, magazine and even many religious papers contain advertisements of this character:

> BIG PAY.—Send stamp for a sure-selling article. Agents wanted. Address, etc.

Of late it has been found that the demand for a stamp proves injurious to the advertiser, and so one sees numerous announcements:

> FREE.—Send name and address for our quick-selling articles. Fortunes made in the work. Address, etc.

When the correspondent replies, it is found that the house will furnish circulars, instructions and samples of "quick-selling goods" for a few dollars. These articles are generally of the most simple kind, and no person would think of traveling about the country and offering them for sale.

The fact is that the average man or woman cannot transform himself or herself into a peddler and resort to such means of gaining a living. A few of the large number sending for "samples" no doubt do make money, but that is no evidence that every one can; and the upshot of the matter is that the money invested is thrown away. A dollar or two is not missed by each victim, but the aggregate is simply enormous, when the total number of curious or over-anxious correspondents is remembered.

Another class of advertisements calls for a trifling investment for some little article of household use, like a carpet-tacker, a dish-washer, a knife-sharpener or a multiform instrument in one. The advertiser sends the article agreed upon, but when the buyer receives it, he uses it for a day or two and then throws it aside. Thousands of dollars are annually spent in this foolish way. Sometimes, however, the class of goods proffered are palpable frauds, but the character of the newspapers in which the advertisement appears, makes the affair seem all right.

Ready-Made Love-Letters. There's another class of advertisers who take advantage of susceptible natures in advertising their wares. They know very well that the tender passion finds its victims in the rural regions, and they know, too, that human nature is the same the world over. There are hundreds of young men who, having fallen in love, foolishly imagine that their success in winning their suit depends upon addressing the object of their affections in stilted phrase, and so they cast about to find some form by which to perfect themselves in the composition of letters to their "adorable." They see an advertisement like this, for instance:

> LOVE-LETTERS. 40 models free. Address
> ——— Pub. Co., ———

And then they send for the pamphlet in question. The publishing company which promises to furnish the book, or "samples," of course forward the same, and follow it up with seductive inducements relating to certain "guides," which we will not mention here, and which they feel assured the young man will need as soon as he is married.

In the first place, every young man who is in love should bear in mind this fact: He can express the peculiar sentiment of his heart much better by relying upon himself in matters of this kind, no matter how simple it may be; and, furthermore, few young ladies have an exalted idea of a young man who will resort to the labor of some one else's brain to speak his sentiments. Girls are quick to detect an imposition of this kind. Don't do it.

Then, again, you can get along after marriage much better by letting the pernicious literature of the day alone and relying for advice upon home physicians and experienced friends. Save your money, and don't squander it on trash of this description.

Other Advertising "Catches." Then we find young men advertised for to learn telegraphy; others to learn the detective business; others to act as salesmen for a big-paying business, and so on. The place to learn telegraphy, if one intends to follow the business, is in a telegraph company's office; and they never advertise. If you want to be a detective, get into some reputable agency; they never have to advertise for men. If you desire to learn commercial business, get into a store and learn the trade from the bottom up; these are the only men who ever succeed.

Above all, don't answer advertisements offering these inducements, for they are but baits to catch the anxious and unsophisticated.

Besides all these there are the false claims for patents on some little contrivance, generally a gate, which a farmer may have constructed himself. Many a farmer has paid a stranger, who claimed to be the patentee, $5 or $10 for the use of such a gate. The only steps to take when accused of infringing upon any patent is to "do nothing." Do not be frightened into doing anything. Remember the case must be brought in the United States Circuit Court, and ninety times out of a hundred the man who blusters around making all kind of threats of how much it will cost you etc., would never think of bringing the case to trial. That is not their object. Their aim is to get your money without the aid of courts.

Then there are the grain and provision speculation, the counterfeit money dodge, lotteries, cheap guns, patent recipes, etc., etc., all of which are out and out humbugs. Never think of getting something for nothing in any kind of trade, for you will find when the money has been passed from your hands the article is absolutely worthless, or comparatively so. Be cautious, but not afraid of everybody who may call upon you, believing all men rogues, for in that way you will also be the loser. Post yourselves and then use judgment. If an article is of real merit and you need it, and it is cheap, buy it; but a swindle or humbug of any nature, or anything that savors of such,—have nothing to do with it.

Innocent Purchasers. There is a doctrine laid down and enforced by the courts under the general head of "innocent purchasers," which is not altogether satisfactory. As has been very pertinently observed, it is an unjust and oppressive discrimination in favor of one class of purchasers, to the exclusion of others equally legal.

Any lawyer or judge might be challenged to give good reasons why the innocent purchaser of a drive well, or barbed wire, is not entitled to the equal immunity or rights as a banker who purchases a raised note. The whole history of court decisions appears to be a combination with swindlers, so that the farmer is to be eternally the victim; and his labor is forever to be used to fatten the whole horde of swindling cormorants who flourish on his simplicity and artlessness. Courts can always find a precedent rendered away back in feudal times, reeking with hoary error, and enriched in antiquity by the groans and oppressions of the people. Green, the drive-well man, has been, and is, robbing farmers throughout the country in recovering damages for infringments of the drive-well royalty.

The lawyer will say, "this is all right. The man who buys a piece of machinery ought to have known it was all right before he buys." Yes, but the courts protect the innocent swindler who buys the raised or forged note of the farmer; and if the courts intend to render justice or entitle themselves to the respect of the world, why not protect the innocent purchaser of machinery, bought in the public markets, hundreds and probably thousands of miles away from him who holds a patent? When, oh, when will Justice, with her ever-poised wings, protect all alike—the farmer in his rural home as well as the banker in the city?

Swine, a well known pachydermatous (thick-skinned) animal, constituting the genus *Sus*, in the *Suidæ*, or swine family. The wild boar, the stock from which all our domestic breeds have sprung, is a native of Europe, Asia and Africa.

This animal is active and powerful, and as he grows older is fierce and dangerous. He is usually of a dirty brown or iron-gray color, with occasional black spots or streaks. The body is covered with long, coarse hair, intermixed with short, woolly down. The hair becomes bristles as it approaches the shoulders, and forms a sort of mane, which stands erect when the animal is irrrtated. The head is large, bony, and very strong, carrying a huge jaw, armed with sharp, crooked tusks, capable of inflicting fearful wounds. The eye full, neck thick and muscular, loins broad and legs strong, and in height from 28 to 40 inches.

The wild hogs, in a state of nature, are usually found in moist, sandy and well wooded situations, close to streams of water. They feed by choice upon plants, fruits and roots, but when pressed by hunger will eat worms, snakes, small game and carrion. Twilight and night are the only times when they voluntarily leave their coverts, and their acute sense of smell enables them to detect the presence of food, even though it be some distance below the surface. Hence, they often do considerable damage in open and cultivated fields. For the first year or two the whole herd follow the sow, and all unite in common defense against any and all enemies, forming a regular line of battle, the weaker occupying the rear. But when of full age, each animal wanders alone, as if conscious of his strength, and neither seeking nor avoiding danger. They are supposed to live to about 30 years of age. As they grow old the tusks drop out, and their hair turns quite gray. Old boars are rarely found with the herd, but seem to keep apart from the rest and from each other. The sow produces but one litter in the year, and then but few in number, and carries her young about sixteen weeks; and is rarely seen in company with the male except in the rutting season. She suckles her young from four to six months, and continues to protect them for some time afterward. When attacked, she defends herself and family with great courage and fierceness. Often several sows and their litters herd together, and in such herds they are exceedingly formidable and dangerous; but it is only when disturbed or provoked that they attack man or beast. Occasionally in the rutting season, when the passions are inflamed, the males encounter each other; then it becomes a struggle for life, and not unfrequently both combatants die on the field of battle. When attacked or alarmed by dogs, the wild boar first suddenly retreats, turning occasionally to menace them with his tusks; but in a short time, if closely pursued, he stands at bay and fights desperately for life, rushing upon and tearing his tormentors with great strength and fury. From the earliest ages, hunting the wild boar has been a favorite sport with all classes and conditions of society, and particularly with the nobility of most European countries.

The pace and endurance of the wild boar are not to be learned by comparison with the domestic ones, as the vigor and speed of the former require the hunters to be well mounted on the fleetest and most powerful horses, and even then they are often left far behind in the chase.

All the varieties of the domestic hog will breed with the wild boar; the period of gestation is the same in the wild and the tame sow; their anatomical structure is identical; their general form bears the same characters; and their habits, so far as they are not changed by domestication, remain the same. Where individuals of the pure wild race have been caught young and subjected to the same treatment as a domestic pig, their fierceness has disappeared, they have become more social and less nocturnal in their habits, lost their activity, and lived more to eat. In the course of one or two generations, even the form undergoes certain modifications; the body becomes larger and heavier; the legs shorter, and less adapted for exercise; the formidable tusks of the boar, being no longer needed as weapons of defense, disappear; the shape of the head and neck alters; and in character as well as in form, the animal adapts itself to

its situation. Nor does it appear that a return to their native wilds restores to them their original appearance; for, in whatever country pigs have escaped from the control of man, and bred in the wilderness and woods, not a single instance is on record in which they have resumed the habits and form of the wild boar. They, indeed, become fierce, wild, gaunt, and grisly, and live upon roots and fruits; but they are, notwithstanding, merely degenerated swine, and they still associate together in herds, and do not walk solitary and alone, like their grim ancestors.

The first mention that has been found of the swine family in ancient writings is in the Bible (Leviticus, 11th chapter, 7th verse). In all probabilities, however, the hog had a cotemporaneous existence with other animals at a far earlier period, for, if pork had not been the prevailing food of that people, then such stringent commandments and prohibitions would never have been necessary. The hog was highly esteemed by some of the ancients, and was the animal sacrificed by the Greeks to Ceres, the goddess of the harvest. In America swine were unknown until their introduction after its discovery by the Europeans. They were probably introduced into Hayti from Spain by Columbus in 1493, and into Florida by De Soto in 1538, and into Virginia in 1609. In the latter settlement it is said they multiplied so rapidly that within 18 years the people were obliged to palisade Jamestown to keep them out.

Since their introduction into this country they have been an object of special attention and a source of great revenue and profit to the Nation. Many different breeds have been introduced from time to time, and from almost all countries, and some of the best breeds ever produced have originated in our own country. Different breeds are prized in different sections, according to the fancy of their producers, the facility of raising them and the particular object of the farmers. We give the history of each of the breeds of any note, either of the present or of the past, in this country, together with a description of their chief characteristics.

BREEDS OF SWINE.

Bedford or Woburn. This breed was originated by the Duke of Bedford on his estate at Woburn, and was produced by a cross of a Chinese boar and a large English hog. A pair was sent by the duke to General Washington as a present, but they never reached him. They were dishonestly sold by the messenger in Maryland, in which State, as well as in Pennsylvania, they were productive of much good by being disseminated through the country. When pure, they are white, with dark ash-colored spots. They are of large size, with deep round bodies, short legs and thin hair, easily kept and mature early.

Berkshire. Tradition, and the earliest published accounts of what has long been particularly distinguished by the name of "Berkshire" swine, represent them, down to about a century since, as among the largest breeds of England, weighing when full grown 700 to 1,000 pounds, or more. In 1842 they were represented in an English encyclopedia as weighing 400 to 800 pounds. These were doubtless of the improved breed. Originally they were represented as being generally of a buff, sandy, or reddish-brown color, spotted with black, occasionally tawny or white spotted in the same manner. They were coarse in the bone; head rather large, with heavy flop ears; broad on the back; deep in the chest; flat-sided and long in the body; thick and heavy in both shoulders and hams; well let down in the twist; bristles and long curly hair, with rather short, strong legs. Their meat was better marbled than that of any other breed of swine in Great Britain—that is, had a greater proportion of lean freely intermixed with fine streaks of fat, which made it much more tender and juicy than it would otherwise be. They were consequently, from time immemorial, preferred to all other swine there, for choice hams, shoulders and bacon. They were slow feeders, and did not ordinarily mature till two and a half to three years old.

In a subsequent edition of that encyclopedia they were represented as of rounder body and somewhat finer in all their points, with ears like most of those of modern breeding, medium in size, and erect instead of flopping. This portrait is of a sandy or reddish brown color, spotted with black; the feet and legs for nearly their whole length white, slightly streaked on the sides and behind with reddish brown.

It is also traditional that the improved breed was brought about by a cross with the black or deep plum-colored Siamese boar; or that even the pure white Chinese boar assisted for the purpose. The Siamese sow is a dark slate, varying to that of a rich plum color; the feet are all white; the face is dished; head fine, with short, erect ears; shoulders and hams extra large; back broad, slightly swaying; body round and long. The cross was made about the middle of the last century, and the result principally established in Berkshire, England: whence the name.

In reference to their introduction into the United States, Mr. A. B. Allen, who is considered high authority on the early history of the breed, states that the earliest importation of Berkshires into the United States was that by John Brentnall, of New Jersey, in the year 1823.

The next importation was made in 1832, by a Mr. Hawes, an Englishman, who settled at Albany, N. Y., and afterward made further importations. It is thought some were brought to Canada in 1838, and, in 1839, Bagg & Wait, English farmers, who had settled in Orange county, N. Y., began importing largely, and followed it for several years, selling their stock in Kentucky, Tennessee, Missouri and the South.

In 1841, Mr. Allen himself selected in England 40 head and brought them to New York. At this period, and for some years previous, a sort of Berkshire craze swept over the country; every means possible was used to "boom" the breed, and the stock was sold far and wide by speculators at enormous prices. They were at that time hogs of superior excellence, but

under the neglectful system of stock-raising then prevailing in the new Southwest they could not do otherwise than deteriorate. As a consequence of this their popularity waned, prejudice and disgust ensued in lieu of extravagant admiration, and to that generation of men in this country the Berkshires became objects of almost detestation.

The farmers of England never lost faith in their value, and improvement was constantly going on. About 1865, enterprising Americans were again attracted by the good qualities of the hogs their fathers had aforetime admired and then hated, and began making importations of the best that money would buy. Each year since has witnessed improvement in form and quality, and the stock has been diffused through every State, Territory and the Canadian provinces, where it is esteemed second to none for either pork production, pure, or for crossing on and improving the general utility of the highly-bred as well as the most primitive sorts of swine, wherever found.

Fig. 1.—*Berkshire.*

The present standard of good points are: Snout and head fine and rather short, but larger in proportion to the body in the male than in the female, and with a bolder and more determined expression; face dished and broad between the eyes; jowls full or thinner, according to the fancy of the breeder; eyes bright and expressive; ears small, thin and upright, or inclining their points a little forward; neck short, rather full in the throat, and harmoniously swelling to the shoulders; chest broad and deep; back broad and moderately arched; rump nearly level with it; shoulders, above all in the boar, extra thick, yet sloping smoothly to the body; hams broad, round, deep, and so thick through from side to side, particularly in the sow and barrow, that, standing directly behind, except when pretty fat, the sides of the body are scarcely seen between them and the shoulders; legs fine, strong, of moderate length, and set rather wide apart; feet small, with clear, tough hoofs; tail slender and well set, with a handsome curl near the rump; bones fine and of an ivory-like grain and hardness; offal very light in comparison with weight of carcass; hair fine, soft and silky; no bristles, even on the boar; quick and spirited in movement; stylish in carriage, and, in the boar more especially, bold and imposing in presence.

The meat of the improved Berkshire, like that of the unimproved, abounds in a much greater proportion of sweet, tender, juicy lean, well marbled with very fine streaks of fat, than other breeds of swine; but the former was far more delicate, as now, than the latter ever was. This renders the whole carcass the most suitable of all for smoking. The hams and shoulders are almost entirely lean, a thin rim of fat covering only the outside.

The fine specimen of the Berkshire breed presented on this page is a picture of Royal Prosperity, a fine boar owned by Alex. M. Fulford, of Bel-air, Md.

Byfield. At one time this breed was held in great repute in the Eastern States. They did much good in crossing with other breeds. They are white, compact and well made, in size and length moderate and with backs broad, have fine, curly hair, and reach the weight of from 300 to 350 net. This breed originated in Massachusetts about 1800. The first that is known of it is that a fine, white boar was purchased at a market stall by a man living in Byfield. Proving an excellent breeder its progeny was widely scattered over the New England and Middle States.

Cheshires. This is comparatively a modern breed, and but little known throughout the United States. In writing the history and description of this breed Mr. F. D. Coburn says: "I have been unable to secure any reliable evidence of the bringing to this country of any of the swine of that breed or name; but there is a legend that between 1850 and 1855, one or more of the old-time Cheshires were imported to the vicinity of Albany, N. Y, and a sow, at least, taken to Jefferson county in that State, where crosses were made to some extent, not only with the stock common to

the region, but with valuable hogs obtained from Canada, and also largely with the Yorkshires. At all events, between 1860 and 1870, in Jefferson and some other counties, the favorite swine were of a large, white sort, known as the Jefferson County, or Cheshire, breed, or sometimes, 'Improved Cheshire,' and less frequently 'Cheshire and Yorkshire;' and again in some instances as 'Improved Yorkshires.' Harris, writing in 1870, says: 'For a dozen years or more they have been exhibited at the fairs of the New York State Agricultural Society, and for the last six or seven years have carried off nearly all the prizes offered for pigs of the large breed.'

"At that time the leading breeders admitted very freely that they were of mixed origin, but claimed that they had been kept pure sufficiently long to thoroughly establish them as a breed."

The Cheshires are pure white, with very thin skin of pink color, with little hair; are not uniform in this respect, as pigs in the same litter differ widely in the amount of hair; the snout is often long, but very slender and fine; the jowls are plump and the ears erect, fine and thin; the shoulders are wide and the hams full; their flesh is fine-grained and they are commended on account of the extra amount of mess pork in proportion to the offal.

Mr. J. H. Sanders, who successfully bred Cheshires prior to 1875, speaks of them as follows: "In my opinion the Cheshire is simply a derivative of the Yorkshire, as are also the Suffolk, Lancashire Short-face Middle York, York-Cumberland and all the other English breeds of white hogs. I bred the so-called Cheshires for six or seven years, and took a deep interest in noticing the variations and changes that were produced in that time by selection, in breeding and crossing. Within the space of seven years, without intoducing any blood but what was supposed to be pure, I produced all the different types of the Yorkshire from the large York down to the Lancashire Short-Face. The white color was firmly fixed, and I never knew one of my Cheshire boars to get a pig that had a black hair on it, although they were bred to sows of all breeds, including the purest Essex. Another peculiarity that I watched with interest was the frequent appearance of blue spots in the skin of the purest and best-bred specimens. This peculiarity would sometimes disappear for one or two generations, and would again crop out stronger than ever.

"The type which I finally succeeded in fixing upon the Cheshires as bred by me was almost identical in size, form and quality with the most approved modern Berkshire. Indeed, so marked was this resemblance in every thing but color that they were often facetiously called 'White Berkshires.' As bred by me I regarded them as among the very best of white hogs. They were well haired, had a very delicate pink skin, and their meat was most excellent, tender and juicy."

For breeders who desire white hogs, and to whom the Suffolks appear too small and the Chesters too large, we know of nothing better than the best of some of these Cheshires, as they present, in some respects, a sort of compromise or happy medium between the two. The strong admixture of Yorkshire in their make-up would be more than likely to assert itself in their progeny, either when bred together or on any other swine not thoroughly established in character.

Chester Whites. This breed originated in Chester county, Pennsylvania, and was produced by a cross of the Bedford upon the common stock of the country. The first pair of the former were just imported in 1818 from Bedfordshire, England, by Captain James Jeffries.

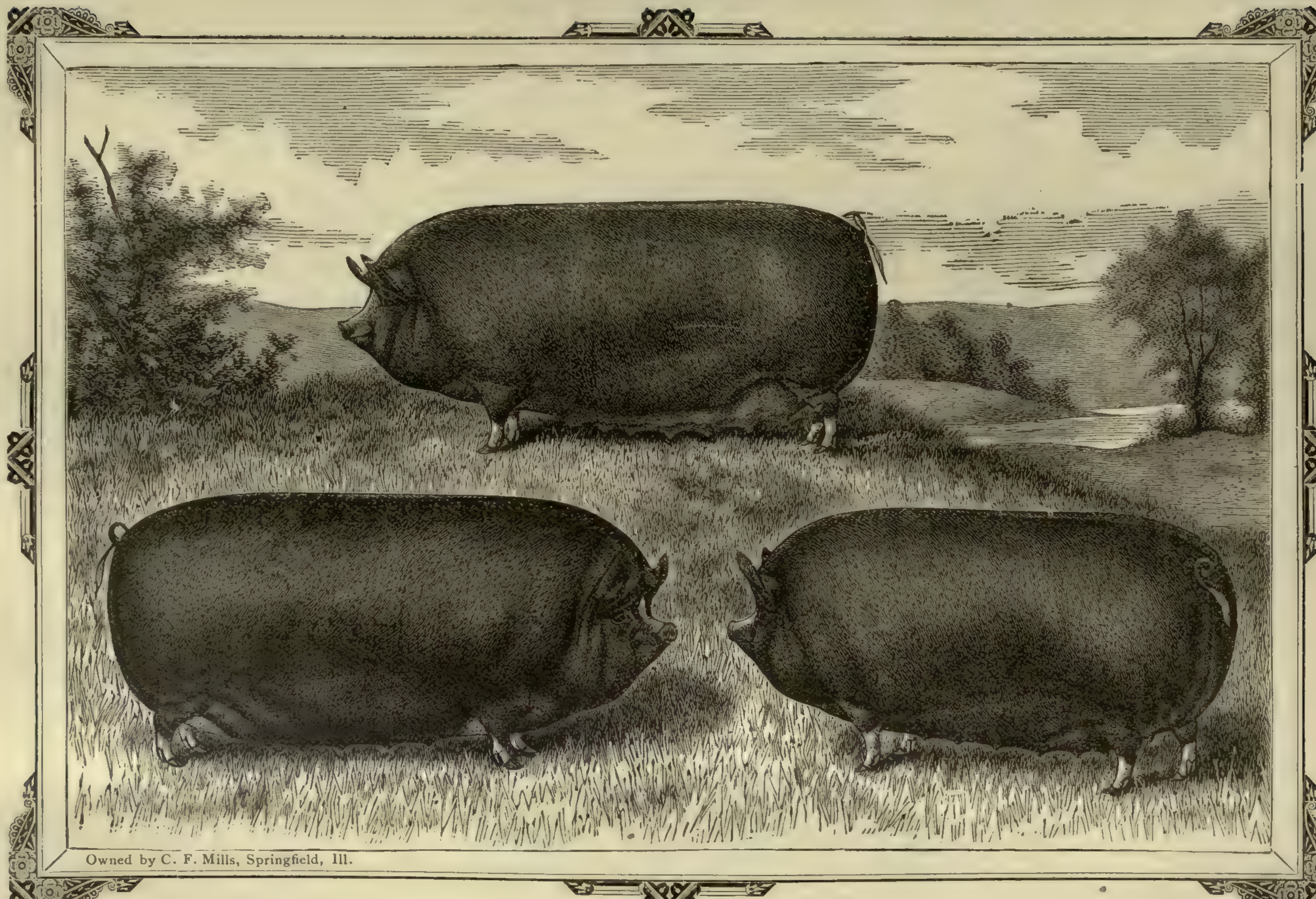
The better class of farmers in the vicinity of Mr. Jeffries, desiring something better in the way of swine than they were then raising, secured crosses of the Jeffries stock on their own. The former seems to have increased and multiplied to some extent, and the progeny continued to be bred on and with the original stock of the county until, in the course of years, its hogs had much more than a local reputation for both size and quality, and wherever mentioned were spoken of as the Chester county stock. They are among the most docile of swine, and belong to the largest breeds known, individuals having attained the enormous weight of 1,300 lbs.

The swine Breeders' Convention agreed upon the following as a description of characteristics of the Chester Whites:

"Head short, and broad between the eyes; ears thin, projecting forward and lap at the point; neck short and thick; jowl large; body lengthy and deep, broad on the back; hams full and deep; legs short and well set under for bearing the weight; coating thinnish, white, straight, and if a little wavy not objectionable; small tail and no bristles."

Since the foregoing was adopted, the tendency has steadily been towards reducing, somewhat, the coarseness of their bone, and shortening their heads and ears; and the improvement has been so marked that fair specimens of the breed are nearly models in form. The large, lopped ears, coarse heads, long, coarse tails and hair, and coarse, spongy bones are not, as in time past, characteristics of the breed; and the enormous weights to which they were formerly fed, are now not considered most desirable or profitable. If smaller hogs are desired, the Chester sows are excellent to use boars of some of the smaller or more compact breeds on; and it is claimed by those who raise Suffolks, that the Suffolk boar bred to Chester sows produces "the best Chester Whites possible."

Chinese. This hog has been a main source of the variations and improvements in the modern breeds of British swine, and from there introduced into the United States, and to these are due the American breeds that now have a reputation unexcelled by any other. The type of the Chinese hog occurs in Siam, and in the regions immediately adjacent to that country; and though generally called Chinese by English and Americans, is more properly called Siamese by the French. Its length of body is three and one-half



Owned by C. F. Mills, Springfield, Ill.

Fig. 7.—BERKSHIRE HOGS.

feet; its length of tail is nine and a half inches; and its height at shoulder is 20 inches. Its eyes are surrounded by a slight tinge of flame color; its ears are short, straight and flexible; its skin, except on the belly, is black; and its hair is soft and somewhat silky on the body, stiff and thick on the head and under jaw, thin on the other parts, and generally hard and black.

The typical or strictly pure Chinese or Siamese hog is too delicate in structure and tender in constitution to be adapted to countries very different in climate from Siam; but sub-varieties of it, and crosses from it, are distributed throughout the Indian Archipelago, some of the islands of Polynesia, many of the eastern and central parts of Asia, and even far distant parts of Africa; and several or even many of these have been introduced to Australia, to America and to Europe, and have very powerfully corrected the bad properties and improved the good ones of the aboriginal hogs of England and of other domesticated descendants of the wild boar of Europe, from which all our breeds have come. The best cross is between the Berkshire and Chinese.

The varieties of this widely extended race with which we are chiefly conversant in this country, are derived from China, being brought to England as sea stock, by vessels employed in the trade which England has so long carried on with the Chinese Empire. They have usually the dark-colored characteristics of the race, but they are often also white, and of a size exceeding the medium; for in China there are varieties of breeds, just as in other countries. Some of them kept in the temples attain, in consequence of age and long fattening, to enormous magnitude; but it does not appear that these sacred pigs are any otherwise distinguished from the common breeds.

The Chinese hog with which we are chiefly familiar, is derived from the vicinity of Canton. Those of the interior are little known to us. It is well known that the Chinese feed more largely on pork than on any other animal food. The hog is the principal animal, except the dog, which is cultivated by the Chinese for human subsistence.

The Chinese pay great attention and care to the rearing and feeding of swine. Extreme attention is paid to cleanliness and regular feeding.

Essex. This breed of swine is by no means widely disseminated over the United States, or popular with the masses; yet it is a long established breed and has many excellent qualities. Loudon, in describing the old Essex, speaks of them as up-eared, with long, sharp heads; roached back; carcasses flat, long, and generally high upon the leg; bone not large; color white or black and white; bare of hair: quick feeders, but great consumers, and of an unquiet disposition. Youatt's work describes them as a parti-colored animal,—black, with white shoulders, nose, and legs—in fact, a sort of sheeted pig; large, upright and coarse in bone.

The first improvement is credited to the late Lord Western, who, while traveling in Italy, took a great fancy to some Neapolitan hogs, of which he secured a pair that were sent home to his estates. These were described by him as a breed of "very peculiar and valuable qualities, the flavor of the meat being excellent, and the disposition to fatten on the smallest quantity of food unrivaled." This pair were bred together and their offspring to such an extent that there was danger of their becoming extinct, and then crossed on the Essex with the effect of obliterating the white and producing a progeny with the appearance and many characteristics of the pure Neapolitans.

Having attained what he considered perfection, Lord Western bred exclusively from his own stock, which resulted in their gradually losing size, constitution and fecundity to such an extent that when he died, in 1844, his herd had become "more ornamental than useful," though the swine of the surrounding country had been much benefited from the Western stock. "In the meantime, the well-known Fisher Hobbs, then a tenant on the Western estate, had taken up, among other farm live-stock, the Essex pig, and made use of the privilege he enjoyed of using Lord Western's male animals to establish a breed on the strong, hardy, black Essex sows, even if somewhat coarse, crossed with the Neapolitan-Essex boars. On the carefully selected produce of these, divided and kept as pure, separate families, he established a breed that he first exhibited, and which has since become famous as the Improved Essex."

In the edition of Youatt's book edited by Sidney in 1860 (London), he says they probably date their national reputation from the second show of the Royal Agricultural Society, held at Cambridge in 1840, when a boar and sow, both bred by Mr. Hobbs, each obtained first prizes in their respective classes; and that "their defect is a certain delicacy, probably arising from their Southern descent, and an excessive aptitude to fatten, which, unless carefully counteracted by exercise and diet, often diminishes the fertility of the sows and causes difficulty in rearing the young."

They are classed with the small breeds, but are about the largest of that class, and frequently grow to weights that would entitle them to be considered among the larger breeds, often weighing 400 to 600 lbs. at maturity, though usually most profitable when slaughtered young for fresh meat, breekfast-bacon or family use, for which they are highly esteemed, their meat being well-flavored and fine-gained, and their lard firm and white; when properly dressed they are but little or no darker than other hogs, even those with white hair.

The standard agreed upon in the Swine Breeders' Convention was as follows: Color black; face short and dishing; ears small, soft, and stand erect while young, but coming down somewhat as they get age; carcass long, broad, straight and deep; ham heavy and well let down; bone fine; carcass, when fat, composed mostly of lard; hair, ordinarily rather thin; fattening qualities very superior. As breeders they are prolific, and fair nurses.

They are good grazers and have the advantage, over some of the more tender-skinned white hogs, of being able to withstand (at any age, however young) the hottest sun of July or August without having their backs or skin in the least affected; and they are never known to scald or mange. The young pigs of the Essex are usually more delicate than those of the coarser breeds, and will often appear quite inferior to the latter, at the same age, up to eight or ten weeks, when they will begin to shoot ahead. This is not always the case, but often is. This may be attributed to the mothers not being such good milkers as some other kinds. It seems to be their nature to run to fat rather than milk. Notwithstanding the good qualities of the breed it has not seemed to fill the popular ideal, and there are many life-long swine-breeders who never saw an Essex, and would not know what to call it if they did. Probably one cause of their lack of popularity or failure to be widely disseminated, is that they are a smaller, and perhaps more delicate swine than the farmers in general care to raise, accounted for somewhat by the fact that it has not been many years since the largest animals possible were the ones most admired, most in demand, and bringing the highest prices.

Persons breeding common stock or any swine that are somewhat too slow in maturing, would, as a general thing, be pleased with the results of using an Essex boar. It is the opinion of some very intelligent men that, under a certain age, the Essex will give as great, or a greater return of pork for food consumed than any other hogs we have.

Jersey Red. It is quite uncertain as to when this breed was first imported into the United States. They were, however, bred in New York as early as 1823, and there called Duroc. These are also known by this and various other names, as Red Berkshires, Saratoga Reds and Jersey Reds. The breed was first brought to public notice in England. By some it is claimed they were taken there from Spain. The name by which they were distinguished from other breeds was that of Red Berkshire. Prof. David Low, in his work, "The Breeds of the Domestic Animals of the British Isles," published in 1842, describes their color as reddish brown with brown or black spots. About the year 1850, Sir Robert Peel brought them before the public, and by some they were called the Sir Robert Peel hog.

This breed has been bred in New Jersey for many years: hence the name. For quite a long time they have run wild in the timber and mountainous country of Tennessee and Kentucky.

In the opinion of some the red hogs in America are mostly from a stock known in England years ago as Tamworths, described as hardy and prolific, but slow in maturing. One recent writer in the West says: "It is admitted by those best informed that Jersey Red, Duroc, Saratoga Red, etc., are but local names for the ancient Berkshires of England, where they were called Tamworths."

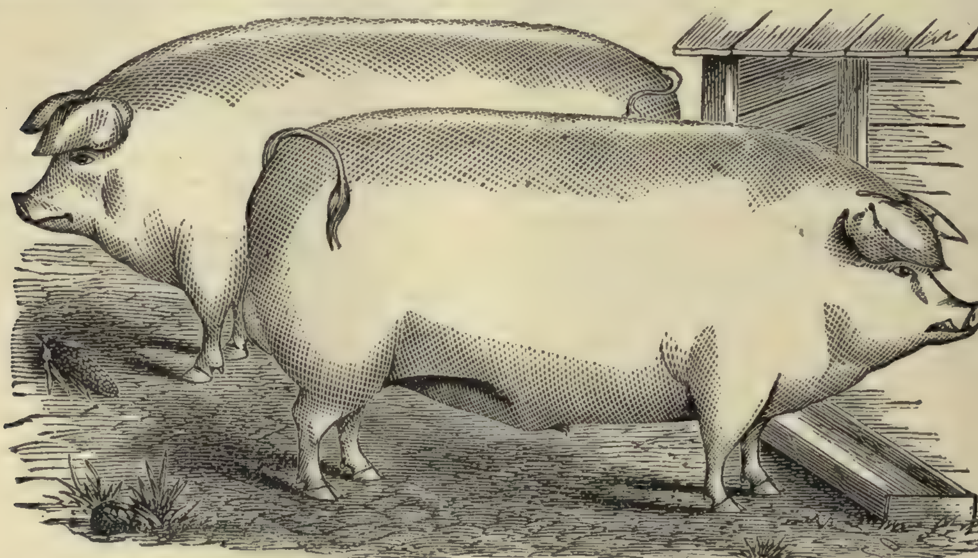


Fig. 3.—*Chester Whites.*

The National Swine Breeders' Convention, in 1872, reported that their definite origin was unknown, but agreed upon the following as the characteristics of good Jersey Reds: They should be red in color, with a snout of moderate length, large lop ears, and small head in proportion to size and length of body; they should be long in the body, standing high and rangy on thin legs; bone coarse; heavy tail and brush; hair coarse, including the bristles on the back.

Col. F. D. Curtis, a breeder of red hogs, and a gentleman who has devoted much time to investigating their history, characteristics, etc., speaks of these red

hogs as follows: "There are three families of red hogs in America, viz.: Jersey Red, Duroc, and Red Berkshires. Since the National Swine Breeders' Convention of 1872, I have not been able to get any additional information regarding the origin of the Jersey Reds. Some breeders, latterly, make claims for purity of blood, and for special features for the hogs of their breeding, which do not correspond with the general characteristics of the red hogs of New Jersey. Previous to the convention they were not advertised as a distinct breed. They had been crossed with Berkshires, Chester Whites, and other breeds, which made them considerably mixed in color, ranging from red to red-and-white and sandy, with the variety in characteristics which such crosses would make. Here and there in the State, chiefly in Burlington County, farmers in a neighborhood and individuals had kept the hogs of their fathers as pure as they could, and so the blood had descended from one generation to another, with the characteristic of red color more marked than any other except size.

"Previous to the convention I endeavored to find out from citizens of New Jersey the origin of their red hogs, but was unable to do so. Mr. D. M. Brown, Windsor, N. J., said he had known of them as long as he could remember—nearly 50 years—but he could not find any one who could tell where they came from. David Pettitt, Salem, N. J., wrote me that he recollected the red hogs for 30 years, but had never heard of their origin.

"More than 20 years ago I saw in Virginia and Maryland hogs similar to those of New Jersey, and they had been for many years a common breed in that section of the country. I stated at this time that the reds are probably descended from the old importations of Berkshires, which has never been disputed; and also that they are much coarser than the improved swine of this breed.

"*Duroc.* This is a fancy name given to red hogs bred in Saratoga county, N. Y., for 59 years. A Mr. Kelsey, of Florida, Montgomery county, N. Y., was the owner of the famous horse Duroc. In the year 1823, Isaac Frink, Esq., a leading farmer in the town of Milton, Saratoga county, N. Y., went to Mr. Kelsey's to see this horse, and there saw a red sow with a litter of pigs, which Mr. Kelsey said he had imported from England. Mr. Frink purchased a boar pig and took it to his home and called it Duroc, in honor of the horse he had been to see. This hog was remarkable for his great length of body, and was extensively crossed upon the native hogs of Saratoga county, where the descendants are still bred. The crosses of these Duroc hogs have been almost innumerable, but, nevertheless, like the kindred family, the Jersey Reds, they have wonderfully maintained the old Berkshire characteristics. About 52 years ago William Ensign, who lived 25 miles distant from Mr. Frink, obtained a pair of red hogs from Connecticut, where, I understand, they are still bred and known as Red Berkshires, which pair of pigs were also crossed upon the hogs of the vicinity. The offspring of these red hogs extended to the neighboring counties, and made for themselves a high reputation. There had been no fixed type for a Duroc other than red, as different breeders followed their own taste and convenience in crossing. As a result, some had lopped ears, an original mark, and kept up by crossing with Chester Whites, while perhaps the majority which have been crossed with the more modern Berkshires, have smaller ears, more or less erect, with rounder and more compact bodies, similar to the Black Berkshires. These hogs retain the capacity for rapid growth and superior quality of flesh and other excellencies which the original hogs possessed.

"*Red Berkshire.* A few years ago several gentlemen engaged in breeding these hogs agreed to accept the name of Red Berkshire as the exclusive name for their hogs, convinced this was the blood from which their stock had descended and was the true name. They also fixed a standard of characteristics which coincided with the original form and peculiar features of the breed, which form and features were possessed by the best types of their hogs. This standard is now admitted to be a proof of purity of blood, and will be the means of establishing a uniformity in the breed which will be a guide not only to the public, but to breeders, and serve to weed out cross-bred hogs which may have but little similarity other than color. I am not aware that the breeders of Jersey Reds have established any standard of characteristics, but the sooner they do the sooner they will get rid of the pretensions of individuals that they possess the only pure-bred stock. The following is the standard alluded to above for Red Berkshires:

"The body should be long and deep—not round, but broad on the back and holding the width well out to the hips and hams. The head should be small compared with the body, with the cheek broad and full; neck short and thick; face slightly curved, with the nose rather longer than in English breeds; ears lopped and rather large; medium in bone; legs medium in length, well set under the body and wide apart; cut up high in the flank; hams broad, full and well down to the hock; hair medium in fineness and thickness, usually straight, sometimes wavy and inclining to bristles on the top of the shoulders; tail, hairy and heavy; color red, ranging from dark glossy cherry to light yellowish red, with brownish hairs and occasionally flecks of black on the belly and legs.

"The darker shades of red are most desirable In disposition they are remarkably mild and gentle, and so docile they are easily confined. They are kind and careful mothers, and wonderfully prolific."

The Jersey Red of to-day has a small head, thick snout, rather small, drooping ears, short neck, straight back and underline, a thick full ham, body round, deep, with full flanks, short-legged and medium bone. Color, red to red dark. They are of quick growth, get large enough for all purposes, often averaging, by the car load, 300 pounds gross from ten to eleven months old. They are docile and very prolific, good mothers, careful with their young. They are a nice, compact

hog, and popular with packers, and it is claimed will outweigh any hog of their size in the world.

The Jersey Red, as those in the State of New Jersey, are much larger than the Red Berkshire, and also much coarser in structure, are rapid growers, frequently dressing 600 pounds when eighteen to twenty months old. They have long bodies, short legs, large bone with rather large drooping ears, face wide, neck short, large through the heart, large hams, color dark to sandy red, and noted as a bacon hog. They are also very docile, prolific, attentive mothers, and great grazers. In fact, this is also a characteristic of the Red Berkshire—there is no better grazing hog in existence. The great advantages of these swine are: 1st. Their susceptibility of being fattened at any age. 2d. Their capacity for growing very large if desirable. 3d. They will produce as much pork for the same amount of feed as any other breed, if not more, and though not quite as handsome as some others, yet they are the hardiest breed known, the most prolific, and best hog in existence at the present time for the farmer, swine-breeder and stock-grower.

Another great advantage of this breed of swine is to cross with other breeds. It is well known throughout the country that the hog that is generally kept by farmers is bred in and in, until their constitutions are gone, and that the first storm that comes makes sick hogs, and the cry is "Hog cholera!" Experience has proven that the Red Berkshire or the Jersey Red boar, with Poland, Berkshire or Chester White sows, makes the healthiest and best fatted hogs that are known to-day, and they are known as soon as seen in the stock-yards, and buyers are always anxious to purchase them.

LANCASHIRE AND YORKSHIRE. These two breeds are very much alike, or are probably one and the same breed. They originated in Lancashire and Yorkshire, two adjoining counties, or shires, in the North of England, and were produced by a cross of the white Chinese upon the stock of that locality. There are breeds there in Lancashire that have attained celebrity. These are the Short-Faced, the Middle breed and the Large Lancashire White.

The Short-Faced breed may be known by the following characteristics: The shortness of the face from the eyes to the end of the snout; prick ears; small bones; a good coat of white hair; cubic in form with broad back and broad hams, well let down. The skin, as well as the hair, is white, although an occasional one may be found with a few dark blue spots in the skin, but never dark or black hairs. The small breed hogs must have small bones; a short face; silky hair; fine, small upright ears; a comparatively square form; must have good square hams, the most valuable part of the hog; must carry the meat near the ground; flat on the back; straight and cubic in form.

NEAPOLITAN. "It is most probable," says Sidney, "that the Neapolitans are the descendants of the dark Eastern swine imported by early Italian voyagers, and cultivated to perfection by the favorable climate and welcome food." They were first brought to this country by James G. King, of Hudson county, New Jersey, from Naples, Italy, about the year 1840. About 1850 Mr. William Chamberlain imported some from Lorento, Italy, to Dutchess county, New York. These, as were their progeny, were of uniformly dark slate color. A few others were brought to this country by other gentlemen, but they have never been widely distributed in the United States. From being natives of a warm climate, and with a very fine and almost hairless skin, it is probable they are too delicate for our American climate and methods. They are classed with the small breeds and their flesh described as like "young, tender, fat chicken."

The leading characteristics of the Neapolitans are described as follows by M. C Weld, of New Jersey, a gentleman who has given considerable attention to their breeding:

"Head small; forehead bony and flat; face slightly dishing; snout rather long and very slender; ears small, thin, standing forward nearly horizontally, and quite lively; jowls very full, neck short, broad and heavy above; trunk long, cylindrical, and well-ribbed back; back flat, and ribs arching, even in low flesh; belly horizontal on the lower line; hind-quarters higher than the fore, but not very much so; legs very fine, the bones and joints being smaller than those of any other breed; hams and shoulders well developed and meaty; tail fine, curled, flat at the extremity, and fringed with hair on each side. General color slaty or bluish plum color, with a cast of coppery red. Skin, soft and fine, nearly free from hair, which, when found upon the sides of the head and behind the fore-legs, is black and soft, and rather long. Flesh firm and elastic to the touch."

POLAND-CHINA. This has been one of the most popular breeds of hogs, especially in the Mississippi Valley, of all the improved breeds ever introduced into this country. They are claimed by their friends to stand at the front of all other breeds for general utility.

Over the history and characteristics of this breed there has been much controversy. Individual breeders have claimed the credit of establishing the breed. Mr. A. C. Moore, of Fulton county, Illinois, and Mr. D. M. Magil, of Butler county, Ohio, both prominent breeders of Poland-China swine, and others have thoroughly discussed the origin of this breed. There has also been much angry discussion as to a suitable and proper name for it. One of the chief points in the controversy in the latter was as to whether a Poland or "Polish" breed constituted a prominent early cross. As no positive proof, however, seems to have been produced of the importation of a single Poland hog into the United States, the name finally adopted by the National Convention of swine-breeders at Indianapolis, in 1872, seems to be a misnomer.

The history of the Poland-Chinas, as given by Mr. Coburn, is as follows:

"Early in the present century there existed in those fertile regions of Southwestern Ohio, watered by the Big and Little Miami rivers—notably Warren and Butler counties—stocks or 'breeds' of coarse, slowly maturing hogs that in time grew to large size, but were difficult to make fat, and designated as 'Russian,' 'Bedfords' and 'Byfields.' Some of the more sagacious farmers there realized the desirability of a cross that should reduce the coarseness and at the same time increase the fattening qualities of their hogs. In 1816, John Wallace, one of the trustees of the Shakers' society located at Union Village, Warren county, visited Philadelphia on business, and while there was shown some pigs called 'Big Chinas,' with which he was so well pleased that he purchased a boar and three sows, and the same season took them with him to Warren county.

"They were understood to be either imported or the direct descendants of parents imported from China. Two of the sows and the boar were entirely white and the other sow was white with some sandy spots within which appeared smaller black spots. The striking characteristics of these Chinese hogs that specially commended them to the Ohioans, were compact forms, early maturity and the remarkable ease with which they were made fat. These were so appreciated that the Chinas and their progeny were crossed on the best stock of that region during the subsequent twenty years, the product being what was known, popularly, as the Warren County hogs. About this time or in 1836, the Berkshires, that had been well known in New York for some years, were introduced into Warren county by Munson Beech. Between 1838 and 1840, William Neff, a Cincinnati man, shipped into the same locality, from England, some hogs called "Irish Graziers," which were white with the exception of an occasional sandy spot about the eyes. These two breeds were bred and intermixed extensively with the descendants and crosses of the Big Chinas on other breeds, and the stock thus produced constituted the basis of what is now known as the Poland-China. From the most authentic accounts obtainable it appears there has been no admixture of other blood with this breed since 1840, and from that time to the present, men with great experience, good taste and judgment have bred them with a view to correcting defective points and giving them the very highest quality. To the skill of those men and the wonderful success of their undertaking the omnipresent Poland-China is a most valuable testimonial."

Great improvement has been made within a few years past in the form and finish of these hogs, and while they were formerly mostly spotted, they are now bred more nearly black, and in many instances are marked very similar to the Berkshires. Though considered by many as a comparatively new breed their characteristics are shown to be of sufficient fixedness to be transmitted with reasonable certainty to their offspring, even when crossed on breeds quite different.

The best specimens are well haired, have good length, short legs, broad, straight backs, deep sides, flanked well down on the leg, broad, square hams and shoulders, deep chests, short legs, short, full, high-crested neck, heavy joints, short heads, fine muzzles, and moderately fine and drooping ears. They can be made to weigh as much as any hogs we have, if not more, and are properly designated as belonging to the large breeds.

SUFFOLKS. This is one of the small, white breeds of swine, and originated in England, where pigs essentially the same are called Yorkshires, or Small Yorkshires, and York-Cumberlands.

They have been known in America for 40 years or more, and were brought to notice by importations made into Massachusetts by Isaac and Josiah Stickney. Though known in all the States to some extent, at one time or another since, they have never become widely popular or extensively raised as farmer's hogs, doubtless due to the fact that they were too small, not wholly satisfactory as breeders and nurses, had skins too tender to withstand the exposure they encountered, and too nearly resembling some of their remote ancestors described as being "perfect bladders, filled with hog's lard, and nearly of the same size and quality."

Many who attempted to raise Suffolks found that their tender, papery skins were too delicate to remain sound in the mud, wind and sun of the prairie regions, where mange seemed to be their natural accompaniment. In other words, the change from the royal rosewood pens and plum-pudding, at Windsor Castle, to our boundless seas of mud and maize, was too great, and other breeds of less aristocratic origin have far surpassed them in the race for popular favor.

The standard characteristics and markings of the Suffolks, as agreed upon in the Swine Breeders' Convention, is as follows: Head small, very short; cheeks prominent and full; face dished; snout small and very short; jowl fine; ears short, small, thin, upright, soft and silky; neck very short and thick, the head appearing almost as if set on front of shoulders; chest wide and deep, elbows standing out; brisket wide but not deep; shoulders thick, rather upright, rounding outward from top to elbow; crops wide and full; ribs well arched out from back; good length between shoulders and hams; flank well filled out and coming well down at ham; back broad, level and straight from crest to tail, not falling off or down at tail; hams wide and full, well rounded out; twist very wide and full all the way down; legs small and very short, standing wide apart—in sows just keeping the belly from the ground; bone fine; feet small, hoofs rather spreading; tail small, long and tapering; skin thin, of a pinkish shade, free from color; hair fine and silky, not too thick; color of hair pale yellowish white, perfectly free from any spots or other color; size small to medium.

It is highly probable the best of the Suffolks as they now exist are much superior, for the general farmer's use, to those of 15 to 20 years ago, owing to increased size, hardiness and a less delicate skin, with more hair. While, as has been stated, they are not general

favorites with those who produce the bulk of our pork, they are by no means without their enthusiastic admirers, who prefer them to any others of the porcine tribe.

For those who want a few pigs of a satisfied disposition, that keep easily, like to be petted, and are of no other color than white, the Suffolks will be found very desirable. For those who raise pork in large quantities by methods having but little painstaking and attention to details in them, some other breed or combination of breeds will be found to answer a better purpose, at least until certain characteristics of the Suffolks are modified, as they doubtless will be.

VICTORIAS. These hogs greatly resemble the Yorkshire in color, size and style. The breed was originated in Saratoga county, New York, by F. D. Curtis, about 1852. This gentleman began breeding with a view to supplying the demand for a medium-sized white hog that would be well-haired and mature easily. They are a combination of the swine common to that locality with the "Grazier," "Byfield," and the Yorkshire or Suffolk. Their characteristics are a good coat of fine, soft hair; head fine and closely set on the shoulders; snout short and face slightly dished; ears erect, small and thin; shoulders bulging and deep; legs short and fine; back broad, straight and level, and the body long; hams round and swelling, and high at base of tail, with plaits or folds between the thighs; tail fine; rosettes common on the back; skin thin, soft and elastic; the flesh fine-grained and firm, with thick side pork. They keep easily and can be made fit for slaughter at any age.

The breeder's description of them is: "They are white in color, have short legs, broad, straight backs and deep sides; a good coat of hair, very fine bone and quality; stand very firm on their feet, and have an excellent constitution. They possess great power of transmitting their color and quality when bred to other breeds, and the large amount of prime meat to weight of carcass makes them favorites of shippers and packers."

YORKSHIRE. The Yorkshires are among the best of the pure bred swine of England, and have stamped their impress upon nearly all of the modern white breeds. Their good qualities are: They are of a size, shape and flesh that are desirable for the family or the packer's use. They are hardy and vigorous in constitution, have a good coat of hair, protecting the skin so well either in extreme cold or heat that it rarely chills or blisters. They are very prolific and good mothers; the young do not vary in color, and so little in shape that their form when matured may be determined in advance by an inspection of the sire and dam.

The Yorkshire, Medium or Middle-breed, says Mr. Sydney, is a modern invention of Yorkshire pig breeders, and perhaps the most useful and popular of the white breeds, as it unites, in a striking degree, the good qualities of the large and small. It has been produced by a cross of the Large and the Small York and Cumberland, which is larger than the Small York. Like the large whites, they often have a few pale blue spots on the skin, the hair on these spots being white. All white breeds have these spots more or less, and they often increase in number as the animal grows older.

The Middle Yorkshire breed are about the same size as the Berkshire breed, but have smaller heads, and are much lighter in the bone. They are better feeders than the small whites, but not so good as the large whites; in fact, they occupy a position in every respect between these two breeds.

The Cumberland, a Middle-breed Yorkshire, are not distributed throughout the West, but when thoroughbred specimens have been introduced they are held in great esteem, as well for an animal for exhibition purposes as for family use. They are especial favorites with packers who buy their stock on foot, for the reason that they yield larger proportionate net weights than any other hogs which grow large enough for their use. They are small in bone but large in flesh, of the very best quality, evenly and proportionately distributed over the whole frame.

THE COMPARATIVE VALUE OF THE DIFFERENT BREEDS. A coarse coat and pendulous ears are regarded by most experienced judges of hogs as indications of thick skin and large size, and a fine coat and erect ears as indications of small or moderate size and of tendency to rapid growth and fattening.

Good or essential points viewed in the abstract, or regarded as a standard for testing any particular breed or specimen, are fineness of bone, thinness and fineness of skin, fullness of head and cheek, thickness and moderate shortness of neck, voluminousness and compactness of body, depth and expansion of sides, breadth of breast and loin, fullness of quarters, moderate shortness of legs, hardiness of constitution and moderate or rapid tendency to fatten at an early age.

But several of the different breeds of swine are essentially equal to another in value, some for one set of circumstances and purposes, and some for another; and while a few breeds are bad in any circumstances, even the best breeds are not good in all. Hogs, like other kinds of farm stock, ought to be selected with direct reference to their special fitness for the climate in which they are to be kept, for the peculiar management which they are to experience, for the particular kinds of food which they are to receive, and for the precise purposes to which they are ultimately destined. One breed may be best for the bleak exposure of a mountain farm and another for the warm and sunny shelter of a farm on a wooded plain; one for the heat of the South, and another for the cold of the North; one for roaming at will through field or forest, and another for constant confinement in the sty; one for the harsh and stinted food and another for an abundance of rich food; one to supply pork and bacon for family use, another to supply pork for the public market, and another to supply material for the commercial curer of hams

and bacon. The respective merits and qualities of the various breeds are quite fully detailed under the respective breeds.

BREEDING, CARE AND MANAGEMENT.

Breeding and Rearing Swine. There is no class of farm stock in which there is so wide a range between the good and the poor, the profitable and the unprofitable, as that of swine.

The boar and the sow ought to be selected with special reference either to the purity of the breed or to some special and well-designed purpose of crossing. The boar ought to be not less than twelve months old, and the sow not less than ten months; and both may be used for breeding from three to five years, and then fed for the market. Young sows differ widely from one another in prolificness and in attention to their pigs; and any which prove on trial to be comparatively unprolific or to be careless nurses, ought not to be retained as breeders. Many breeding sows of more than four years of age, and almost all of more than five or six, become more or less careless about their brood, and are therefore not fit to be continued as breeders; and they at the same time begin to suffer considerable deterioration in the qualities of their flesh, so that they must be fattened and killed to prevent loss in their own carcass.

Sows gestate during about 112 days, or 16 weeks; and may, therefore, have two litters in one year, or five litters in two years, or ten litters in four years. The most convenient practice, for the sake of adapting the constitution of the pigs to the seasons of the year, and in consequence insuring to them a maximum of hardiness and health, is to secure two litters in each year, the one in March and the other in September. When farrowing occurs in summer, or later in the spring than March, the pigs are too young to be fed off next season; and when it takes place in winter, or later in the autumn than August, they are liable to be injured or even killed by the severe cold which follows, or may suffer serious detriment before spring from a deficiency of roots and of green food.

A pregnant sow ought neither to be confined to a sty nor allowed to travel at will; but may be permitted the full range of a yard or of any similarly limited enclosure where she can do no damage; and, a considerable time before the calculated period of her farrowing, she ought to be separated from the herd, and kept constantly and cleanly littered with a small quantity of short, dry straw. A few hours before her farrowing, she may be observed to carry straw in her mouth to make a bed with; and she must then be allowed only such a berth as is requisite for her comfort, and denied all such rough or long straw as might afterwards, by any accident, cover any of her brood. She ought, when nursing, to be well fed; for if she then lose condition, her pigs will suffer, and she herself will occasion double cost to regain her strength and flesh, and if the litter be numerous, they ought to be fed two or three times a day with a slightly tepid mixture of cow's milk, water and wheat bran, and during one or two hours after each feed they may be kept separate from the dam.

Some sows bring forth 10, 12 or even 15 pigs at a birth, but eight or nine is the usual number; and sows which produce fewer than this should be rejected. The sow should have at least 12 teats; for it is observed that each pig selects a teat for himself and keeps to it, so that a pig not having one belonging to him would suffer. A good sow should bring forth a large number of pigs of equal vigor. She should be very careful of them and not crush them by her weight. She should not be addicted to eating the afterbirth, and what may often follow, her own young. If a sow has this habit, or if she has difficult labors, or brings forth dead pigs, she should not be kept for breeding purposes. Sows will usually take the boar within three days after farrowing and sometimes get in pig. But after that period they rarely come in heat until three or four days after the pigs are weaned.

The breeding sow should be, as everything else upon the farm, first-rate—broad, lengthy, deep, short-snouted, of fine bone, with tail well set on, a thin ear, and skin gathering in folds even to the hock, and of a breed that will fatten on clover and grass in summer, and on mangolds in winter, sliced and sprinkled with ground corn and oats. Various are the breeds now-adays possessing such characteristics. Grudge not a few extra dollars in the purchase of an exemplary sow to begin with. It is loss of time, besides disappointment, to buy second-rate stock, however excellent your judgment may be, with the purpose of improving it. Around the sty, in which the breeding sow is kept at the time of farrowing, there should be run a couple of rails, one above the other, a foot from the

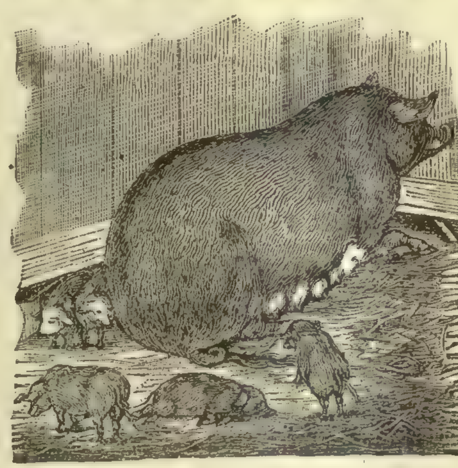


Fig. 4.—*A Fender for Pig-pen.*

wall, the lowest being about three-quarters of a foot from the ground. The great risk at such time is of the little pigs being smothered by her lying helplessly upon them in her pain; whereas if there be a rail she is likely to bear against it, so that the little ones, if they have the bad luck to get underneath, will either

work themselves out or escape the great burden of her direct weight. They soon learn worldly wisdom enough to take refuge behind, where you should have a little soft straw or hay for their especial use.

Another way to protect the little ones is by the safe guard or fender as illustrated by Fig. 4. The fender or guard consists of a board or scantling fastened upon that side of the pen where the bed is located. It needs to be high enough above the floor for the pigs to pass under it, and at the same time extend out far enough to prevent the sow from lying close to the wall of the pen. If the pigs are between the sow and the wall, the fender permits them to escape. It is well to make this fender when the pen is built; being permanent, it will be very much stronger than a temporary one; it will then always be in place and not in the way.

INDIGESTION. The perfection of the litter within the womb of the brood sow is one of the easiest things accomplished that can be conceived of, because so entirely a natural, unimpeded process. The provisions of Nature are wonderful in the direction of entire safety being thrown around the litter while so encased. Nature rarely makes any mistakes in her modes, and nothing short of utter starvation or downright abuse will interfere with the growth of the embryo, or expel it from its prison-house till the allotted sixteen weeks have expired. But during this period, the conditions are entirely natural, while after the birth of the pig they are largely artificial.

Not giving due weight to the fact that the health of the sow, at time of farrowing, and before, very largely determines the fact as to whether the pigs will start and grow, under the new surroundings and conditions, without any hindrance, improper food, or too much of it, is often given. Indigestion in the sow at pigging time, from the high feeding, accompanied with too close confinement, is quite likely to engender a feverish state. The sow will be irritable, and the first danger that comes to the litter, under this condition of things, is, that the pigs will be eaten by the sow. The sow that suffers from indigestion gives this to the young pig from the very start. The pig having the best appetite, and hanging to the teat the longest, will be likely, as with gourmands under every circumstance, to succumb first.

Indigestion coming on in this manner to the young pig is not infrequent in the case of sows confined in a close pen, debarred from access to the ground, and to green food. The pig, after having drawn vigorously from the unhealthy milk supply for a few days, suddenly loses its appetite, seeking a corner away from the litter, has free, light-colored discharges, breathes rapidly; and the morning after these symptoms are observed, it is very likely to be found dead. This speedily fatal result is likely to follow with greater certainty if the weather is cold, or the sow and litter have a wet nest. There is hardly anything more damaging than the latter, and how any portion of the litter can survive its influence is hard to conceive.

It is well known, in the case of the human family, how susceptible the infant is to derangement of digestion, accompanied by diarrhœa, whenever the mother indulges in such articles of food as, if given to a child not suckling, would, if partaken freely of, produce internal disturbance and a loose condition of the bowels, the discharges being thin and light-colored. This result occurs in an astonishingly short period after the food is eaten in the case of the infant, showing how quickly absorption of any deleterious substance takes place, and also how promptly the mammary gland takes up the offending material, giving it off through the milk. This transfer occurs just as speedily in the system of the brood sow as in the system of the human mother, and the young high-bred pig, especially the Suffolk, is exceedingly impressible, and liable to disturbances similar to those that affect the infant.

The prevailing notion that the hog has digestion equal to any undertaking in the way of converting crude or offensive food, leads many to give, in excessive quantities, whatever refuse happens to be on hand, whether spoiled grain, putrid meat, or other refuse. The result of such a mess, when given to a sow about to pig, or having a litter at her side, is inevitably damaging to the pigs. The milk glands act in such a case as an outlet for offending substances that get into the system through the stomach, or that, through any species of disordered action, are engendered within the system. From this it will readily be seen that the milk of an animal not in a perfect state of health, must contain a considerable portion of the impurities that are, from hour to hour, given off.

The fact that poison taken into the system of the young, either human or brute, through the milk, acts so promptly, generally producing disorder of the stomach and bowels within a very few hours, is sufficient proof of the virulence of the poison, as well as of the importance of guarding against such accumulations within the system of the brood sow while suckling her young. Dry corn gives a tendency to feverishness. Too much sour slops, if the sow be debarred from access to the earth, ashes, charcoal and like substances, capable of neutralizing the excess of acid, will derange digestion; the blood becomes impure, and, as stated, these impurities escape, in part, into the milk. Now, when we have instituted the necessary measures to produce a choice stock of young pigs, it is a matter of no small importance that we take pains to secure the property thus produced. To do otherwise is like growing a crop of grain, and then, by neglecting the necessary precautions at harvest time, losing the crop.

Under the sow at farrowing time, there should be little or no straw, as with the best disposition she is then more apt to annihilate some of the wee ones who may be lost to sight, having gone burrowing on their own behalf. The best practice, however, is to have her watched, and the little ones taken from her as they appear, and, if the weather is cold, kept near a fire in a hamper, in wool for a day or two, being carried to and fro for suckling. This entails a

little trouble, but is well repaid, as you may so save a whole litter, three-fourths of which, if left with her, the chances are you may find dead within 24 hours after birth. As soon as they are pretty strong upon their legs, and can expostulate lustily, you may leave them in the fenced sty with mamma altogether, having taken care first to initiate them into the secret of their harbor (the railing around the wall). All this a savage mother will not allow; nay, often she will devour her offspring if meddled with at all. As a preventive against this awkward *finale*, a wash of aloes and water, into which the piglings are dipped, just newly farrowed, has been used.

A parent of this sort, it will pay you best, however, to fatten and consume in turn. Gentle sows are sufficiently attainable to permit the immediate sacrifice of a savage. If the wee ones be ailing, a hot bath for them, and a dose of castor oil (say four ounces) to the mother, of which they will enjoy a reversion through her milk, is a safe and usually successful treatment. That the sow will require warm food, gruel, etc., after her labor, and must be carefully tended, and not highly fed for some days, it is almost superfluous to remark. Indeed, unless the tyro have servants about his stock who of themselves will exercise such ordinary thought, he will have a very mountain to surmount. We may notice only that boiled food promotes especially the flow of milk, and that for those sows which litter in autumn, lettuces are the most wholesome and juciest of food.

Towards weaning time turn out the sow occasionally by herself, and accustom the nursery to take warm milk and slops on their private account. This will grease the slips for their final launch into life, which should take place as soon as they have shivered through the ninth week. Mind and do your little pigs well. The sow should be richly fed throughout the nursing, so that when you wean the litter, they shall be pretty stout to start on their own account. Still, at the best, it is a ticklish period when they are first put over the nest. Ruinous as cruel is the policy of stinting an infant. It is far better for you to keep half a dozen in good trim, ready ever for pork or winter baconers, than half a hundred trotting everlastingly, half-fed, about the yard—scabby, wizen-looking and pot-bellied—in anxious search for anything to pacify the pangs of their hunger. Starved in infancy, young stock seems to lose not only size, but in a great degree its aptitude to fatten.

Selection and Care of Boar. It is not altogether correct to say that success in swine-breeding depends entirely upon the proper selection of the male, but it very largely depends upon it.

In all breeding it is the male that impresses itself upon the exterior of the offspring. The mule is often cited as an illustration of this fact. The mule is an ass with some modification. Take the best sows or the best mares in the world and breed them to inferior males and the offspring will be inferior, while the offspring of inferior sows or mares can be greatly improved by the use of good males. Every one is familiar with these truths.

On this subject Goodale, in his Principles of Breeding Domestic Animals, says:

"Practically, (all) the knowledge obtained dictates in a most emphatic manner that every stock-grower use his utmost endeavor to obtain the services of the best sires—that is, the best for the end and purposes in view; that he depend chiefly on the sire for outward form and symmetry."

In discussing this subject, Mr. Coburn says: "The foremost breeders have come to recognize the male as half the herd; and hence if he is to exert as much influence on the character of its offspring as is exerted by all the females in it, too much care and discrimination cannot be exercised in his selection and management, not only that he may be the best, but do the best."

The breeder and farmer will, therefore, see that it is of the utmost importance to start right by carefully selecting the boar. He should be an animal of fine external form, thick, short neck, broad face and heavy under jaw. All these indicate a strong vitality, and necessarily that must exist in every meat-producing animal. He should also have good width between the fore legs, large girth immediately behind them, long ribs, well spread out from the back, broad loin and well developed, have clean, elastic skin, soft hair, which should be free from bristles, clean limbs, small joints, and if possible a concave face and slightly drooping ears. Experience has demonstrated that these features are indications of the qualities required in a good breeder, and they have passed into rules which breeders have long since needed.

Ribs that are long and well sprung at right angles from the back give room for a capacious stomach; the broad loin is suggestive of active kidneys, and a clean, fine, elastic skin, with soft, lively hair, devoid of bristles, denotes a freedom from anything like fever, and the possession of a healthy liver that transacts its current business with promptitude. A reasonably fine muzzle and limbs clean, small joints, and standing square upon the feet denote solidity, strength, and firmness of framework. The dished or concave face and fine and somewhat drooping ear, are unerring signs of an easy keeper and a quiet and contented disposition.

In selecting a boar, however, the animal itself should not be the only thing looked at. It is well to look at the whole herd from which he is to be selected, for the purpose of ascertaining if they have good forms and constitutions and even feeding qualities. If these are shown, it is safe to select a boar from the herd, but a breed of hogs in which there are no two alike ought never to be looked to for a boar. Nor must the sows upon which it is intended to cross him, be entirely lost sight of. Their defects especially need to be studied, in order that in the selection of the boar, such a one may be selected as will correct the defects of the sows in the offspring. For instance, if the sows should be light in the ham, the boar

should be particularly strong there. If the sows have sharp backs, breed only to a boar with a broad back, and so on. Sometimes the sow is too coarse in some particular part, and the remedy is to select a boar particularly fine in those parts. It is usually recommended to select a boar somewhat smaller and more compact than the sows upon which he is to be crossed.

It is becoming quite common to see through the country many of the best hogs of some of the improved breeds that even when quite young show signs of breaking down in the ankle-joints. As they grow older and heavier they become worse in this respect, until they are virtually cripples. This is the result of careless selection and continued corn diet, which does not furnish the bone-making substance. Such boars should not be used, even if in every other respect they are excellent.

As to the breed, we have nothing to say here, leaving the breeder or farmer to use his own taste and judgment. He ought to be able to tell what he wants when the different breeds are so easily seen. But having chosen the breed, the boar should be pure; for if not pure, there will be no certainty that he will be able to stamp his own qualities upon his offspring. It may also be wise in this connection to say a word upon the treatment of the boar after he is procured. Many a farmer is disappointed in a boar for which he has paid a good price, when the fault is wholly his. Perhaps he shuts the animal up in a close pen—a very usual custom. The boar has, under such circumstances, no opportunity for exercise, and it is quite likely he is fed highly at the same time. Lack of activity is the almost certain result of such treatment. But even this treatment is no worse than turning the animal loose among an unlimited number of sows and among stock hogs. Under these circumstances he is soon worried and worked almost to death. There should be a medium treatment practiced. Do not confine the animal too closely and do not let him rove according to his own will. He should have a comfortable pen with a lot adjoining; should have good, nutritious food, and kept in a condition of thrift, not too fat or too poor.

The best way to keep a boar from becoming unruly and very troublesome is from the first to keep him in an enclosure that he cannot break out of, and then he will not learn how. It is much better if his quarters are isolated from those of other hogs, especially sows, except at coupling time, otherwise a good share of his days and nights will be spent in trying to get among them, which he will likely succeed in doing just when he ought not to. A sow turned in with him and served once will have as many, and perhaps better pigs than if he worried and chased her for a week. When his pigs come, and begin to verge along towards maturity, the owner can easily judge whether his boar is what he wanted. If wholly satisfactory and there was not a strong probability, amounting almost to a certainty, of doing very much better, Mr. Coburn says he "would recommend breeding him to his own daughters; yet, at the same time, indiscriminate in-breeding is not to be thought of; this breeding together of sire and daughter is recommended only when the individuals are both healthy, and it is desired to fix and retain in the offspring certain points of great value prominent in the parents."

Grade Boars. One of the great and costly mistakes made by a large number of farmers who display good judgment and liberality in other matters, is, in using grade or, too often, scrub boars, on the score of economy. The manner of its occurrence is something like this: The farmer has some common sows, or, perhaps, obtains one that looks well, and he thinks is a little extra, though nothing much is known of her stock or breeding; she may be with pig by what he has been told was a good boar, or he breeds her to the most passable one convenient, and in course of time she farrows; if she has only a small number, or saves but a few pigs, and is a good suckler, there will probably be a boar pig in the litter that makes a development surprising to the owner, and is really handsome. This pig is kept for a boar, first, because in appearance he is as good as the majority of thoroughbreds, and much better than the other hog stock on the place that has not had as good an opportunity for development; secondly, the man who has thoroughbreds asks from $10 to $25 apiece for them; and as this home-made pig has not cost a fourth of that, the difference between his cost and that of the other is so much saved; and "a penny saved is as good as a penny earned." He is used on the sows of the herd; but being a good animal individually, almost by accident, and not inheriting his valuable qualities from a long line of ancestry equally good, it is not possible to transmit them to his offspring to any appreciable extent, and weedy, unthrifty scrubs and dissatisfaction follow. After one, two, or three years of unavailing effort to make something out of them, in many instances the same farmer, without any apparent comprehension of the cause of his disappointment, will repeat the foolish experiment with another pig of like character, or, rather, lack of character; and so, as the years go by, the best of them, perhaps, are frittered away practicing this sort of economy that "saves at the spigot and wastes at the bung-hole." Every sane man in any way connected with the raising of live stock should understand that the greatest improvement, and consequent profit, can only come from using sires of high quality, descended from generations of sires and dams like them, followed by good care and judicious weeding out every year. The man who keeps a half-dozen sows cannot afford to do without the use of a thoroughbred boar; and a pig of the right sort, at a cost of $25, is as cheap as dirt,—enough more economical and profitable as an investment, than it would be to have the sows served by a scrub or half-breed, even if $5 each was received for the privilege. The wise men who use good boars in the fall are the ones who will have good hogs to fatten and sell the following fall to prompt buyers, at outside figures.

Castration. This operation is performed upon the pig chiefly with a view to more rapid fattening, and the result is doubtless attained, for at the same time that it increases the quiescent qualities of the animal, it diminishes also his courage, spirits and nobler attributes, and even affects his form. The tusks of a castrated boar never grow like those of the natural animal, but always have a dwarfed, stunted appearance. The operation, if possible, should be performed in the spring or autumn, as the temperature is the more uniform, and care should be taken that the animal is in perfect health. Those which are fat and plethoric should be prepared by bleeding, cooling diet and quiet. Pigs are castrated at all ages, from a fortnight to three, six and eight weeks, and even four months old.

There are various modes of performing this operation. If the pig is not more than six weeks old, an incision is made at the bottom of the scrotum, the testicle pushed out, and the cord cut, without any precautionary means whatever. When the animal is older, there is reason to fear that hemorrhage, to a greater or less extent, will supervene; consequently, it will be advisable to pass a ligature round the cord a little above the spot where the division is to take place.

By another mode—to be practiced only on very young animals—a portion of the base of the scrotum is cut off, the testicles forced out, and the cord sawn through with a somewhat serrated but blunt instrument. If there is any hemorrhage, it is arrested by putting ashes in the wound. The animal is then dismissed and nothing further done with him.

On animals two or three years old, the operation is sometimes performed in the following manner: An assistant holds the pig, pressing the back of the animal against his chest and belly, keeping the head elevated, and grasping all the four legs together; or, which is the preferable way, one assistant holds the animal against his chest, while another kneels down and secures the four legs. The operator then grasps the scrotum with his left hand, makes one horizontal incision across its base, opening both divisions of the bag at the same time. The testicles are then pressed out with his finger and thumb, and removed with a blunt knife, which lacerates the part without bruising it and rendering it painful. Laceration is requisite only in order to prevent the subsequent hemorrhage which would occur if the cord were simply severed by a sharp instrument. The wound is then closed by pushing the edges gently together with the fingers, and it speedily heals. Some break the spermatic cord without tearing it; they twist it, and then pull it gently and until it finally gives way.

The most fatal consequence of castration is tetanus, or lockjaw, induced by the shock communicated to the nervous system by the torture of the operation.

Spaying. This operation consists in removing the ovaries, and sometimes a portion of the uterus, more or less considerable, of the female. The animal is laid upon its left side, and firmly held by one or two assistants, an incision is then made into the flank, the forefinger of the right hand introduced into it, and gently moved about until it encounters and hooks hold of the right ovary, which it draws through the opening; a ligature is then passed around this one, and the left ovary felt for in like manner. The operator then severs these two ovaries, either by cutting or tearing, and returns the womb and its appurtenances to their proper position. This being done, he closes the wound with two or three stitches, sometimes rubs a little oil over it, and releases the animal. All goes on well, for the healing power of the pig is very great.

The after-treatment is very simple. The animals should be well littered with clean straw, in sties weather-tight and thoroughly ventilated; their diet should be cared for; some milk or whey, with barley meal, is an excellent article. It is well to confine them for a few days, as they should be prevented from getting into cold water or mud until the wound is perfectly healed, and also from creeping through fences.

The best age for spaying a sow is about six weeks; indeed, as a general rule, the younger the animal is when either operation is performed the quicker it recovers. Some persons, however, have two or three litters from their sows before they operate upon them; where this is the case, the result is more to be feared, as the parts have become more susceptible, and are, consequently, more liable to take on inflammation.

Feeding. The elements of great importance in the rearing of swine, are to keep them comfortably warm, to afford them a constant supply of fresh air, and to keep them perfectly free from every kind of nastiness and vermin. The necessity of comfortable warmth at all seasons and the positive saving it effects in both food and strength are pointed out in the article Feeding of Animals. Pigs which have little or no protection from the cold winds, cold rains, sleet and snow, and which try to keep one another warm by cowering together in heaps, and which, in spite of every device they practice, often shiver with cold amid the severities of spring and winter, cannot possibly thrive upon even the best and most abundant food which man can supply; and if, on the other hand, they enjoy no shade from the scorching and blistering play of sunshine in summer, they both will become somewhat unsightly in appearance, and may be occasionally made sick, and generally retarded in growth. A close, ill-ventilated sty has an absolutely pestilential atmosphere, and makes pigs look delicate and sickly, and undermines their very constitution, preventing them from ever attaining proper size and weight; while a sty with an open-barred door and a constant current of fresh air, maintains them in vigor, gives them the full advantage of their food, and affords full and facile scope for their rapid growth and ample maturation. Cleanliness, not only of the litter and the floor of the sty, but of the feet and all the skin of the animals themselves, is essential in the energetic performance of the organic functions, and

even to the prevention of comparative dwarfishness and some measure of disease. The propensity of swine to roll themselves in mud in summer only proves that they require protection from the scorching heat of the sunshine, and from the attacks of flies, and affords not the remotest indication that any daubing of the pores with dirt can possibly be beneficial. A washed sow in the hot season of our temperate climate, and in almost every season in such a climate as that of Palestine, "returns to her wallowing in the mire" simply because she feels scorched and blistered and sickened under the ardent sunshine; and hence when she receives from man the aid which is due to her as a domesticated animal, she demands, not dirt all the year through, or any day at all, but shade in summer, shelter in winter, and a clean, dry bed in every season.

Swine are generally fattened for pork at from six to nine months old; and for bacon, at from a year to two years. Eighteen months is generally considered the proper age for a good bacon hog. The feeding will always, in a great measure, depend upon the circumstances of the owner—upon the kind of food which he has at his disposal, and can best spare—and the purpose for which the animal is intended. It will also, in some degree, be regulated by the season, it being possible to feed pigs very differently in the summer from what they are fed in winter.

The refuse wash and grains, and other residue of breweries and distilleries, may be given to swine with advantage, and seem to induce a tendency to lay on flesh. They should not, however, be given in too large quantities, nor unmixed with other and more substantial food; since, although they give flesh rapidly when fed on it, the meat is not firm, and never makes good bacon. Hogs eat acorns and beech-mast greedily, and so far thrive on this food that it is an easy matter to fatten them afterwards. Apples and pumpkins are likewise valuable for this purpose.

There is nothing so nutritious, so eminently and in every way adapted for the purpose of fattening, as are the various kinds of grain—nothing that tends more to create firmness as well as delicacy in the flesh. Indian corn is equal, if not superior, to any kind of grain for fattening purposes, and can be given in its natural state, as pigs are so fond of it that they will eat up every kernel. The pork and bacon of animals that have been thus fed are peculiarly firm and solid. Animal food tends to make swine savage and feverish, and often lays the foundation of serious inflammation of the intestines.

Spring Feeding. There is no period of the year when it pays so well to be on the alert, looking out for every class of farm stock, watching for shivering, general discomfort and shrinkage, as from March till May grass. The hog, if fairly well fed during summer and fall, and tolerably well cared for during the cold, dry weather of the three winter months, will have held up pretty well till now. But, as stated, the two months during which it will pay better to give extra care than during any other period of the year begin with March.

And the question, how to compensate for the absence of grass, comes up very prominently. Swine-breeders do not, as a rule, give due consideration to the fact that the hog is, in his natural state, a consumer of green food, and, in that state, is mainly dependent upon grazing. We have, by confining him in dirt yards and plank pens, debarring him from access to green stuff, changed him from proverbial daintiness as to his food, into a veritable "hog," ready to devour all manner of filth, giving us, in return, flesh made up of impurities, because the corruption the hog eats inevitably taints his blood, and through this enters into all his tissues. It is no more surprising that the hog learns to eat filth, taking this down with apparent relish, than it is that the boy of 15 learns to relish tobacco, perhaps the most acrid, prostrating and sickening of all plants.

As an evidence that the hog was, in a state of nature, quite select in his diet, we will state, upon the authority of Linnæus, that, as compared to other vegetable eaters, he accepted fewer plants for his daily food than any other animal. Thus, the cow ate 276 plants, rejecting 218; the goat, 449, rejecting 126; sheep, 387, rejecting 141; the horse, 262, rejecting 212. The hog, more nice than either, accepted 72, rejecting 171. But under domestication, as usually carried out, he has no discretion left him. Being denied the privilege of hunting his own food, he takes corn for his breakfast; for his dinner he takes corn; and he likewise takes corn for his evening meal. Hence, it is not surprising that the hog has become diseased, and though, through careful selections, we have made a model of his form, bringing it up to the highest standard for profit, and at the same time pleasing to the eye, yet he is often made to succumb to epidemics.

We all know the effect upon sailors of confinement upon a given kind of food, being debarred, at the same time, from vegetables. Scurvy, the scourge that arises from confinement to certain kinds of food, and from, at the same time, being debarred from other kinds, is not, as many suppose, a mere affection of the gums, but is as general in the disturbance it gets up as is the so-called hog cholera in the case of the hog.

The hog, confined, as he usually is, and fed upon corn alone, if he could get his eye upon green grass, would doubtless make as strong demonstrations to get a taste of the coveted food as did the scurvy-scourged seamen of the ship Centurion, under Lord Anson, when approaching the island of Juan Fernandez, crazed at the sight of vegetation upon the shore. And when a squad of men were sent ashore, bringing green grass aboard the ship, the men devoured it with avidity, taking on an improved condition at once. The villager knows how eager the pigs, shut up in the pen during the whole year, are for the grass and weeds from the garden near at hand; and partly because he wants to get rid of his weeds, and partly because he thinks the pigs will like a little green stuff "for a rel-

ish," he throws the refuse to them. He does not reflect that green food is the natural sustenance of the hog, as it is of the cow, while, by feeding on corn alone, he is keeping his pigs in an extravagantly artificial state.

The question from March till May is, how best to supply the hog with food that will most nearly answer in the place of the pasture grass that we suppose all hog-raisers expect to supply when the proper season arrives. To turn out upon the field then is not admissible, except on something besides the pasture or meadow, as, the grass being dead, his instinct would lead him to the next best substitute, *viz.*, the roots of the grass. But the corn and stubble fields—along the fences of these—will afford roots which the hog can grub up if given the opportunity; and by even this expedient, the weather being moderate, a state of unthrift may be converted into thrift, paving the way for abundant health and rapid gain when the green things of spring are far enough along to give a good bite. But in the absence of even the meager change to be found along the fences, and especially in the case of such animals as cannot be given their liberty, the natural instinct for green and soft food should be gratified through whatever material may be at hand.

Health and growth during the following summer may depend largely upon the success in averting indigestion, and the morbid state of the blood which comes of this, through discreet management during April and May. If no vegetables can be spared for this purpose, it will pay to buy them, not on account of the mere nutriment contained, but for the dietetic and sanitary reasons mentioned above. Coal ashes, charred coal and charcoal from wood should be within reach at all times. In a general way, and by the use of divers suitable agencies, the digestion should be secured against impairment, the bowels kept in a condition the opposite of being constipated, that the blood may be neither impoverished nor charged with unhealthy secretions. By acting with discretion in the manner pointed out, and protecting them from inclement weather at the same time, thrift during the entire season is likely to be the result.

Summer Feeding. The warm season is Nature's time for vegetable growth, and no less so for animal growth. But farmers seem to regard it as a fortunately easy time to carry pigs on very small feed. Many of them have the strange notion that the pig should be tided over the summer upon a little pasture, and prepared to be fattened after the cold fall weather sets in. Grass promotes the health of pigs, and a proper amount of it is highly beneficial; but profitable feeding requires that pigs should make their most rapid gain in the warm weather. A hundred pounds can be put on pigs in summer as cheaply as 50 to 65 pounds can in cold weather. We believe this statement will be endorsed by all feeders who have tested the warm and the cold seasons for feeding under ordinary circumstances. We admit that swine houses may be built so as to maintain a mild temperature in winter, and then there would not be so great a difference as we have noted. But those who provide for a summer temperature in winter are thorough believers in full feeding at all seasons of the year, and need no admonition as to the economy of full feeding in summer.

What is the appropriate grain food for pigs in summer? The answer to this question must depend upon the age and condition of the pigs. Pigs from two to six months old must have such food as will produce growth of muscle and bone—not fat. Indian corn for such pigs is, therefore, to be avoided, except in very small quantity. Corn is the most fattening food, the food to fill up the large, lank muscular frame, to lay on clear, solid pork. But the young pig has all this frame-work to grow, and should have food best adapted to that end. A clover pasture is a good beginning, and this should be supplemented with nitrogenous and phosphatic food, such as oats, peas, wheat middlings, linseed meal, or cotton-seed meal; or best of all, several of these mixed together. Linseed meal, which can be had at $20 to $25 per ton in many parts of the country, is perhaps the best extra food for young pigs in summer, because of its easy digestibility, soothing effect upon the digestive organs, and its peculiar adaptation to the growth of muscle and bone. Cotton-seed meal has much more oil, more nitrogenous matter, and is rich in phosphates, but is not so easily digested as linseed meal, and is constipating, while linseed meal is slightly laxative. Wheat middlings, which is purchasable in the West usually at $6 to $9 per ton, is also well adapted to the growth of frame and muscle in pigs, and will produce this growth at a low rate of cost. Perhaps the best combination of food would be 100 pounds of linseed meal, 200 pounds of wheat middlings and 100 pounds of corn meal, mixed together. This would give a mixture of qualities leaving nothing to be desired. This combination of food will keep the pigs in prime health in the hot season, having no tendency to produce a feverish state of the system. Peas, oats, or corn, ground together in equal proportions, also make an excellent combination for summer pig food. We doubt if hog cholera would ever appear in pigs thus reared. This disease is of very rare occurrence in the Eastern States, and the cases there found are mostly propagated by contact with Western hogs. Western feeders would do well to provide a greater variety of food for their pigs. Peas and oats grow as naturally and as profitably in the West as corn. Use them all in the growth of pigs, and diseases will be much less troublesome.

How to Soak Corn for Hogs. During the dry summer months corn gets hard and dry, and if it happens to be a rough variety, hogs will eat no more of it than will keep them in decent living condition. At such a time it is profitable to soak the corn, as by that means we partially restore it to the condition of the roasting ear, and every farmer knows that it is the time that hogs will grow or fatten to the best advantage.

By soaking corn that has become excessively hard

and dry, we restore it in a measure to its normal state, and put it in a condition easily to be masticated and rapidly digested, and there hinges the whole question: the more rapid the digestion the quicker is assimilation, and the more rapid the assimilation the faster does the animal arrive at maturity to fit it for the market.

Corn can be soaked in a tank constructed for that

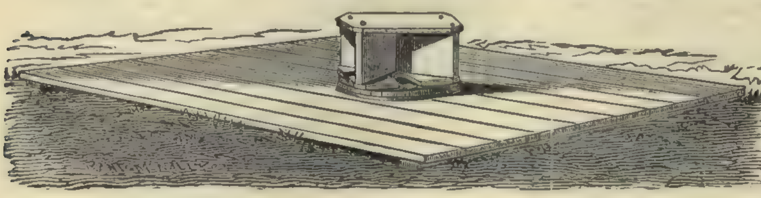


Fig. 5.—*Hog-Watering Device.*

purpose, where a large number are fed; but on a smaller scale, kerosene casks can be used. They may be quickly cleansed by taking out the head and throwing in a few old newspapers and touching a match to them. When it gets into a good blaze and begins to crackle pretty lively, turn the cask upside down, and the blaze will be extinguished for want of air.

Two such casks will hold corn enough to feed two days—four feeds—for twenty shoats, soaking each cask full of corn twenty-four hours. If you are desirous of pushing forward your fattening hogs while they bring a good price, soak your corn.

Feeding Green Corn. Green corn, as soon as it is fairly ripe enough for ordinary table use, is probably the very best fattening food available to the general farmer for feeding swine. The pigs eat it with a peculiar relish, and will grow and fatten upon it with surprising rapidity. No food is equal to this for putting pigs in good " show condition " for the fairs.

But while all this is true, it no doubt is a very expensive food when used at this period. In a discussion upon this point to which we once listened, an old farmer remarked that he had "often noticed that when his wife fed his hired men on green corn at the table, one man would often eat four or five ears, while one of these same ears if ripened, ground into meal and made into bread, would feed four or five men." Probably this is overstating the difference, but it is no doubt an expensive, and in some degree a wasteful, use of food to use corn before it is fully ripened.

Water. Plenty of pure, fresh water is essential to the successful raising of swine. They are more choice in the food they eat and the water they drink than they often have credit for. A hog can appreciate a good drink of cool clear water as much as almost any animal. It is often a source of great difficulty, however, to furnish abundance of such water at all times. Many devices have been invented for the purpose of affording a constant supply of water to swine, but we know of none seemingly so well adapted as the one illustrated in this connection. It is known as the patent hog-waterer and is made by the Sandwich Enterprise Co., Sandwich, Illinois.

Fig. 5 represents the apparatus as it appears when in position for use. As can be seen, all that is exposed is the top with its openings for the hogs to drink from. The water maintains the same height in the drinking tank, no matter how much is used.

The top presents four openings where hogs can drink, the weak animals having equal chance with the stronger, and no opportunity is given them to get their feet in and soil the water. Indeed, no matter what the circumstances, the animals have good, clean water to drink as long as the source of supply is kept up.

By Fig. 6 is presented a sectional cut showing the arrangement of the apparatus in ground, from which an understanding of its mode of operation can be had. A represents the reservoir tank or trough, such as any farmer may have for his stock. K, strainer on end of pipe to prevent trash or dirt passing through and interfering with action of the float valve. B is

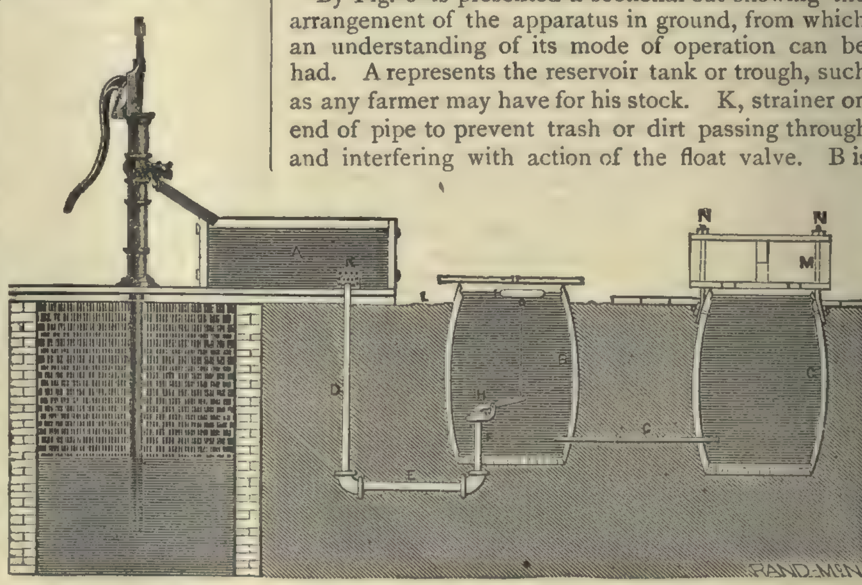


Fig. 6.—*Sectional View of Watering Device.*

the regulating barrel. C, the drinking barrel. G, the pipe connecting same. As can be seen the water in B and C will remain on same level, as both are connected; consequently, if water be taken from C it will lower the level in B correspondingly, and when the water in B is lowered the float I descends with it, allowing the float valve H to open and water to pass through until the float valve shuts off the flow of water.

Teeth. The teeth of the hog may be represented

by the following formula: Incisors, six upper, six lower, canines, one upper, one lower, on each side; wolf teeth, so-called, now determined to be molars, one upper, one lower, on each side; molars, six upper, six lower, on each side; in all, 44 teeth.

TO TELL THE AGE OF SWINE. The animal is born with eight teeth—four corner incisors and four tusks.

On the eighth or tenth day appears the second or third temporary molar.

At four weeks old the four nippers appear—two in the upper and two in the lower jaw.

At the fifth or sixth week the foremost temporary molars appear in the upper and lower jaw.

At the age of three months the intermediary incisors have appeared above the gums.

At the sixth month the so-called wolf's teeth will have appeared; and at the same age appear the third permanent molars.

At the ninth month the following teeth will have appeared, namely, the permanent corner incisors, the permanent tusks, and also the second permanent molars.

At the twelfth month the permanent nippers will be in view.

With the twelfth and thirteenth months the three temporary molars will have been shed, and their permanent substitutes, which, at fifteen months of age, will have fully appeared, are now just cutting through the gums.

With the eighteenth month the permanent intermediary incisors and the hindmost permanent molar will have made their appearance and with the twenty-first month they will be fully developed.

RINGING. This is an operation performed to counteract the propensity which swine have of digging in the earth. The ring is passed through what appears a prolongation of the septum, between the snout bone and the nasal. The animal is thus unable to obtain sufficient purchase to use his snout with any effect, without causing the ring to press so painfully upon the part that he is forced to desist. By the accompanying engravings we represent Brown's single and double hog and pig ringers, made by Chambers, Bering & Quinlan, Decatur, Illinois. These rings close with the joints outside, and it is thus claimed leaves no sharp points in the flesh to cause irritation and soreness, as in the case of rings that close with joints in the flesh. The cuts also show the "champion hog holder," in the hand.

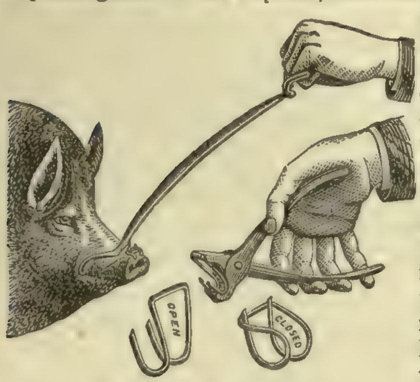


FIG. 7.—*Double Hog Ringer.*

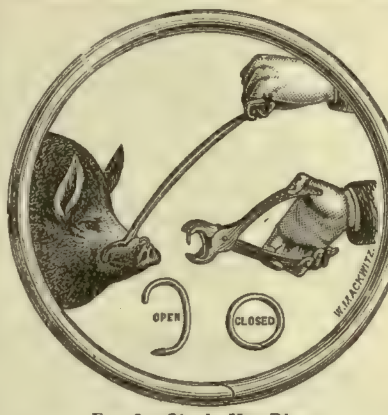


FIG. 8.—*Single Hog Ringer.*

By Fig. 9 is represented an apparatus for catching hogs, manufactured by the same parties as the ringers are. The instrument as above described for ringing hogs answers every purpose for marking them, as well as sheep and cattle, the same ring being used. For this purpose it is inserted in the ear of the animal, instead of the nose. Letters, or numbers, or both, are stamped upon brass, a letter or number on each piece, and then slipped upon the ring in the ear, which is then closed. Each animal when properly marked, should have on the ring the initials of its owner's name and a number.


FIG. 9.—*A Hog Catching Apparatus.*

PIGGERIES. In all the great swine-growing regions, where from twenty-five to five hundred hogs are annually fattened and sold from single farms, the life of the animals must necessarily be passed out-of-doors. So far as the breeding stock and the first few months of the life of the pigs are concerned, this is always the best, both from an economical and sanitary point of view. There are, however, many small farmers who annually fatten, from what they require for family use, up to fifteen or twenty head a year, who find it most convenient and economical to feed and fatten both in summer and winter in pens. All this large class must depend, first, on the skim milk, buttermilk and whey, and upon the slop of the kitchen for feeding; second, upon clover, cut and fed, weeds and other refuse material about the farm, and lastly and principally on corn, either ground or raw. It is better for all this class that the pens when built be planned so as to combine ease of handling with security and comfort of the animals.

Because swine are blessed with keen appetites, strong digestion, and hardy constitutions capable of resisting a great amount of neglect and ill-usage, they have been, and in too many instances are yet, the worst used animals kept for the profit of man. And, as if to add to the abuse, their endeavors to make the best of ill-treatment, have been charged to the account

of their natural uncleanliness; and the idea that wholesome meat can not be made by feeding animals with garbage, has caused pork to become the horror of dietetic reformers, who pronounce it unfit for human food. It were as wise to condemn the use of milk, and to pronounce cows unfit for civilized communities, because some individuals persist in confining them in filthy stables, and dosing them with distillery slops. In his native state, the hog is as dainty in his taste as other animals, and his lair is found in a dry situation, well cushioned with clean leaves, unsoiled by any neglect of his own. It would be within the mark to say that in most instances, twenty per cent of saving can be effected in food, and in additions to the manure heap, by a well regulated building for the accommodation of swine.

FIG. 11.—*Plan of Pig-pen.*

The plan, Fig. 11, combines the requisites, with many of the conveniences, of a desirable pig-pen. The engraving shows one complete pen, with its divisions. A row of these pens may be built as a long shed, and the description of one will answer for all. The pen is twenty feet long from front to rear, by eight feet wide. The posts at the front are ten feet high, and at the rear seven feet. A feed passage runs along the front of the pens, shown at *a*. The feeding and sleeping apartment is shown at *b*. At *c* is a passage which also runs along the whole building, but which, when closed by the doors, *d*, makes the passage a part of the yard, *d*. The feed passage, *a*, is three feet wide. The feeding place, *b*, is ten feet deep by eight feet in width; the passage, *c*, is three feet wide, and the yard, *d*, four feet, making the whole space of the yard seven by eight feet when the passage is closed. When the passage is opened the door, *d*, closes the opening from the yard into the feeding place, and the occupants of the pens are shut up. Any pig that may have to be moved from one pen to another can then be driven without any difficulty wherever it may be desired. A swinging door in the rear may be made to allow the pigs to pass in or out of the barnyard or the pasture, if one is provided for them. But generally it will be found better to have the pens built upon one side of the barnyard, so that the pigs may be used to work up any materials for manure or compost that may be at hand for the purpose. The floor of the pen should be, in part at least, of plank; that of the yard may be of pavement, of cobble-stone, or of cement, but should be so laid that it can not be torn up. A tight roof should cover the whole, and sliding windows at the rear and front will provide good ventilation. This is very important for the comfort of the animals in hot weather. The floor of the pens should slope backwards at least two inches in ten feet, and the yards ought to be well drained. A bar is fixed around the bottom of the pen, about six inches above the floor, and projects about six inches from the side for the purpose of preventing the young pigs from being overlaid by the sow and smothered. A large quantity of waste material may be worked up in these yards, and will add much to the comfort and cleanliness of the pigs.

The framework of these pens should be of six by six timber for the sills, four by four for the posts, and two by four for the girts and tops and bottoms of the partitions. The whole quantity of lumber needed for one complete pen would be 1,200 feet, consisting of 80 linear feet of six by six timber, 61 linear feet of four by four posting, and 77 linear feet of two by four scantling, 104 feet surface of two-inch plank, and 500 feet of boards if the roof is of shingles. A row of ten of these pens, making a building 80 feet long, able to accommodate fifty or sixty pigs, would cost about three hundred and fifty dollars, completed.

SLAUGHTERING. For slaughtering hogs see page 1153.

CURING AND PICKLING PORK. See Bacon, Ham and page 967.

COOKING PORK. See page 1060.

DISEASES OF SWINE.

THEIR CAUSES, SYMPTOMS, REMEDIES. The diseases to which swine are liable are not very numerous, but some of them are notably fatal. These are due, of course, to the abnormal condition in which they are kept. In their wild state they are not afflicted with any of these maladies. Several of the following diseases are given as treated by A. R. Coleman, in his prize essay upon the diseases of swine. This essay was selected by the Swine Breeders' Association as the best treatise upon the diseases of hogs yet written.

ADMINISTERING MEDICINE. In explanation of the prescriptions given in the article we wish to say that they are given from the smallest to the largest doses, being adapted to small or large animals, say from fifty to two hundred and fifty pounds. It must be left to the operator's discretion and judgment to suit individual cases. If the desired effect of any medicine is not produced after one or two doses, it should be given in smaller quantities and at shorter intervals until the effect is obtained. In reference to drenching hogs we wish to say that when medicine can pos-

Owned by J. H. Countryman, Rochelle, Ill.

Fig. 6.—POLAND CHINA HOGS.

sibly be given in other ways, it is not advisable, as a drench given by force is liable to pass down the windpipe into the lungs as soon as the animal squeals during the operation, and frequently causes instant death. Again, when the hog is too sick to eat, our experience has taught us that to force medicine down the hog rarely assists nature in the restorative process, as the total loss of appetite usually indicates approaching dissolution, although in some instances the sick hog refuses to eat for a day or two and yet recovers. Sometimes the sick hog will not eat in the morning, yet eat during the day; therefore it is advisable to offer the animal some tempting food (in which the medicine is thoroughly mixed) occasionally during the day.

To drench a large hog, take a cord, tie a running noose at one end, slip it into his mouth and back of the tushes, or canine teeth. Secure the other end to a post, fence-rail, staple, or any firm and convenient place, or let an assistant hold the end. When a hog is secured in this way he will always pull back, thus keeping the cord tight, and it is then not difficult to drench him. Take a piece of hard wood and shape it into a stick, flat at one end, and about an inch and a half wide, stand on the right side of the pig, reach over and insert the flat end between the teeth on the left side of the mouth, and then, by turning the stick edgewise, the mouth will be opened sufficiently wide to admit of the introduction of a portion of the neck of a bottle, and also to prevent the latter being broken by the teeth. Insert the bottle on the right side of the mouth, but be careful to allow only a small quantity of the contents to enter the mouth at one time until swallowed; then there is no danger to be apprehended from choking. On no account allow the whole contents of the bottle to empty itself into the mouth and throat in one continuous stream; otherwise strangulation will be the inevitable result.

In administering medicine it is by far the best way, if it can be accomplished, to mix and give it in their food; but this cannot always be done. The animal may not always be able, either from weakness or other causes, to take it, for the medicine may be of a character not adapted to be given in that form, for either in taste or smell it may communicate to the food such an unpleasantness that the animal will positively refuse to touch it. The sense of smell is particularly well developed in the hog. Medicines of small bulk and emetics, when a speedy or certain effect is desired, are best given in solution as a drench, or when not possible to give medicine in the food drenching must be resorted to. In administering these, persons not accustomed to handling hogs will have great difficulty in doing so. To drench small pigs let an assistant seize the animal by the ears and slightly raise it, keeping the body secured between the legs.

As a rule farmers give over-doses of medicine to their hogs and also to other animals. It is better to administer medium doses and repeat every twelve hours if necessary. Large doses not only debilitate the animal, but unfavorably affect the sense of taste and the hog soon becomes disgusted with all drugs and will refuse to take additional doses.

Apoplexy. This is a cerebral disorder, caused by an excessive determination of blood to the brain, or congestion, and may be produced by over-driving in hot weather, a too plethoric condition of the system, over-feeding, or by excitement.

Symptoms. These are usually few at the outset, as the affection generally occurs with great rapidity. A restlessness may be observed, with bloodshot eyes and variable appetite, with constipation, and scanty excretions of fæces and urine, or a comatose condition. The animal may be feeding, when it may be observed to suddenly stop, reel, stagger and fall dead—a quantity of froth or foam issuing from its mouth.

Treatment. Apoplexy in the pig being a most fatal complaint, endeavor if possible to ascertain correctly and remove the exciting cause. If from a too plethoric condition of the system—owing to the nature of the food — the animal should be placed on low diet, and it might be advisable to administer an emetic, such as tartar emetic 3 to 8 grains, and white hellebore 2 to 4 grains. Afterwards the following might be given: Epsom salts, 2 to 4 ounces; calomel, 3 to 10 grains; ginger, ½ to 4 drachms in 1 pint of water. If very much constipated, use frequent clysters. Keep on low diet, and pay strict attention to cleanliness. The treatment of this disease is in the majority of cases anything but satisfactory; therefore the greatest attention should be directed to the removal of the exciting cause, as a preventive measure for the welfare of the yet unaffected animals.

Epilepsy. This disease is cerebro-spinal, and is generally organic; but it may be functional, and symptomatic of irritation in other parts, as in the stomach, intestines, or other organs; although up to the present time little light has really been thrown on its nature. It is due most probably to some lesion or peculiar morbid condition of the nervous system, and may be to some peculiar condition of the blood, probably arising from defective nutrition, or it may be due to worms, or parasites. It is characterized by sudden fits.

Symptoms. These mainly comprise severe convulsions, with coma, and foaming at the mouth. The animal may be in apparent health, and without any previous manifestations of disorder, or at all events may appear quite calm and conscious, when, without any warning, a paroxysm will come on. If standing it may be observed to stagger, stare, and commence violently champing the jaws, with foaming at the mouth. The animal may then drop on its haunches and the fore-legs become rigid, the muscles of the neck contract, the head be thrown up, and violently thrown from side to side, or jerked upwards; the muscles of the body are also severely convulsed. Urine and fæces are discharged involuntarily, and the creature breathes with difficulty, the tongue often protrudes, and is badly bitten; at length the animal falls, straining, struggling and unconscious.

The mucous membranes are red and congested and the heart beats violently, the convulsive phenomena speedily subsides and the animal regains its feet or else falls into a deep sleep. In severe forms the convulsions and death soon ensue; in others, the fits grow weaker and less frequent until they disappear altogether. As a rule they are never of very long duration.

Treatment. This is not in the majority of cases at all satisfactory. Epilepsy is rarely recoverable. Assuming the affection to have no other origin than that of a purely nervous disorder, extract of belladonna, 5 to 20 grains, would appear to be indicated; but if the abnormal action can be traced to worms, then their eradication should be provided for. Whatever may be the exciting cause, endeavor to remove it. Good food, proper housing, attention to the general comfort and opportunity for exercise are indispensable. At the period of attack little can be done; the dashing of cold water over the head is the most proper course to pursue. After the seizure has passed, existing irregularities may then receive attention, and their removal attempted. A very useful vermifuge is areca nut pulverized in 1-drachm doses, given fasting, and afterwards followed by a purgative, such as Epsom salts, 2 to 6 ounces, or Castor oil, 2 to 4 ounces. With the exception of the Epsom salts, which might be given in the food, the other three medicines had better be administered in the form of a drench.

CHOLERA; ANTHRAX; TYPHUS; CYANOSIS; ERYSIPELAS; CARBUNCULOSUS; GASTRO-ENTERITIS. This disease is known by the vernacular or common names of distemper, red soldier, red disease, blue sickness, blue disease, hog cholera and measles. It is a subject respecting which there is a great diversity of opinion, some regarding it as typhus, others as anthrax hence the various appellations. It is undoubtedly a blood disease. It is a malady that appears first to affect the digestive organs, and then the blood undergoes changes favorable to translations, which occur in different parts of the body. By most authorities it is considered contagious.

This disease has been so terrible in its devastating effects, and so great a pecuniary loss to the farmers of this country, that we will speak of it more in detail than other diseases require.

History of the Disease. During the year 1856 there appeared in the New England States occasional cases of sickness of a peculiar nature among the hogs. In the two following years this disease extended into the States of New York, Pennsylvania and Maryland. Many farmers in the counties of Adams and York, Pennsylvania, in 1858, lost almost their entire stock of swine.

During the year 1859 it traveled westward through Pennsylvania and Ohio and reached the miasmatic districts of the Wabash river in the Southern portion of Indiana and Illinois, where it multiplied and developed rapidly, and of a malignant type; especially in such parts of the country where torpidity of the liver, intermittent, bilious and typhoid fevers, prevailed in the human family. It is claimed by some that the so-called hog cholera was endemic in the Western States several years prior to 1859, but we have not found any authenticated account of its previous existence.

Since the year 1859, the hog disease has spread West, North and South, throughout the United States and Territories. It appears in some seasons epidemic, other seasons endemic.

Probable Origin of Hog Cholera. For ages hogs have been kept in filth and dirt, and in many instances in closely confined pens, and fed in their own offal, and were obliged to drink in dirty, filthy troughs, or in stagnant pools of water, filled with myriads of poisonous germs. The hogs were not only compelled to eat their food mixed and highly flavored with their own manure, but to remain for months in close proximity to the same. Many of the pig-sties were walled in by a tight board fence, which excluded pure air; consequently they were obliged to breathe the foul and noxious gases loaded with disease germs constantly arising therefrom. The smell of an ancient hog pen is sufficient proof, and should satisfy all doubters on this point.

Year after year hogs have been kept in the same pen, or yard, amid a constant accumulation of swine discharges, filth and decomposing organic substances. The ground became saturated with putrescent matter; the moisture and requisite temperature in hot weather induced decomposition and putrefactive fermentation, which yielded septic germs. The disease germs being inhaled into the lungs of the swine, they were thus planted in the blood during its circulation through the lungs.

If the swine were not made apparently sick from the effect of the poisonous germs, their systems were weakened, and the liver generally deranged, the poison acted directly on that organ; and the disease was transmitted to their offspring, which in turn were likewise subjected to the same routine of filthy treatment administered to their progenitors, and thus further charged their systems with disease germs.

This hereditary diseased condition, together with the direct and constant reception of the septic germs, cumulative poison, during several swine generations, most effectually loaded the swine system with disease, until at last the time had arrived, the swine constitution succumbed; the heroic and repeated rallying efforts of Nature failed; the burden of disease could no longer be borne; the last straw broke the hog's back; the septic germs developed in the swine system, a new disease was born, and was named hog cholera.

Remedies and Swindling Hog-Cholera Receipts. About all the poisons usually kept in the drug stores have been given to hogs within the past few years. Hogs have been dosed with arsenic, antimony, calomel, copperas, blue vitriol, and other poisons, in hopes that some might prove a cure or preventive. Persons have been traveling through the country peddling "sure-cure and preventive receipts for hog cholera,"

for which they get from the farmers, who are anxious to find something to stop the terrible ravages upon their stock, from $5 to $50 for each receipt. These are nothing but swindles, and no farmer should pay a cent for such knowledge. These men know nothing or but little of the disease and of course their remedies are worthless and even hurtful. Here is one for which a farmer paid $10, for it was warranted a "sure cure:"

"Take calomel, poke root, wild cherry bark, muriatic acid, sulphuric acid, nitric acid, oxalic acid, pyroligneous acid, phosphorus, plantain, arsenic, ipecac, Indian or wild turnip, arnica, Peruvian bark, sulphurous acid and potash, equal parts. Dose, 1 pound for 10 hogs every 6 hours until the hog needs no more."

In commenting upon the foregoing we will state that wild cherry bark, plantain and Peruvian bark are harmless. Ipecac and wild turnip may be taken in moderate quantities. The acids may be given in some diseases in small doses, well diluted with water. Calomel, arsenic and potash are well known poisons. Poke root and arnica, in large doses, are violent poisons. Hogs that take a dose of this wonderful and infernal mixture will never have a chance to die from the effects of "hog cholera," as a dose of this poisonous combination will take care of the hogs long before "hog cholera," or any other disease, can affect the animal. Therefore, in this respect, this is a "sure preventive."

Symptoms. The premonitory signs occur late, are very transient, and are seldom observed; usually the death of one or more pigs, under mysterious circumstances, first arrests attention. Some may then be noticed to be dull, not to seek for food or water, but to creep beneath the straw or any dark place, seeking quiet and isolation from the rest, carrying the head low and ears drooping.

Signs of abdominal pains are often well marked, and there is a disposition to lie on the belly with forefeet outstretched.

In some cases there is a great cerebral disturbance and in others stupor, so that they may be either wild and frantic and utter cries, or else quite unconscious. Vomiting frequently occurs, the retching being often quite violent, and food may be vomited, or mucus and bile only.

In the early stages the fæces are of normal consistence, and the urine pale. After a time diarrhœa sets in, and the excrement is then dark or black colored, and extremely offensive. There is a singular jerking or spasmodic breathing, complicated by congestion of the lungs, and usually a painful, irritating cough, which increases the general weakness. Great weakness of the hind parts is often noticed from the commencement of the attack, which increases as the disease advances. The animal staggers when moving about, its limbs cross each other, and often at last are perfectly paralyzed. It is then often found that the creature cannot scream, and there is present a subdued hacking cough. The blood does not flow freely if a vein be opened, and ecchymosis occurs over the whole body. The discoloration of the skin and mucous membranes—suggesting so many names for the disease—commences some time before death, and occurs especially on the belly, inside of the thighs and fore-legs and behind the ears. Where the skin is thinnest it is especially noticeable. The red or purplish color disappears wherever the skin is pressed, except in parts where any extravasation of blood has occurred. In rapid cases, the mucous membrane is of a bluish red color, and in chronic cases it is of a dirty yellow color. The temperature of the body is at first increased, but afterwards it is lowered. Slight forms now and then appear, which consist of discoloration of the skin and loss of appetite, extending over a few days, when recovery follows; but in severe cases, the animals generally succumb in a very short space of time from the commencement of the attack.

Post-mortem Appearances. The skin is black and blue, as if the animal had been bruised during life. The capillaries and moderate-sized veins of the skin and subcutaneous tissue are dark colored, and gorged with blood. A yellow serum is apt to accumulate wherever there is ramified redness. The serous and mucous membranes are studded with ecchymosis, which are almost developed as a rule in the thoracic organs. Impaction of solid material in the intestines is frequently observed. The liver and spleen are usually congested and of a dark color, and the parenchyma of the liver more particularly is soft. The lungs are often much congested. The blood is dark, seems fluid, and coagulates very slowly.

Treatment. When the disease breaks out, keep the animals on low diet, and promote action of the bowels by clysters; and give them an emetic—white hellebore 5 to 10 grains, or sulphate of zinc, 5 to 15 grains, followed by purgatives. The following drench would be suitable: Epsom salts, 2 to 4 ounces; sulphur, 1 to 2 ounces; and gentian and ginger, in powder, 1 to 2 drams, in about 2 pints of water. The dose must be regulated according to the size of the animal. The medicine should be given before diarrhœa sets in. Moderate exercise, fresh air and syringing, or sluicing the animal over with cold water, are measures to be recommended.

Preventive measures should consist of cautious feeding in young growing animals, wholesome vegetable diet, and a sparing allowance of only well cooked animal food, strict attention to cleanliness, and separation of the afflicted from the healthy animals. The sulphite or hypo-sulphite of soda, in about 1 to 2 dram doses, five or six times a day, would act very well. It could be given in a little feed if the animal would take any.

Dr. J. H. Detmars, an eminent and well known microscopist and biologist, who has been employed for years by our Government to investigate the so called hog cholera, classifies the diseases under the single general head of epizootic and enzootic diseases of swine, or epizootic influenza of swine, but assuming different characteristics, as the catarrhal-rheumatic form, the gastric-rheumatic form,

the cerebro-rheumatic form, and the lymphatic-rheumatic form. The treatment which he recommends is as follows: The treatment may be divided into two parts, a hygienic and a medical. The former, which includes a removing of the causes, is, in this, as in most other cases, of very great importance. If the causes are promptly removed, a great many sick animals not already too far gone may be saved. If the same are not, the very best medical treatment will be of little avail. The sick animals must be separated from the herd, must be provided with a clean and dry resting-place, must have pure air to breathe, clean water to drink and healthy, clean and easily digested food to eat. He recommends giving to each hog at the beginning of the disease a good emetic, composed either of powdered white hellebore (*Veratrum album*) or of tartar-emetic, in a dose of about one grain for each month the sick animal is old, provided the latter is of good average size. The largest dose to be given a full-grown animal should not exceed fifteen or sixteen grains. The emetic is best administered by mixing the same with a piece of boiled potato, or, if the hellebore (which he prefers) is chosen, strewing the powder on the surface of a small quantity of milk, as neither boiled potato nor milk will be refused by any hog unless the animal is very sick, and in that case it will be too late to make use of an emetic.

After the desired action has been produced the animal will appear to be very sick, and will try to hide itself in a dark corner, but two or three hours later it will make its appearance again, and will be willing to take a little choice food, such as a few boiled potatoes, a little milk, etc. At this time it will be advisable to again give a small dose of medicine, either a few grains (two or three to a full-grown animal and to a pig in proportion) of tartar-emetic or of calomel. Mix with a piece of boiled potato, or, if the symptoms should not have returned, mix with a small pinch of flour and a few drops of water (sufficient to make a stiff dough) and form into small round pills.

The tartar-emetic has to be chosen if the disease has its principal seat in the respiratory organs or presents itself in its catarrhal-rheumatic form, and the calomel deserves preference if the gastric or bilious-rheumatic form is prevailing, but especially if the liver is seriously affected. Either medicine may be given in such small doses as mentioned three times a day for several days in succession, or until a change for the better becomes apparent. It is also advisable, particularly if the disease exhibits a very typhoid character, now and then to mix for each animal a few drops carbolic acid with the drinking water or with the slops. Convalescent animals, which have become very weak and emaciated, will be benefited by giving them once a day from a few grains to half a drachm of sulphate of iron (copperas) mixed with their food, but the use of iron must be discontinued if the patients become constipated or if the excrements turn black. Those convalescents in which the lungs have become hepatized to a considerable extent may receive repeatedly small doses of carbonate of potash for the purpose of promoting the absorption of the exudations deposited in the tissue of the lungs. The size of the dose of carbonate of potash as well as of iron depends upon the size and the age of the animal. A local or external treatment is also of considerable importance. A good counter-irritant or blister, composed of cantharides, or Spanish flies, and oil, made by boiling one ounce of the former and four ounces of the latter for half an hour over a moderate fire, or for one hour in a water-bath, should be applied on both sides the chest in all such cases in which the organs situated in that cavity are seriously affected. Such a counter-irritant has usually a very beneficial result. In most cases one application will prove sufficient to relieve the animal to a considerable extent, provided the oil is thoroughly rubbed in before the disease has made too much headway, or before the vitality of the organism has been destroyed. If the effect of the fly-blister proves insufficient, it may be applied again the next day; but if the same produces no effect at all, it may be taken as an indication that the animal is going to die, and that any further treatment will be useless.

In relation to prevention and treatment, Dr. Detmars, in a late report, says: The worst thing that possibly can be done, if swine-plague is prevailing in the neighborhood, is to shelter the hogs and pigs under or in an old straw or hay stack, because nothing is more apt to absorb the contagious or infectious principle, and to preserve it longer or more effectively than old straw, hay, or manure-heaps composed mostly of hay or straw. It is even probable that the contagion of swine-plague, like that of some other contagious diseases, if absorbed by, or clinging to, old straw or hay, etc., will remain effective and a source of spreading the disease for months, and may be for a year. Therapeutically, but little can be done to prevent an outbreak of swine-plague. Where it is sufficient to destroy the infectious principle outside of the animal organism, carbolic acid is effective and, therefore, a good disinfectant; but where the contagious or infectious principle has already entered the animal organism its value is doubtful. Still, wherever there is cause to suspect that the food or the water for drinking may have become contaminated with the contagion of swine-plague, it will be advisable to give every morning and evening some carbolic acid, say about ten drops for each animal weighing from 120 to 150 pounds, in the water for drinking; and wherever there is reason to suspect that the infectious principle may be floating in the air, it will be advisable to treat every wound or scratch a hog or pig may happen to have immediately with diluted carbolic acid. During a time, or in a neighborhood in which swine-plague is prevailing, care should be taken not to ring or castrate any pig or hog, because every wound, no matter how small, is apt to become a port of entry for the infectious principle, and the very smallest amount of the latter is sufficient to produce the disease. Still, all these minor measures and precautions will avail but little unless a dissemination of the infectious principle, or disease germs, is made impossible.

To prevent the spreading of the disease the following precautionary measures should be taken: Any transportation of dead, sick, or infected swine, and even of hogs or pigs that have been the least exposed to the contagion, or may possibly constitute the bearers of the same, must be effectively prohibited. Every one who loses a hog or pig by swine-plague should be compelled by law to bury the same immediately, or as soon as it is dead, at least four feet deep, or else to cremate the carcass at once, so that the contagious or infectious principle may be thoroughly destroyed, and not be carried by dogs, wolves, rats, crows, etc., to other places. Another thing may yet be mentioned, which, if properly executed, will at least aid very materially in preventing the disease: that is, to give all food either in clean troughs, or, if corn in the ear is fed, to throw it on a wooden platform which can be swept clean before each feeding. If the cause and the nature of the morbid process and the character and importance of the morbid changes are taken into proper consideration, it cannot be expected that a therapeutic treatment will be of much avail in a fully developed case of swine-plague.

Fatty Degeneration in Pigs. Of the first symptoms of this fatal ailment Dr. N. H. Paaren, Illinois State Veterinarian, says that sometimes within a day or two after birth, the pigs will be singularly quiet, making little resistance to being taken hold of, and showing a slowness to seek the mother when placed a distance from her. Apparently the young animals are in good condition, but their actions contradict the appearance. A state of general helplessness, or partial paralysis soon results, beginning at the hinder extremities and increases until the fore parts become involved. Sometimes the pigs will quit sucking the next day, or a few days after birth, and will stand around, or lie down quietly and suddenly die, without having shown any marked symptoms of disease at all, and so far as can be seen, without much suffering. Others, while having a good appetite, and having plenty of milk from the mother, will in the course of a week or longer, gradually grow thinner and weaker until death ensues. Others will become corpulent, and even lay on considerable fat, but still die of exhaustion. Often a few of a litter will begin scouring badly, or become bloated, without any known cause and soon die off. Again, apparently healthy pigs will suddenly become affected with partial or general paralysis, or with cramps, and speedily die. Dr. Paaren says that he has been informed of whole litters being carried off in the various manners described.

In the main, the Doctor states, a *post-mortem* examination always reveals the same conditions. There is a general want of blood, and a consequent paleness of all the organs, especially of all the muscles, which appear attenuated, flabby and frail. Frequently the muscles have such a bacon-like glossiness that only by the closest inspection can sections thereof be recognized as muscle. Examination under the microscope reveals fatty degeneration of the muscular structure. Sometimes the entire muscular fiber seems to be made up of granular matter, and often there is not the slightest appearance of transverse striæ on the muscular fiber, which appears to be composed of minute and highly refracting globules of oil. Pigs that die soon after birth, generally show an imperfect development of fatty tissue, and many of them are even very lean. Thus, the Doctor shows that a state of fatty degeneration does not consist of an excessive development of fat between the muscles, with an atrophied state of the latter; but on the contrary, is a morbid alteration of the muscular fibers themselves, whose contractile substance is transformed into fat.

In consequence of the fatty degeneration, Dr. Paaren proceeds to say, the efficacy of the affected organs is materially lessened, and naturally the young pigs dislike exercise and soon become helpless. The degeneration of the respiratory muscles and the muscles of the heart causes imperfect breathing and circulation of the blood. If the digestive organs, the liver, the pancreas and the pepsin glands are in a state of fatty degeneration, they cannot perform their offices, assimilation is imperfect and the production of blood cannot take place. The blood being poor, the general state of weakness is increased, and the further perfection of fatty degeneration promoted. The general weakness thus produced is a sufficient cause of fatality.

The causes of fatty degeneration in pigs are not always the same. Sometimes it is congenital. It has been clearly established that it often develops in the fœtus. That they are born in apparently perfect condition, is owing to the fact that until their birth they are protected from external influences, and are sustained by nourishment fully prepared in the shape of the blood of the mother. As soon as it is born, however, and becomes dependent for its sustenance upon resources from without, which must be digested and assimilated through its own vital powers, the young animal is in danger of a collapse from its inherent weakness; and if it does not succumb soon after its birth, it is apt to succumb sooner or later to diseases which are due to fatty degeneration.

Dr. Paaren claims this disease is one of the banes of high breeding and in-and-in breeding. Want of proper exercise and too high keeping of the sows are very liable to increase this morbid tendency. In-and-in breeding, he claims, judiciously practiced, is not objectionable, but when close breeding is persisted in while animals are continually kept in an abnormal condition of body (which is the case under the present system of feeding), evil consequences will sooner or later become manifest. Medical treatment in such cases as this of course is futile.

Foot-and-Mouth Disease; Epizootic Aphthæ. This is a contagious eruptive fever, affecting all warm-blooded animals, and attacking men, under certain circumstances, as readily as any of our domestic quadrupeds. The contagious matter is discharged in great abundance with the saliva, and from the vesicles which form in and about the mouth, also on the teats and feet. The virus adheres to the wood-

work, litter, floors, roads and whatever the affected animals come in contact with, and is thence communicated to healthy animals coming after them.

Symptoms. The disease is invariably characterized by a brief period of incubation, varying from twenty-four hours to three or four days. The earlier symptoms are usually ushered in by a shivering fit, succeeded by a slight dullness. A vesicular eruption soon occurs in the mouth and on the digits, and in female animals usually also on the teats. There is a tendency in young animals, when sucking the dam or drinking the milk from affected animals, to a similar eruption on the fauces and pharynx, with irritation of the larynx and of the whole digestive tract. Diarrhœa in these cases tends to exhaust the young animals, whose sore mouths prevent the taking of food. The eruption in the mouth is first indicated by smacking of the lips, and champing of the jaws, and great salivation. The pain is evidently intense. If the mouth be examined, vesicles will be found on the tongue, and on the inner surface of the lips and cheeks. In a short time the vesicles burst, and the red, painful spots thus exposed are soon covered by epithelium in favorable cases, whereas in others unhealthy ulcers develop. When the eruption occurs on the feet, it is observed around the coronet, and in the inter-digital space. The intense pain, inability to stand, lameness and swelling above the hoofs, are usually the first signs noticed. The animal is inclined to lie down the greater portion of the time, and to utter screams, accompanied with much champing of the jaws, and salivation if compelled to move. There is a great tendency to sloughing of the hoofs, and pregnant sows frequently abort; emaciation occurs, the poor sufferer being unable to take food, owing to the intense pain in the mouth. There is also more or less constitutional fever, often attended by a cough. In favorable cases all symptoms of fever usually subside by the sixth day, the appetite is restored, and convalescence well established by the ninth or tenth day. In cases of a fatal termination, the fever runs high, ulceration spreads, the animal becomes exhausted, the hoofs slough off, the blood becomes impure, and death generally occurs about the ninth or tenth day. In the majority of cases the disease is mild.

Treatment. Although epizootic aphthæ is not often a fatal disease, still attention must be paid to proper treatment. The use of laxatives and salines must be resorted to, and the affected parts should be dressed with chlorine water or carbolic acid, one part to twenty or forty parts of water,—or other antiseptic and healing dressings. It is hardly necessary to attempt to feed when the animals are suffering from this disease, except allowing them their slops or gruel. The preventive measures should be strict isolation of the affected animals from the healthy ones, the placing of suspected ones in quarantine, and the free use of disinfectants about the premises.

Keep all the suppurating surfaces clean, especially about the hoofs. One might use some of the following applications: Chloride of zinc, 2 drams; tincture of myrrh, 1 ounce, and water, 1 pint. Or, carbolic acid, 1 ounce; glycerine, 12 ounces; tincture of myrrh, 1 ounce; water, 1 pint. Or, Condy's Fluid, 1 tea-cupful; water, 1 pint. Attend well to ventilation and cleanliness and to the general comfort. The sulphite or hyposulphite of soda given in ½ to 1 dram doses three or four times a day is good. It is also a good antiseptic and healing gargle for the mouth.

Fractures in Swine. These occasionally occur in hogs, but in the way of treatment little can be done. If slight, they had better be left entirely for nature to effect a cure; but if serious and the animal is in proper condition, it should be killed at once for food. From its obstinate, intractable nature but little can be accomplished in the way of treatment.

Mange or Itch. This is a skin disease of purely a local nature, and is caused by an insect (*sarcoptes*), a species of acarus, which induces irritation, ulceration, suppuration and incrustation on the surface of the body generally.

It is a contagious disease, never originating spontaneously, and requiring for development the passage of either the parasites or their eggs from diseased to healthy animals. The pig is, perhaps, less affected by this troublesome disorder than other animals; any way it is the least observed.

Symptoms. Much irritation and itching occurs, the animal manifesting great uneasiness, continually rubbing itself, and does not thrive. The insect is situated under the scales of the cuticle, and very difficult generally to detect, but may sometimes be found by a powerful magnifying lens.

Treatment. Apply topically any of the following dressings: Carbolic acid, 1 ounce, to water, 16 ounces; or mercurial ointment; but care should be taken not to apply these to too great a surface of the body at one time. Another dressing is oil of tar, sulphur, and linseed oil, equal parts; or creosote, 1 ounce, spirits of wine, 15 ounces, and water, 16 ounces. All the premises and articles coming in contact with the affected animals should be thoroughly cleansed or destroyed. Of course all unaffected animals must be kept from coming in contact with affected ones. Sequestration must be strictly observed and enforced.

Measles; *Rubeola.* Measles may be defined as "a contagious febrile disease, characterized by catarrhal symptoms, and the presence of a rash under the skin with the disappearance of fever. It has often been confounded with small-pox. The term measles has been most erroneously applied to two diseases of the pig, the one being a parasite malady, due to the existence of *Cysticercus cellulosus* in the muscular system; and the other a disease of the blood of a grangrenous character, usually associated with severe gastro-intestinal derangement, and well known as "hog cholera," "blue sickness," etc. Very little is really known with regard to this malady. It is not known whether it is one and the same disease in man

and these animals, or whether it is transmissible from animals of one species to those of another.

Symptoms. From what has been observed of this disease, it appears to consist of irritative fever, with catarrhal symptoms, swelling of the head and throat, constipation usually, and loss of appetite. Irregular eruptions commonly begin to appear about the second or third day, which are generally confined to the insides of the thighs and fore legs, sides and underparts of the body and face, and consists of a perceptible elevation, the redness of which disappears on pressure. In the center of these elevations a perceptible hardness is felt; usually after the expiration of another day a red papulous eruption takes place from the central points of hardness, and gradually in two or three days more the acute signs are allayed, the spots become brown colored, the cuticle peels off, and perfect subsidence usually takes place by the ninth or eleventh day. Sometimes complications occur, as diarrhœa or inflammation of the lungs, these often proving fatal. With the first symptoms of the fever there is generally cough, vomiting, redness of the eyes and flow of tears.

Treatment. As soon as the disease is ascertained to be present, the sick animals should be separated from the healthy ones; and those that have been in contact with them, it would be well to place in quarantine. Strict attention should be paid to cleanliness and general comfort, and free ventilation, yet allowing a warm temperature. The bowels require to be kept open with gentle laxatives, and mild doses of salines are useful. Feed with warm, sloppy, easily digested food, and have plenty of cold, clean water always accessible. It is not by any means a dangerous disease if proper care is taken of the patient and complications do not occur.

If much fever is present it would be well to give three or four times a day as a drench, potassium-carbonate, ½ a drachm to 1 drachm; sodium-carbonate, 20 to 40 grains; Epsom salts, 1 to 2 ounces. Dissolve in from a half to a pint of water. These doses must be regulated according to the size of the animal, the smallest dose being suitable for pigs of about 50 lbs. weight, and the largest for animals of 200 lbs. and upwards.

PARTURIENT PARALYSIS. The sow is sometimes attacked by this affection. The most frequent cause is exposure when the sow is in a too plethoric condition at the time of parturition.

Treatment. Care should be used in permitting her pigs not to worry her. They should be kept from her, or only allowed to nurse at certain times, though usually the milk dries up. Give a sufficient purgative to move the bowels; then administer salines, and if there be much fever give sedatives; or if she be very weak give stimulants, as nux vomica, 5 to 20 grains twice daily, until the desired effects are produced.

PLEURO-PNEUMONIA. This disease may be divided into two forms. One, sporadic or enzootic pleuro-pneumonia, which occurs spontaneously, and is influenced by climate, season, and location. It is not usually fatal, and is generally considered not to be propagated by contagion, but common to all animals. The other, epizootic pleuro-pneumonia, is a malignant form of inflammation of the lungs, of an eminently contagious character, and heretofore supposed to be peculiar to the ox species alone.

That this latter form has its origin spontaneously, and afterwards spreads by contagion and infection, there can be no doubt whatever. By every means in our power, we should avoid, by preventive measures, the introduction of affected animals among healthy ones, because treatment in contagious pleuro-pneumonia is a miserable failure. Happily our country has not suffered from its devastating ravages as have most of the older European countries.

Sporadic pleuro-pneumonia is in the majority of cases amenable to treatment; but whether after a certain time, and under certain circumstances, it does, or does not, become a contagious affection, has not been definitely determined.

Symptoms. Rigors, dullness, loss of appetite, or depraved appetite, often eating each other's excrement; general debility; respiration much affected, a quick, spasmodic, labored breathing, with hard, dry, hacking cough, and in some cases swelling about the lower jaw, often coughing up through one or both nostrils mucus or coagulated blood, and sometimes lung substance; also, either constipation or diarrhœa. When the latter occurs the fæces are usually black and extremely fetid. Toward the last stages the animals become emaciated, and in walking show staggering gait, often crossing the hind legs, and sometimes falling. They are inclined to lie in moist, damp places. It is in the early stages of the disease that loss of appetite, rigors, dullness, cough, and the swelling of the lower jaw and throat are usually observed.

In the early stages when breathing is very bad, Fleming's tincture of aconite should be given, eight or ten drops, till as many as twenty, and to some even forty-five drops might be given with good results; also nitrate of potash, in about 1-drachm doses. To a fair-sized hog should be given gentian 1 drachm, ginger 1 drachm, and about every alternate day, either sulphur or magnesium sulphate, from one to two ounces. In constipation, purgatives should be given in greater or less quantity until the desired effect is produced. After the first stages are passed, sulphate of iron may be given, ½ drachm daily. After a time, every day or so, great benefits may result from strong counter-irritants, composed of mustard, turpentine and liquid ammonia, applied behind the shoulders. If there is much coarse hair, it should be cut off, and a blister applied with a stick once or twice a day.

QUINSY; *Cynanche tonsillaris.* This disease is somewhat similar to a malignant sore throat, but chiefly manifesting itself on one side of the neck, and implicating the tonsil of that side.

Symptoms. The bristles on the affected side are erected. There may be 12 or 15 of them sticking out

and firm, and if they be pulled, or even touched, the animal screams with pain. The surface over which they are implanted, is depressed or cup-shaped, and of a dark bluish color. The animal becomes exceedingly dull, listless, deaf, and is continually lying; there is no desire to take any food, and if made to rise and move, it is very evident that the body is supported with difficulty by the extremities; the breathing becomes laborious, the expired air hot and fetid; the mouth hot and foaming, and the lower jaw is constantly moved from right to left, or left to right; the eyes are bloodshot; there is either extreme of constipation or diarrhœa, and the evacuation of fæces seems to afford some momentary relief. The animal usually becomes comatose, and may be asphyxiated in from 24 to 48 hours, or linger on and die in convulsive fits, about the seventh, eighth or ninth day.

Treatment. The affected animals should be instantly separated from the healthy ones, and, in the first stages, the affected tissues should if possible be either extirpated freely with the knife, or very deeply cauterized. Cold water, with vinegar and niter in it, should be allowed the animal. Gargling the throat frequently with chlorine water is beneficial. Administer an emetic, such as white hellebore, 10 grains, or tartar emetic, 5 to 10 grains, or sulphate of zinc, 10 to 25 grains. Afterwards a brisk purgative—say Epsom salts, 3 to 6 ounces—if constipation is present, persisting in the free use of injections. Also give stimulants to support the animal through the attack. These constitute about the chief and only means that can be employed. Emetics in moderate doses—such as tartar emetic, 3 grains, ipecacuanha, 4 grains—given frequently, are very beneficial. All these medicines must be given in the form of a drench. In gargling the throat the fluid must be thrown in from a small syringe. This can easily be done when the mouth is opened, either by an assistant's hands, or by the insertion of a stick or other hard, suitable instrument.

Rupture; *Hernia.* By hernia is meant the protrusion of any organ or viscus, or part thereof, through an opening, either natural or artificial. The term hernia is most commonly applied to rupture or displacement of portions of the intestines, omentum or other abdominal organ.

Hernia in the pig is of little consequence as compared with hernia in the horse; therefore, it will only be necessary to notice two or three of the most frequent forms in which it occurs in swine.

Ventral or abdominal hernia is a protrusion through an artificial opening in the abdominal walls. This may be caused by a direct injury, and is easily seen, and most frequently occurs in young animals. If it does not become strangulated, that is, constricted at the opening through which it has passed, there is little danger to be apprehended. Usually, little can or need be done in the way of surgical treatment. Animals thus affected usually do very well, and fatten as readily as others not so injured, the pig not having to undergo any violent exertion, as in the case of the horse. It is advisable that the animal be kept quiet and comfortable, and fattened as speedily as possible, paying attention to the rupture, so that should any obstruction or strangulation of the part occur, it may be slaughtered at once, in preference to trying any remedial measures.

Umbilical hernia is a protrusion through the naval opening. This occurs only to young animals at birth or very soon afterwards. It is often congenital. In early life, as the animal grows, it often retracts and disappears naturally. If it be very desirous to keep the animal for stock or show purposes, early bandaging should be adopted.

Scrotal hernia is a descent of the intestine into the scrotum. This usually occurs in young animals, and is often not detected until the animal is castrated, when the portion of intestine will portrude through the incision made by the operation. When this is the case, it should be returned as soon as possible, and a few stitches put through the scrotum, allowing a small dependent orifice for the escape of any matter that may form, but not sufficiently large to admit of the passage of the intestine. When so treated most cases usually do well. The animal should be kept quiet, and on rather a low, sloppy diet for a few days, and allowed plenty of clean water to drink.

Sore Throat, Malignant; *Œdema glottidis.* This disease consists of a rapid effusion and exudation amongst the tissues comprising and surrounding the laryngeal opening and glottis, attended by great difficulty of breathing, in which life is jeopardized by interfering with respiration. From what is known concerning it, most authorities agree in classing it among the contagious diseases; and from the suddenness of its attack, and the rapidity with which it runs its course, it generally terminates fatally.

Symptoms. This disease with the pig is characterized by febrile symptoms, dullness, stiff gait and loss of appetite, quickly followed by difficult breathing, swelling and soreness of the throat and tongue, gasping for breath, cough, heat of expired air, and great heat of back, bluish color of the buccal membranes, difficult deglutition, and symptoms of suffocation. If the animal is not too fat, externally and along the course of the trachea, a hard, inflammatory swelling may be traced, often extending down to the fore extremities; the breath is often extremely offensive, desquamation of the epithelium occurs within the mouth and there is a great tendency to gangrene. The disease may terminate fatally in from one to three days.

Treatment. This is, in the majority of cases, most unsatisfactory; for generally the poor sufferer succumbs to a disease which we appear to have no power to arrest, much less to cure. Happily it is of rare occurrence. In the early stage an active emetic might be given, such as tartar emetic, 4 grains; ipecacuanha, 6 grains; white hellebore 6 grains. Give either in food, or drench very carefully. If the animal will drink anything, or will eat a little, a purgative should be given, as, castor oil, 2 to 4 ounces; or raw linseed oil, 1 pint; or aloes, 1 to 2 drachms in

solution. If the animal will drink water, dissolve in it a little hydro-chlorate of ammonia and niter, or sulphite or hypo-sulphite of soda, 1 drachm, and give several times daily. The application to the sides of the neck of rags wrung out of boiling water, or other active vesicant, would be beneficial. Also, as constipation is generally present, frequent injections may be beneficial.

In other animals, when the difficulty of breathing is great, tracheotomy might be performed; but in the pig the operation is not practicable, it being far easier performed in theory than in practice.

Preventive measures should be adopted in preference to curative. Great care should be exercised in handling or cutting the diseased flesh, as bad results might occur from having abrasions or cuts upon the hands. Other animals should not be allowed to eat any of the blood or flesh of diseased animals, and the carcasses of all that die from this disease should be buried deep and as soon after death as possible.

TRICHINIASIS. The disease known in the human family by this name is due to a small species of entozoon or parasite, and appears to be generally found in the muscles of voluntary motion. Trichinæ dwell in very minute cysts of an oblong figure. (See page 893.) When taken with food, they multiply in the intestines, and then migrate to the muscles. There are also other varieties of *Tænia* and hydatid parasites, peculiar to other animals, as sheep and cattle, from eating the flesh of which this or similar diseases may be induced in the human body. Pigs, and often cattle and sheep, suffer to a great extent from hydatids of the liver. These *Cysticerci* are apt to take up their abode also in the liver, mesentery and other internal organs of man, when consumed as food, especially when taken in a raw or underdone condition.

Prevention in these cases is about all that can be done, as treatment is of little or no avail; for it is usually not until after death and in the cutting up of the meat that the disease is observed. If pigs were kept more enclosed, where they could have no possible access to the excrement of human beings and dogs, the disease would be much less prevalent than it is now.

It would appear that the embryos of the ova of *Tænia* can affect only young pigs under a year old, because in older animals they cannot pierce through the tissues, as experiments performed with animals over a year old have generally failed.

In some of the sparsely populated districts hogs might run at large without much risk of contracting disease, but in thickly populated districts swine should be kept and bred in enclosures. This is believed to be the only sure and proper way to prevent and keep this disease in subjection.

WORMS; *Cysticercus cellulosus.* The very inappropriate term "measles" is applied to that morbid state induced by the presence of *Cysticercus cellulosus* in the muscular structure of swine. It is a purely parasitic disease, and depends for its origin on the introduction, into the system of the pig, of the mature and fecundated ova of one or more species of tapeworm (*Tænia*). From experiments and observations that have been made, it is now a conceded fact, that the tapeworm of man (*Tænia solium*) and the tapeworm of the dog (*Tænia serrata*), and probably of the wolf, will produce in the muscular system of the pig, the cystic form of parasite, the *Cysticercus cellulosus* and in the brain of sheep the *Cœnurus cerebralis*, or hydatid disease; and also, that both the *Cœnurus cerebralis*, or hydatid of the sheep, and the *Cysticercus cellulosus*, or measles cyst of the pig, will produce tapeworm in both man and dog. The ova of the tapeworm are taken into the system of the pig by feeding or swallowing them in human and canine excrement—afterwards developing—and the embryos are supposed to pierce and pass through the tissues, and are then carried through the large arterial vessels by the circulation until they reach their destination in the muscular system or structures. But it would appear that this can happen only to young animals, the parasites not being able to make their way through the tissues of adults.

Pigs are said to be born measly, and it is supposed that one of the most constant means whereby the disease is propagated is by breeding from affected parents. Pigs affected with *Cysticerci* may become fat and never betray any sign of sickness, or the parasites may be so numerous as to cause great constitutional disturbance. The flesh after death requires very careful examination to detect the cysts or bladders containing the parasites. They are often found beneath the internal membrane of the mouth, under the tongue, inner lining of the eye-lids and the muscles below the spine within the abdomen. The disease is supposed not to be so prevalent now as formerly, owing probably to the animals, not being allowed to run at large so much and get access to human excrement. Keep dogs clear of tapeworms by an occasional vermifuge; bury all excrement of dogs found in pastures, and kill all stray and worthless curs.

WOUNDS. These may be divided into incised, lacerated, punctured and contused. From wounds the pig appears to be particularly exempt, as compared with other and especially the larger animals. This may be owing to the short life usually allotted him, his small size, low form, peculiar habits, and his being also generally pretty well covered with fat, thus protecting to a great extent all vital and important organs. Where pigs are kept with cattle, they are sometimes punctured or gored by the horns of the latter, in which case the abdomen sometimes becomes lacerated, allowing part of the intestine to protrude. This, of course, is often attended with dangerous consequences.

Treatment. This should be attended to as soon as possible, not allowing the protruding intestine to get cold. If the intestine is not broken, treatment is usually successful. First cleanse the part if dirty, using water about blood warm; then carefully return,

and bring the abdominal walls together, and secure by a few stitches, leaving long ends, and allowing these to hang out of the wound; next close the skin by stitches, but leave sufficient opening at the most pendent part, to allow the free exit of any matter that may accumulate. Of course the animal must be held down by assistants during the operation. After wards keep the bowels open by the use of injections of tepid water. Endeavor to prevent constipation by a laxative and cool diet, such as cooked vegetables, gruel, or the like. It is not advisable to give any drastic purgatives; but if necessary to resort to medicines to relax the bowels, use castor or raw linseed oil, repeated every few hours until the desired effect is produced. If in warm weather, and there is much fever or heat about the injured parts, it would be well to shower or apply cold water, to which might be added a little laudanum, and if the discharge is very offensive, and there appears any tendency to take on a gangrenous character, a little carbolic acid, or chloride of lime, or permanganate of potash should be added to the water. A small quantity might be injected into the wound as well as bathing it; but care must be taken not to inject much fluid into the abdominal cavity, on account of the danger to be apprehended from inflammation of the peritoneum or caul.

Swingle-tree, a whiffle-tree, which see. The words swing-tree, single-tree and whipple-tree are also used in different sections of the country to designate the same object.

Swing Plow, a plow with no wheels under the beam.

Swiss Chard, a variety of white beet cultivated solely for its leaves, which are either juicy and used as greens, or are ornamental. The leaves are thick, having heavy midribs, which are served like asparagus, while the rest of the leaf is cooked as spinach. If often cut, new and more tender leaves will be reproduced. It is also called "Silver" or "Sea-Kale" beet.

Sycamore, a coarse, large tree, common in bottom lands throughout the United States, and more properly called "button-wood." It belongs to the plane-tree family, and by some scientists has been called "American plane-tree." The true "sycamore" of European literature is a different species, and is not found growing wild in this country. The American, or button-wood, is not valuable, its chief excellence being that it furnishes the best chop-blocks. The grain runs zigzag and the wood is therefore very hard to split; hence, poor for firewood. Being liable to warp greatly, it is of no account for lumber.

Syringe (sir′ inj), a small tube, with a force valve, for injecting fluid into cavities. There are many styles, and special forms for particular parts. Some have flexible tubes, some inflexible. As scarcely any general disease can be properly treated without such an instrument, one or two of the most common forms should be in every household.

Syrphus Fly, one of the insects beneficial to man. See pages 865, 867.

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TABLE. On this subject scarcely any suggestions are called for in a practical encyclopedia, as in the selection of any kitchen, dining-room, parlor or bed-room table the almost universal practice must be to visit a furniture store and select what seems to suit best. Every one, of course, must have his fancy as to what is most convenient for his purposes. There are tables with and without drawers, leaves, castors, etc., and there are extension tables, square, oblong, round and oval, and for the parlor and bed-room are tables and stands with walnut top, marble top, or other style of finish, and of various degrees of expense.

Tackle, a pulley or machine with ropes and blocks for raising heavy weights.

Tadpole, the young produced from the egg of the frog, which is extremely unlike the animal in its perfect state, seeming to consist only of a head and tail. The head is large, black, and roundish; the tail slender and magnified with a broad, transparent fin. Its motions are very lively. Its food consists of small water plants and different animalculæ. The mouth has very minute teeth. About five or six weeks after it is hatched, the first change takes place. The hind legs first appear, and gradually increasing in length and size, are succeeded, in about two weeks, by the fore-legs, which are formed at an earlier period beneath the skin. The tail now decreases, so that, in a day or two it is quite obliterated. After this change the animal leaves the water and covers the shores in myriads. It has now become a perfect frog. Tadpoles, immediately after they are hatched, are perfectly transparent; and, when placed before the double microscope, the pulsation of the heart may be easily seen, and the blood propelled thence may be observed in its passage through the whole body.

Ta-feu (ta′ fu), a fertilizer composed of night-soil and guano.

Taffety or **Taffeta** (taf′ i-ty), a fine, smooth stuff of silk, having usually a remarkably wavy luster, imparted by pressure and heat with the application of an acidulous fluid to produce the effect called "watering." It is of all colors, and is often striped with gold, silver, etc.

Taffy, a kind of candy made of molasses boiled down and poured out in shallow pans. See Candy.

Tail-race, the channel which carries off the water below a water-wheel.

Tallow, the harder portion of animal fat, abounding especially in suet, from the ruminants, cattle, sheep, goats and deer, although there are scarcely any animals but a sort of tallow may be obtained from them. It consists principally of stearine, margarine and oleine, and yields by distillation a large portion of oleic and margaric acids. Its ultimate constituents are, 78.996 per cent. of carbon, 11.700 of hydrogen, and 9.304 of oxygen. See the articles Suet, Fat and Oil.

Tallow is used in medicine as an emollient and demulcent; in pharmacy, to give consistency to plasters and ointments; and in the arts, for dressing leather, for making candles and soap, and for other purposes. Pure tallow is white and tasteless, and differs little from pure lard except in greater density.

To purify rancid tallow, melt it upon lime-water and stir it rapidly and thoroughly. Let it stand until the water settles, and the work is done. Sometimes, however, the same process has to be repeated. By this means the impurities are worked out into the water below.

TALLOW CANDLES. The process of making tallow candles is explained in article Candles.

Tamarind, the pod of a tropical tree, which is of the shape and size of a large bean pod. In the countries where it grows it occasionally forms an article of food, in the form of confectionery, and is esteemed on account of its pleasant acid and cooling qualities, so useful in a warm climate. The tamarind is slightly cathartic. Sugar is used in preserving it. There is but little demand for it in the United States.

Tame, reconciled to the presence of man. Cannot be properly said of plants; these are distinguished into "wild" and "cultivated."

Tannic Acid, the peculiar vegetable principle which combines with the gelatine of skins and converts them into leather. It can be separated from the vegetable substances which most abundantly contain it, and especially from gall-nuts, by any one of several chemical processes; and when separated and purified and dried, it is a white, odorless, fiercely astringent and uncrystallizable powder, very soluble in water and alcohol.

It destroys the acidity of acids, or completely swallows it up in its own astringency, and is decomposed by nitric acid and by chlorine in a very obscure or complicated manner; and is precipitated by the carbonates of ammonia, by alumina, by the alkaline earths, and by many of the oxides of the

common metals. It forms with the peroxide and the protoxide of iron, a black-colored compound which, together with gallate of iron, constitutes the basis of writing ink, and of the black dyes.

Tanning. General recipe: Soak the hide eight or nine days in water, then put it in lime; take it out and remove the hair by rubbing it, and soak it in clear water until the lime is entirely out; then, for three or four days, soak the hide in water in which alum and salt have been dissolved, at the rate of 1 pound of alum and 3 of salt for an ox-hide. Take it out, let it get half dry, and then beat or rub it until it becomes pliable. This method, however, does not produce good leather for shoes.

To Tan Soft Leather, for Gloves, etc. Take ½ bushel of bran and 4 pailfuls of hot soft water; let it stand 24 hours; strain off and add 3 pounds of salt, ¼ pound saleratus, 2 pounds of dissolved japonica, and ¼ pound oil of vitriol; stir till all is well blended together. Let the hides remain in the dye from one to three days. Smaller quantities of the dye can be prepared by observing the proportions of ingredients. This makes as nice leather from squirrel, dog, cat, calf and sheep skins as can be desired for mittens, gloves, etc.

To Tan Mink and Muskrat Skins. First wash the hide in warm water, and remove all fleshy and fatty matter. Then soak it in the following solution: 10 gallons of cold soft water, to which is added 8 quarts of wheat bran, ½ pint of old soap and 1 ounce of borax. If the hides have not been salted, add 1 pint of salt. Green hides should be soaked 8 or 10 hours, and dry ones till they are soft. To make tan liquor, to 10 gallons of warm soft water add ½ bushel of bran. Stir it well and let it stand in a warm room until it ferments; then add slowly 2½ pounds of sulphuric acid, stirring all the time. Let the hide remain in about 4 hours, then take out and work over a beam until dry.

To Tan Buckskins. Take a skin either green or well soaked, and flesh it with a dull knife; spread the skin on a smooth log and grain it by scraping it with a sharp instrument; rub nearly dry over the oval end of a board held upright. Take the brains of a deer or calf, dry by the fire gently, put them into a cloth and boil until soft, cool off the liquid until blood-warm, with water sufficient to soak the skin in, and soak until quite soft and pliable, and then wring out as dry as possible; wash in strong soap-suds and rub dry, and smoke well with wood smoke. Instead of brains, oil or lard may be used, and the skin soaked therein six hours.

To Cure Sheep-Skins, with the Wool on. Take a spoonful of alum and two of saltpeter; pulverize and mix well together, then sprinkle the powder on the flesh side of the skin, and lay the two flesh sides together, leaving the wool outside. Then fold up the skin as tight as you can, and hang it in a dry place. In two or three days, or as soon as it is dry, take it down and scrape it with a blunt knife, till clean and supple. This completes the process, and makes you a most excellent saddle cover. If, when you kill your mutton, you treat the skin this way, you can get more for them from the saddler than you can get for the wool and skin separately disposed otherwise.

To Cure Rabbit-Skins. First lay the skin on a smooth board, placing the fur side under, and fasten the skin to the board with tinned tacks. Wash it over with a solution of salt; then dissolve 1¼ ounces alum in one-half pint of warm water, and with a sponge dipped in this solution, moisten the surface all over; repeat this every now and then for three days; when the skin is quite dry, take out the tacks, and rolling it loosely the wrong way, the hair inside, draw it quickly backwards and forwards through a large smooth ring, until it is quite soft; then roll it in the contrary way of the skin, and repeat the operation. Skins prepared thus are useful for many domestic purposes; and to save and dress all the good skins of freshly killed animals is real economy.

Tansy, a well known bitter herb. Its roots are perennial, its stems are annual, solid, smooth, unbranched and about two feet high; its leaves are doubly pinnatifid, deeply serrated, and of a dark green color; and its flowers grow in dense terminal corymbs, and are numerous, and have a golden yellow color, and bloom in July and August. The whole plant emits a strong but not unpleasant odor, and has a bitter taste, and is alleged to possess tonic, cordial and vermifuge properties, and has long figured in horticultural catalogues as an aromatic herb for making tansy pudding and for other kitchen uses; but it does not agree with every stomach, and has quite lost a large portion of its culinary reputation. Two varieties of it occur in gardens, the Double or Curled and the Variegated or Striped-leaved. The former is cultivated for ordinary purposes on account of being milder and more grateful than the wild sort, while the latter possesses some little claim to a place in the flower-garden. Tansy is propagated from slips or offsets of the root, planted in spring or autumn at distances of 12 to 18 inches apart.

Medicinally it has been used in intermittent fevers, hysterics, amenorrhœa, and as a preventive of rheumatism; but at the present day it is principally used as a vermifuge.

Tapestry (tap'es-try), a kind of woven hangings of wool and silk, often enriched with gold and silver, representing various figures. Figured carpet may be called tapestry carpet. To adorn a parlor properly the same principles of taste, with reference to harmony, etc., of color and figure, should be observed as with reference to dress. For example, when the fashion is to have light colors prevail, curtains and the wall paper should be of light colors, as well as the carpet.

But there is one of the fundamental principles of taste which has reference to any sensation of pleasure and pain that may be produced by a like grouping of objects. For example, if a parlor is draped heavy and close, so that the air becomes heavy and oppressive

from the exhalations of the tapestry, this fundamental principle is violated; for nothing can really be in good taste which uniformly produces a sense of pain. A great amount of heavy and dark tapestry covering all of the windows except a small portion near the base, is extremely oppressive.

Tape-Worm: see Worms.

Tapioca (tap-i-o'ca), a coarse granular substance obtained by heating the moistened starch from the roots of a Brazilian plant. Cassava or mandioc is a more finely granular form. The root is poisonous, but by pulverizing, washing and heating the poison is driven out or destroyed. Tapioca constitutes a very bland, light and nutritious article of food for invalids. It is generally served in the form of pudding, but sometimes as gruel or porridge. For tapioca pudding see page 1071.

Tap-root, the main root of certain trees and plants, which grows straight down into the earth. It characterizes those trees which often grow in places exposed to much wind, as the oaks, which are thus better enabled to withstand high wind. Such trees as prevail in bottom lands have no such stout central support as a tap-root, and when exposed to high wind are sometimes blown over. Hence we find in bottom lands many pits in the ground, made by the blowing down of such trees, which by falling turn up the earth by their roots. The horticulturist may draw a lesson from this fact, and be careful not to cut off the taproots of his trees in the work of transplanting.

Tar, an acrid, bituminous fluid obtained from the wood of certain pines, the larch, fir, etc., by heating. Its dark color is mainly due to the smoke made in heating the wood. The uses of tar are numerous in the arts, and medicinally its effects are similar to those of turpentine,—stimulant, diuretic, anthelmintic and laxative. It is much used externally, by the veterinarian, on wounds and other sores, either alone or with other drugs.

Tare. The "tare" of ancient history is supposed to be what is now known as "darnel," a somewhat poisonous grass sometimes found in grain-fields in the eastern portion of the United States and in the Old World; but at the present day the term denotes several species of quite a different European plant and a kind of vetch, which latter is cultivated in England for fodder.

Tarlatan (tar'la-tan), a kind of thin, transparent muslin, used for ladies' dresses and the like.

Tarragon (tar'a-gon), a species of wormwood, fragrant and aromatic, used in France to correct the coldness of salad herbs. Infused in vinegar it makes a good fish sauce, and it is also an ingredient in pickles, soups and other dishes.

Tart, sour; sharp; also a species of small open pie or flat piece of pastry, containing jelly or conserve. See Pies, page 1035.

Tartar, an acid concrete salt, deposited from wines completely fermented, and adhering to the sides of the casks in the form of a hard crust. It is white or red, the white being more highly esteemed. When pure it is called "cream of tartar," and when crude "argal" or "argol." The word "tartar" also denotes a concretion which often incrusts the teeth (see Teeth), consisting of salivary mucus, animal matter and phosphate of lime.

Tartar Emetic is a double salt consisting of tartaric acid in combination with potassa and protoxide of iron. Medicinally, according to size of dose, etc., it has a great variety of effects. When a person takes too much by mistake, vomiting generally takes place and nearly all the nauseous substance is thrown up. If vomiting has not taken place, tickle the throat, giving large draughts of warm water, until emesis does follow; then give astringents, as oak bark, Peruvian bark, etc.

Tartaric Acid is obtained from tartar, and is soluble, white and crystalline. It is much used in calico printing and dyeing, and also for making effervescing draughts with soda, as in Seidlitz powder. As a neutral salt, in combination with lime or potash, tartaric acid exists in several of the edible fruits, particularly the grape and the tamarind.

Taxidermy (tax'i-der-my), the art of preparing and preserving the skins of animals in the natural form and appearance. Stuffed birds and quadrupeds are desirable in every household, both for ornamentation and as a source of instruction; but the art of preparing them is too complicated and difficult for general practice, as the animals, even the birds, have to be skinned, turning the skin inside out even to the nose or beak, feet and tip of the tail, poisoned with arsenic, and adjusted back to its natural shape and smoothness; and none but enthusiastic "geniuses" would undertake such tasks. Artificial eyes, to be obtained of dealers in that special line, have also to be inserted, and great skill and patience exercised in mounting.

Tea. All the varieties of the tea of commerce are prepared for the market by more or less application of artificial heat: and some are highly or repeatedly torrefied. The leaves which are gathered in the earliest spring afford the strongest and most valuable varieties: those which are gathered late in the year afford the inferior varieties; and those of any season can be made into the green or hyson varieties by peculiar and abundant torrefication.

Many adulterations of tea, by the admixture of the leaves of old stock, of exhausted specimens, or of totally different plants are practiced both in China and America. The Chinese mix the waste, unmarketable teas of former years with the new crop, in order to increase its bulk, and mix other substances with many or most or all of the varieties, in order to increase their weight, to modify their color, or to give them a peculiar flavor; and if they were not checked and controlled by searching inspection at Canton, they would practice such great deception as would speedily

throw the whole tea trade into a state of chaos. The teas freest from admixture with foreign leaves are the better grades of black teas, while those which are most adulterated are the very low-priced and much broken teas, and the lower qualities of black and green gunpowder teas. The pigmentary matters usually employed in coloring or facing teas are Prussian blue, turmeric, China clay, indigo, sulphate of lime, and silicate of magnesia. These are mixed in various proportions so as to produce different shades of blue and green.

The tea-plant is indigenous in eastern parts of China and in Japan, and is held in the highest esteem by the natives, both as an article of diet, and as a means of national wealth. It has been used by the Chinese from time immemorial, some say from the time of Confucius, as both an invigorating beverage and a medicinal condiment, peculiarly salutary to the constitution. It has for ages been the theme of their poets, the idol of their husbandmen, and the highest favor of their emperor and his government; and it is discussed at great length, and with reference to all its history and treatment, in a series of 24 native treatises, which began to be composed about the seventh century. The consumption of it throughout the vast Chinese empire is so great that, in the opinion of an eminent traveler, it would not be materially lowered in price to the native consumer if the whole tea-trade in America was abandoned.

Tea is cultivated, not in every part of China, but chiefly in a tract on the east side, called the tea country, situated between the 28th and 35th degrees north latitude, and more particularly between the 30th and 33d, and possessing a mean temperature in November of 56° Fahrenheit at sunrise and 62° at noon. But in Japan it is cultivated in all parts of the country, around the border of grain and rice fields. The mode of cultivation in the two countries is very much the same. The plant thrives best on light, stony soil, and is commonly sown in the month of February, in rows 4 or 5 feet apart. From 6 to 12 seeds are deposited in each hole; for, on account of their oiliness, they are apt to become rancid, so that a considerable proportion do not germinate. The plants require to be carefully weeded while very young, but are otherwise easily reared.

Their leaves are not available for gathering till the third year after sowing; but they are then good and abundant. At seven years from sowing, the plants attain their full height, but they then have thinner and less valuable leaves than in the third and three following years; and at that time they are generally cut over near the ground, so that they send forth an exuberance of new shoots, and may yield as strong, well-flavored and plentiful leaves as before, and, by this practice of cutting over, repeated at suitable intervals, they can be rendered fairly or fully productive during an indefinite number of years. The leaves are gathered either singly or in sprigs; and can be collected by a diligent worker, sometimes to the amount of ten or fifteen pounds in a day, and on the average, from four to six. The leaves are gathered at different seasons or upon different methods, according to the several varieties of the tea; and are torrefied in buildings adapted for the purpose, having a number of small furnaces, each about three feet high, with a large, flat iron pan at the top.

Next to the peculiar flavor that gives tea its popularity as a beverage, it is an astringent, always tending to close the superficial cells of the alimentary canal, and indeed those of all the blood and lymphatic vessels of the system. It therefore tans, as it were, the membranes, making a sort of leather of them, thus retarding the normal processes of daily renewal. Hence, it is often remarked that tea-drinking prevents one from eating so much as he otherwise would, and therefore from doing as much work as he would without it. Its tanning effects is often seen in its turning the fair skin of the young people to a dark color before they are 40 or 50 years of age.

To Make Tea. Scald the pot and put in a teaspoonful for each person. Upon green tea pour a little water, and allow it to stand two or three minutes where it will keep hot; then fill the pot from the teakettle. Green tea should never be boiled, and it is rendered dead by being steeped long. Of black tea the same measure is used; the pot being filled up at first, and set immediately upon coals or a stove, just long enough to boil it. Water should be added to the tea-pot from the tea-kettle, boiling hot. Black and green tea are good mixed. Never let tea stand in tin.

Teal, a bird of the duck genus.

Team, two or more horses, cattle or other draft animals attached to a vehicle or load for drawing it.

Teasel. This is a rasping herb used for raising the nap on cloth, or combing out the fibers upon the dressed surface of woolen cloth. The bastard variety found in some sections of the East is of no use. The teasel is a biennial. The seed is sown on a deep, loamy clay, previously well plowed and harrowed, in drills 20 inches apart, leaving a plant every ten inches, or in hills 16 inches apart. Cultivate. As the plants do better when allowed to remain and mature where they are sown, the ground can be kept covered by sowing between the rows. In collecting the crop, cut about eight inches below the head, just as it is going out of flower, when the awns are the toughest. Spread and dry under cover, and assort into three lots, according to size and quality. An acre in good condition ought to yield 150,000 to 200,000 heads, worth $1.50 to $2.50 per 1,000.

Technology (tek-nol'o-jy), the science of the industrial arts. Some industrial colleges are called "technological" schools. The industrial arts embrace agriculture, horticulture, gardening, carpentry, blacksmithing, masonry, and all other "useful arts." A list of all the industrial institutions in the United States is given on page 865.

Tedder, a machine for turning and spreading hay;

called also "hay-tedder." A cut of one is given on page 643.

Teeth. The teeth of most of the higher orders of mammals, notwithstanding great and signal differences in the chief groups of genera, possess certain important common characters of both classification and composition, or, in every case, comprise incisors, cuspidates and molars, and consist of enamel, ivory and bony cement. They have different forms and arrangements and relative numbers in different genera, to suit to a nicety the especial wants and feeding habits of each animal; yet, in all instances, though more or less vigorously, according to the saliency of their points and hardness of the substances on which they operate, the incisors nip, the cuspidates tear or lacerate, and the molars grind or bruise or pulverize. The three classes as they exist in the horse, may be taken as a familiar specimen, and bear the popular names of nippers, tushes and grinders, and have been described in our article on Horse. The enamel, the ivory, and the bony cement aggregately adapt the teeth to withstand the attrition of eating, the chemical action of substances incidentally lodged in the interstices, the action of the atmosphere, and the diversity of organic forces within the exposed and unexposed parts of the teeth; and they are differently proportioned to one another, not only in the teeth of different species of animals, but in the different classes of the teeth of the same species, and in the different parts of the same tooth. The aggregate substance of the teeth has more power of resisting both mechanical and chemical agency than common bone; the crown, or exposed and working part of each tooth has vastly more hardness and exterior strength than its root or unexposed part; and the working surface of the crown, whether it consists of edge or points or laminæ, enjoys exactly the amount of superior hardness or intrinsic diversity which fits it for performing its mechanical functions in the best possible manner with the least possible wear.

The enamel is by far the densest and hardest of the three constituents of the teeth, and will yield fire with steel like flint, and is not easily acted on by even the best-tempered files. It never occurs alone, but always as a coating to the other constituents; and it serves so to temper the teeth, as steel tempers iron, that they may resist attrition, and continue unworn as long as the wants of the animal may require.

The ivory is considerably softer than the enamel, yet harder than common bone; and it differs from the latter principally in containing a greater proportion of phosphate of lime, and in some instances, in containing fluorate of lime. The osseous or bony cement is softer than the ivory and contains a larger proportion of animal matter, and somewhat nearly resembles common bone.

Two sets of teeth are given to man and the greater number of quadrupeds; the one temporary, and commonly called shedding or milk teeth, and the other permanent, and commonly called adult or permanent teeth. The jaws grow much faster, and mature much earlier, in proportion, than the general system of the body; and therefore a temporary and comparatively small set of teeth is given them to suit their infant state, and another and comparatively larger set to suit their natural state.

The milk teeth are 20 in number, and the permanent teeth are 32, 20 of which take the place of the milk teeth. At the front of each jaw are two pairs of cutting teeth, called "incisors;" next is a pair of long teeth (having long fangs especially), called "eye-teeth" or "canine teeth," or "canines;" next, two pairs in each jaw of "bicuspids," or "pre-molars;" and lastly, three pairs of "grinders," or "molars," the last pair of these being called also "wisdom teeth," which do not appear until the individual is about full-grown.

Of the milk teeth, the "central incisors" (first pair) come through the gum at about the seventh month of infancy, those in the lower jaw usually first, and give place to the permanent teeth in the seventh year. The "lateral incisors" (second pair) next appear, that is, from the eighth to the tenth month, and give place to the permanent teeth in the eighth year. The canines appear from the 14th to the 20th month, to be followed by permanent in the 11th or 12th year. The pre-molars appear from the 12th to the 14th month, to be followed, the first pair in the 10th year and the second pair in the 11th. The molars (except the last pair, or "wisdom teeth," as noted above), break through the gums from one and a half to three years of age, and yield to permanent teeth at 12 and 13 years. See Teething.

Care of the Teeth. Do not crack nuts with them, or use them for any other purpose requiring equal violence. Do not let them come in contact with very hot drinks, especially on the first draught, at any one time. Even cold fluid, coming in contact with the teeth directly after they are heated up with hot drinks, is likewise deleterious. Do not undergo a mercurial salivation or chew the substance of matches, which contain phosphorus. Use the tooth-brush, with clear water, after every meal, and in the morning on rising. Undoubtedly the best dentifrice or tooth powder is pulverized charcoal. It whitens them, purifies them from unpleasant odors, and will also purify the breath. If you choose, a little common salt may be added to the charcoal. If the teeth are thoroughly cleansed two or three times a week with pulverized charcoal, and washed with water as above indicated, they will be white, pure and will not decay with ordinary usage until far advanced in life. Have a dentist examine them every few months, to remove any tartar that may be collecting on them and to fill cavities, if any can be discovered. Never use metallic tooth-picks.

One of the greatest enemies to human teeth is the concretion denominated tartar, which forms upon them like a crust, and would encase them wholly were there no impediment. Of the nature of this tartar and how it is formed a great deal has been written; but the whole that has been advanced and

urged, sometimes very authoritatively and with great dogmatism, only goes to prove that the writers knew nothing of the matter. All, however, that we really know on this is, that the substance termed tartar does actually exist on the teeth, to which, if not removed, it is very injurious, and that the rapidity of its formation frequently depends upon the state of the stomach. In some idiosyncrasies it is not formed at all; in others, only a little; in others, a great deal. Whenever it does appear, it should be removed; yet, even when there is idiosyncratic tendency to its accumulation, it will not have time to form if the teeth are properly attended to—a thing requiring more of the minuteness of attention than of actual trouble. If tartar be allowed to accumulate, which it almost always does in the permanent absence of tooth-brushes and tooth powder, it not only gradually loosens and destroys the teeth, but corrodes the gums, and reduces them to a state of disease frequently mistaken for scurvy, even by medical men; and at length it occasions the total destruction of the teeth, and a sad unsightliness of the gums, with no other remedy left but to encase the latter in an artificial socket bearing a set of artificial teeth.

Loose but Sound Teeth. Turkish myrrh diluted in water—at first a teaspoonful to a tumblerful of water, and gradually strengthened—and used as a wash four or five times a day, will generally give relief. There are only two causes for the above trouble, *viz:* calomel and soda, and the use of both must be stopped entirely.

For the Gums. Alum water will harden the gums and prevent loosening of the teeth.

A Dentifrice. An ounce of myrrh in fine powder, and a little powdered sage, mixed in two spoonfuls of honey, make an agreeable and delicate dentifrice.

Sozodont—A Dentifrice. Castile soap, five parts; glycerine, five parts; alcohol, thirty parts; water, twenty parts; oil of pepperment, oil of cloves, oil of cinnamon, and anise, a few drops.

Deschamp's Dentifrice for Removing the Yellow Color from Teeth. Take of dry hypochlorite of lime, ½ dram; red coral, 2 drams; triturate well and mix thoroughly. This powder is employed in the following manner: a new brush is slightly moistened, then dipped in the powder and applied to the teeth. According to Deschamp, a few days' use of this powder will produce a marked alteration in the appearance of the teeth, which will acquire a white color.

Cure for Toothache. Spirits of camphor, 10 drops; oil of cloves, 10 drops; chloroform, 15 drops; spirits of ether, 15 drops. Apply to the cavity, or rub the gum a little. The cure is immediate.

Magnetic Pain-Killer for Acute Pain and Toothache. This is one of the very best receipts for relieving acute pain and toothache: Laudanum, 1 dram; gum camphor, 4 drams; oil of cloves, ½ dram; oil of lavender, 1 dram; add these to 1 ounce alcohol, 6 drams sulphuric ether, and 5 fluid drams chloroform. Apply with lint; or, for toothache, rub on the gums, and upon the face against the tooth.

Chloral for Toothache. Dr. Page recommends chloral hydrate as a local application in cases of toothache. A few grains of the solid hydrate introduced into the cavity of the tooth upon the point of a quill speedily dissolves there; and in the course of a few minutes, during which a not unpleasant warm sensation is experienced, the pain is either deadened, or, more often, effectually allayed. A second or third application may be resorted to if necessary.

Infallible Cure for the Toothache. Pulverize and mix in equal quantities, alum and common salt; wet a small piece of cotton, and causing the mixture to adhere, place it in the hollow tooth. A sensation of coldness will be produced at first, which will gradually subside, and with it, the torment of the toothache.

Another: To 1 teaspoonful of creosote put half a teaspoonful of alcohol. Soak a bit of cotton well with this, and put it into the tooth. No harm will arise from the use of creosote, if care is taken not to swallow the spittle.

Another: Cotton wool, wet with paregoric or spirits of turpentine, and placed upon the tooth, will often give relief. Bathe the face with hot drops, and hold some in the mouth; if this does not succeed, soak the feet in warm water, and put a mustard poultice upon the back of the neck. Wrap up in clothes, and drink composition, until a copious sweat is produced.

Teeth of Horses: see pages 678 and 725; of cattle, page 207; of swine, pages 1218-19.

Teething, the first teeth of many children come through without any evil effects, but with others this process produces fever, diarrhœa, restlessness, eruptions of the skin and even sometimes convulsions or fits. Feeble and excitable constitutions are most liable to these disorders. While teething there is more or less disorder of the stomach and bowels with most children. Most children are loose: with some, however, the reverse is the case. A slight degree of looseness is perhaps not objectionable; but should they become too much so, which is liable in hot weather, they must be checked gradually. The time of teething, as a rule, runs from the fifth or the sixth month to the sixteenth month. Some children begin to cut their teeth as early as at the age of three months, while others do not begin till at the age of eight or ten months.

The treatment of the child during teething is simple. The bowels should be kept open, and if restless and gums painful give a little paregoric. The breast should be given to the child often, but not long at a time, so as to avoid over-loading the stomach. The child should have plenty of fresh air, exercise and a cool bath each day. It is very important the bowels of the child be kept free, which is easy to do without medicines, and infinitely better, namely, by not permitting it to eat anything made from fine or bolted

flour. If one, however, thinks this impracticable, and prefers medicine, castor oil, in doses from a teaspoonful to a tablespoonful, may be given every few days. Disguise the nauseous taste of the oil by a little brandy and cinnamon essence. The gums may also be rubbed with honey three or four times a day.

It is a great help and a remarkable relief to the child to cut or lance the gums. The relief children experience in the course of two or three hours from the operation is often very remarkable, as they almost immediately become lively and cheerful. If the gums be carefully looked at, the part where the tooth is pressing up is swollen and redder than usual; and if the finger be pressed on it the child shrinks and cries, showing that the gum is tender. When these symptoms occur, the gum should be lanced, and sometimes the tooth comes through the next day, if near the surface; but if not so far advanced the cut heals and a scar forms, which is thought by some objectionable, as rendering the passage of the tooth more difficult. This, however, is untrue, for the scar will give way much more easily than the uncut gum. If the tooth do not come through after two or three days, the lancing may be repeated; and this is more especially needed if the child be very fractious, and seems in much pain. Lancing the gums is further advantageous, because it empties the inflamed part of its blood, and so relieves the pain and inflammation.

Temperature, of the body: see Heat, page 828, in article Hygiene.

Tenant, a person who holds tenements or lands or both, during a limited period, on consideration of rendering stipulated services or paying a stipulated rent to the proprietor. See page 430.

Tendon, the contracted end of a muscle, which is a hard, tough cord, or bundle of fibers, communicating motion from the muscle to the bone.

Tendril, a coiling, wire-form shoot of a vine that winds around another body for the purpose of support. It commonly grows straight and outstretched until its apex hooks around it to secure a hold; then the whole tendril shortens itself by coiling up spirally and so draws the shoot of the growing plant nearer to the supporting object. Tendrils usually coil around twigs; but those of the Virginia creeper, for example, have their tips expanded into a flat disk or foot, which adhere to objects by a deposit of glue, as the rootlets of the ivy do by their tips. Tendrils are, also, generally forms of branches, but sometimes they are forms of leaves, as in the pea. Their nature in each case is to be learned from their position.

Tenement, house, or other buildings which are permanent. Blackstone says of this word that "although in its vulgar acceptation it is only applied to houses and other buildings, yet in its original, proper and legal sense, it signifies everything that may be holden, provided it be of a permanent nature, whether it be of a substantial and sensible, or of an unsubstantial, ideal kind."

Tenesmus (te-nez´mus), frequent, vain and painful desires to evacuate the bowels, as in dysentery. Being a symptom of inflammation of the lining membrane of the digestive tube, the treatment consists in curing the primary trouble; and this in great part consists of copious warm-water injections.

Tenon (tenon), the end of a piece, generally of timber, which enters a mortise.

Terminal (ter-min-al), in plants, the central branch of the main stem, or central branchlet of a branch, etc., as distinguished from all the other branches, called "laterals" (side-branches).

Terrier, a variety of dog: see page 338.

Tetanus, a disease which consists in the permanent contraction of some or all of the muscles, without alternations of relaxation. It includes the form called lockjaw; and in every case the patient cannot swallow, and the trunk is immovably rigid and curved. It is generally brought on by painful wounds, as running a rusty nail into the foot. The treatment consists of a full hot bath, opium, a teaspoonful of whisky every two or three hours, chloroform, etc. Not all of these will be needed in most cases. See Lockjaw, page 946.

TETANUS, of the horse: see page 789.

Tethering, the confining of a grazing animal to small and precise limits of pasturage by means of a rope or light chain fastened to a pin driven in the ground. See page 302.

Tetter, a skin disease. See Salt Rheum, page 1112.

Texas Fever. The so-called Texas fever is an enzootic disorder peculiar to the ox tribe, incapable of being communicated by simple contact of sick with healthy animals, but is engendered wherever Northern cattle have grazed on pastures previously, or simultaneously occupied by herds from Texas, Florida, Arkansas, and the Indian Territory. The disease is not transmissible between Northern cattle, and a few nipping frosts check its ravages everywhere. It is a disease in which all the internal organs are more or less affected, but especially is this the case with the spleen, which often attains an enormous size. The disease occurs in two forms, in which four stages are readily recognizable, viz: the incubation, the stage of invasion, the congestive stage, and the terminative stage. The infection is of a permanent nature. Splenic apoplexy is an anthrax disease of a contagious nature, which Texas or splenic fever is not. For the treatment of this disease see page 238.

Textile Fabrics, cloths, woven material, generally for garments. The general classes of material are vegetable fiber, as cotton, linen, ramie, jute, hemp etc.; wool and hair, as sheep's wool, camel's hair, and the hair of many other animals; and silk.

Thatch, to make a roof or wall by binding together straw, dried grass, or other like material in a regular

manner. Rye straw, threshed with a flail and kept straight, with the short and broken straws raked out, is the best material; but good wheat or oat straw will make a safe roof. The roof is made ready for thatching by nailing strips of board, say 1 x 2 inches, across the rafters, putting them a foot apart. The pitch should be steep to insure a water-proof and durable roof. The straw should be cut to a uniform length. For greater convenience in handling, tie the straw in bundles that will average about six inches in thick ness. There are different ways of fastening; some use twine, but it is preferable to use wire or the straw itself to fasten the bundles on. Take a few straws from the side of each bundle after it is laid on the cross strips, and passing them over the next one laid and under the strip, and over again, then adding more straw from the bundle just tied. In this way a continuous rope is made until the end of the course is reached. The courses should overlap so as to make the roof the thickness of three bundles, or about eighteen inches; and if the pitch is one-third, the material good and well laid, it should be a warm and serviceable roof for 20 years.

Theory, literally, a *view* of some scheme, plan or doctrine; and this idea, indeed, is the essential feature in all the applications of the word. While this term is properly used in most instances, we introduce the topic here mainly to observe that it is too often used for the purpose of sneering. Concerning one who has made a wise suggestion, but is not understood, it is often said that he is "too theoretical," that he is "more theoretical than practical," etc. Everything that becomes practical was at first a "theory," and all the thoughts and plans one has are "theories" until they are executed, and even then they are always "theory and execution" together.

Thick Wind, of horse: see page 725.

Thill, one of the shafts of a carriage between which the horse is put: sometimes corrupted to "fill."

Thistle, a large group of herbaceous plants, comprising many of the most troublesome weeds of agriculture. They are also an exceedingly destructive class of weeds, and demand constant attention, not only of individual farmers but of whole communities, for keeping them down and exterminating them. The greatest pest, however, of this class of weeds is the Canada thistle. To distinguish this from the common thistle, observe that its heads are hard and small, being about the size of a marble, and that the leaves have narrower and more scattering lobes and appear much more ragged and straggling. The best methods of extirpation are the following: when a patch of them have about come into flower, plow them under; go over the ground with a hoe or spade and dispatch those which have escaped the plow, and keep up this process until the middle of autumn; the next year the piece may be sown to wheat and again watched for new plants. If, however, the patch be small, the plants at any time before seeding may be cut off at the surface of the ground with a hoe or spade, and a teaspoonful of dilute sulphuric acid dropped upon each root. Sometimes merely mowing off with a scythe when in early flower is sufficient for the extirpation of this troublesome pest. The mowing should be repeated two or three times. The method and amount of work required are dependent upon the condition of the ground. On newly cleared grounds they can be often kept down by seeding thickly to grass, and mowing the crop when both the thistles and the grass are in bloom. Digging holes into the mass of roots and leaving a pint or more of salt to each one, is also a sure method of killing this weed. Cropping to clover or grass is another good plan. But State legislation is necessary in this work, as it is almost useless for scattering farmers to fight this enemy, unless all unite, as the downy seed of this thistle is blown about so easily by the winds. Mowed thistles wilted are greedily eaten by live stock.

Canada Thistle.

The above cut shows only a branch of the Canada thistle: otherwise the flower heads would appear disproportionately large.

Thoracic (tho-ras′ik), pertaining to the thorax: see next paragraph. The "thoracic duct" is a tube ascending near the spinal column through the abdominal cavity and chest, to convey the "chyle," or nutriment drawn from the food by the lacteals along the alimentary canal, up near the neck on the left side, where it empties into the subclavian vein.

Thorax (tho′rax), the chest. This is the cavity of the breast, containing the heart and lungs with their attachments, and is separated from the abdomen below by the diaphragm. The thorax of an insect is the second or middle division of the body, to which the wings and legs are attached.

Thorn, as the name of a tree, is a term comprising several species of *Cratægus*, as the English hawthorn, the Evergreen thorn, the so-called "red haws," besides several ornamental varieties in cultivation. Some of these trees, however, are apparently thornless, as their "thorns" are only rudimentary.

Thornapple, one name of the familiar jimson-weed.

Thoroughbred, bred to a high point for a specific purpose, as horses for speed, and cattle for various purposes. For one of the latter to be technically "thoroughbred," it must be full-blooded, or bred from the best blood, and recorded in the Herd Book. The breeding of horses for speed has been carried on longer and more strictly than in any other line, so that the result is now a distinct breed known as "Thoroughbred," which is fully treated on pages 682 and 694.

Thoroughpin, an affection of the hock-joint of the horse: see page 811.

Threshing, the separation of grain from the husks or straw by a beating process. We need not enter into an extended history of this process. It is well known that the most ancient custom of threshing was the tramping out of the grain by cattle. This was superseded by the flail, which is the only arrangement used at present in many countries. All of these old-time customs of performing this operation has been practically superseded in our own country by the thresher, and even by the steam thresher. The flail is used only where it is desirous to save the straw of full length and unbroken.

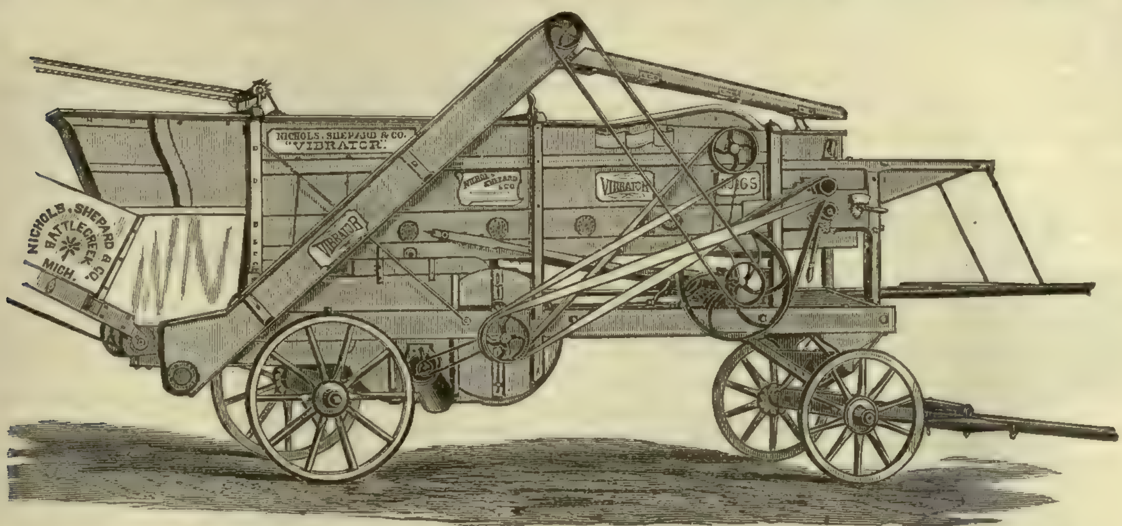


Fig. 1.—*Vibrator Threshing-Machine.*

The steam threshing-machine of to-day is probably the perfection of rapid, clean and cheap threshing. Many of the separators propelled by steam will thresh out 1,000 bushels of wheat per day and even more in good grain, while the practical limits of those run by horse-power are less than half that amount. Many devices have been patented for threshing by means of power machines, among them beaters and rotating. The spiked cylinder is, however, in most general use, being faster than any other known device.

The time of threshing often depends on the time when you can secure the services of the machine, unless you have one of your own. Within a few days after the wheat is stacked, it may be threshed, much depending upon its condition when stacked. The early threshing of wheat after it is harvested is not always a wise economy. The sweating of wheat, however, is best done in the mow or stack, and when in this stage should never be disturbed; but in the haste of both threshers and farmers the grain is often threshed when the straw is very damp, and unless great care is taken to hold the bundles on the cylinder, much waste is apparent; and it is to be doubted if as good flour can be obtained from this wheat as could have been obtained by later threshing. Farmers should insist upon experienced men attending to machines, rather than novices, who only know that the wheat is to be run through the machine. A tyro at the business will often allow many bushels of grain to be carried over into the stack unthreshed.

Many farmers cannot buy a "thresher" themselves, but should be enabled to determine the kind of a machine that is most profitable to them in the threshing of their grain. The main requisite of a good thresher consists in its ability to thoroughly separate the grain from the straw, chaff, etc. With the farmer who hires his grain threshed, speed is another good point which, in the selection, must not be lost sight of.

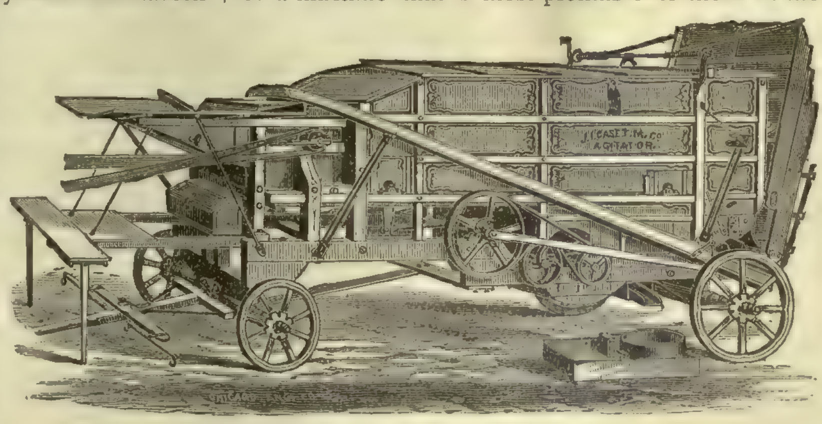


Fig. 2.—*Short-Apron Threshing-Machine.*

Some of the varied improvements made within the last dozen years in this very important and expensive machine are quite remarkable. There are several companies in the United States that manufacture good threshers,—machines that do their work thoroughly and well. We wish to illustrate some of the leading features of the thresher.

Fig 1 represents a thresher adapted to the threshing, not only of wheat, but also oats, barley, flax, timothy, millet, Hungarian, orchard grass, clover, etc.

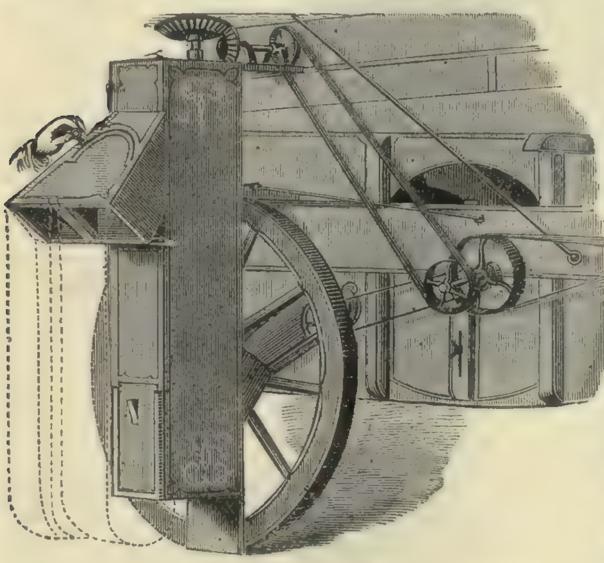


FIG. 3.—*Improved Bag-Holder.*

It is very simple in its construction and noted for its light running. The manufacturers are Nichols, Shepard & Co., Battle Creek, Michigan. It can be run by either steam or horse power.

Fig. 2 is a representation of the "Apron" thresher, manufactured by J. I. Case & Co., Racine, Wis. It can be used for all kinds of grain, is simple in construction and easy-running. It is an improvement over the old "Short-Apron," in the shortening of the apron, lengthening and widening of the straw rake, doing away with the cross apron belt on the right-hand side, and substituting gearing, driving the beater and fan with one belt, and lowering the machine four inches. It is run either by steam or horse power.

Accompanying Nichols, Shepard & Co's machine is an improved bag-holder, illustrated by Fig. 3. It is useless to attempt to enumerate the various merits claimed for one make of these machines over others. Among the leading manufacturers of threshers and separators throughout the United States, are Nichols, Shepard & Co., Battle Creek, Mich.; the Pitts Agricultural Works, Buffalo, N. Y.; Minard Harder, Cobleskill, N. Y.; Russell & Co, Massillon, Ohio; A. W. Gray & Sons, Middletown Springs, Vermont; the Silver & Deming Company, Salem, Ohio; the Wheeler & Melick Company, Albany, N. Y.; C. Aultman & Co., Canton, Ohio; E. M. Birdsell & Co., South Bend, Ind.; J. O. Spencer, Union Springs, N. Y.; M. Williams & Co, St. Johnsville, N. Y.; B. Gill & Sons, Trenton, N. Y.; A. B. Farquhar, York, Pa.; G. Westinghouse & Co., Schenectady, N. Y.; and Joseph Hall Works, Rochester, N. Y.

Thrips, a species of small, spotted fly infesting certain plants, especially the grape-vine. See page 590.

Throat, Sore. See Sore Throat, page 1161.

Throwing, or **Casting,** a horse, is the operation of throwing him down upon the ground, generally in a confined place, and so fastening him that he cannot stir. This is for the purpose of performing surgical operations.

Thrush, the name of several species of song-bird, the most familiar examples of which are the following:

1. ROBIN. See page 1102.
2. WOOD THRUSH. This is confessedly the sweetest feathered songster that America affords, being fully equal to the nightingale of Europe, and in the estimation of many even superior. It is found throughout the United States east of the Missouri river, and as far south as Guatemala, in Central America. It builds its nest in low bushes, of leaves, grass and mud, lined with fibrous roots, where it lays four or five light blue eggs.
3. HERMIT THRUSH. This bird, whose song rivals that of the Wood thrush, is somewhat smaller, and ranges throughout the States east of the Mississippi river. Prevailing color, a light olive-brown. It has a whitish ring around the eyes, and sharply defined subtriangular spots of dark olive-brown on the breast.
4. WILSON'S THRUSH is found throughout the States east of the Missouri river. Prevailing color, brown: differs but little in its appearance from the preceding.

Besides the above, there are found in the same region, but of less note, the Olive-backed, the Gray-cheeked, the Varied, etc., of the true thrush genus; and several so-called thrushes of kindred genera.

Thrush is also the name of a disease, consisting of white pimples in the mouth and throughout the alimentary canal; common among infants.

Thrush is also the name of a diseased condition of the sensible frog of the horse's foot: see page 812; and a disease of the mouth of cattle: see page 238.

Thumb-Screw, an adjusting screw, either with a milled head or with a head flattened vertically, to be turned with the thumb and fingers.

Thyme (time), a sweet-aromatic herb of the mint family, of which there are two species, sometimes, but rarely, cultivated for flavoring culinary preparations, use in liniments, etc. Though strictly a perennial, it becomes stunted after three or four years, and requires, at comparatively short intervals, to be reproduced. A light, dry, and rather poor soil is most conducive to its best condition; and a rich or moist soil renders it luxuriant, but occasions it to be deficient in fragrance

and greatly tends to make it perish in winter. The situation can not be too open. The plant may be propagated either from top-slips or parted roots in spring, planted 6 or 12 inches apart, or from seed sown in April, broadcast or in drills; and the plantlets, from seed, may be either transplanted in summer or allowed to remain in the drills, and those transplanted must be occasionally watered till they become established. In autumn, decayed stems and branches should be cleared away and a little fresh soil scattered among the old plants. Young plantlets of thyme may be planted close along the margin of a border to serve as an edging.

Medicinally, the oil of thyme is considered the most important. It is "reputed" to be "resolvent, tonic and stomachic."

Tick, a little insect, of a livid color and globose form, that infests sheep, dogs, goats, cows and other animals. It is many times larger than a louse, and of a different color, but not of so frequent occurrence. It varies in size from a pin's head to a small bean, but is commonly about as big as a pea; and when not gorged with blood it is flat, but when bloated, is round and of a brown or black color. It has six legs, and runs with much speed. It attaches itself to the skin by means of sharp claws at the extremity of the legs, and pierces the skin by means of sharp instruments in the head. When once it fastens on a spot, it seems to remain quite fixed for several weeks or even months; and it becomes surrounded with numerous young ones, who appear at first like red points, but afterward acquire a brown color as they grow. It propagates rapidly, and is often found in great numbers on a single sheep, and commonly prefers the animal's neck and shoulders to other parts. To destroy ticks, see respective articles on the animals.

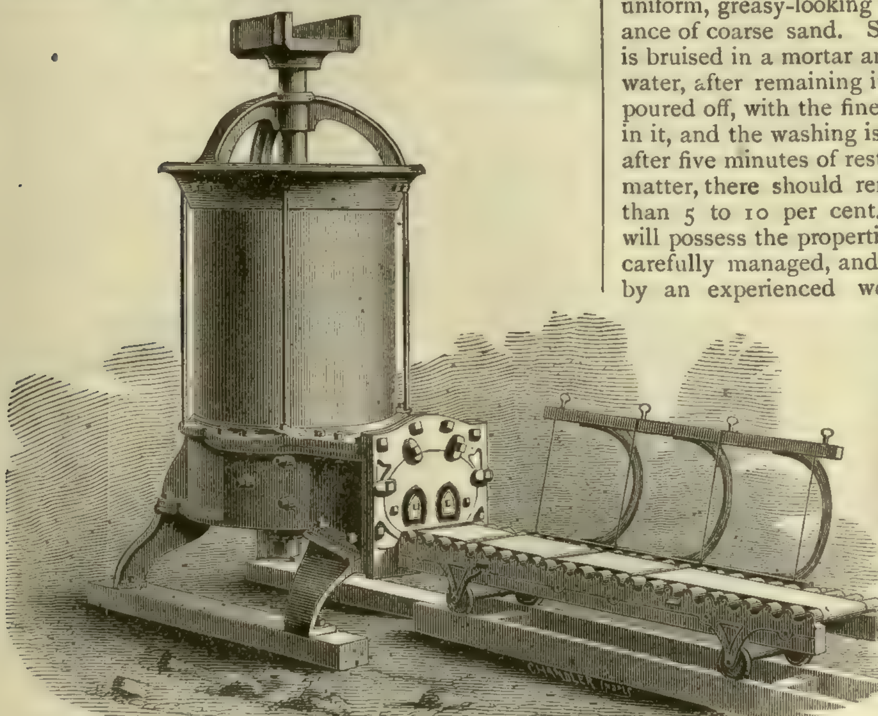


Fig. 1.—*Eureka Drain-Tile Machine.*

Tied. A horse's elbows are said to be "tied" when they set too close to the ribs.

Tile. While this term originally denoted only baked plates of clay for roofing, flooring, etc., it now includes very prominently drainage pipe, made of burnt clay; and in addition to what is said in the article on Drainage, some remarks are called for here on the subject of tiling in particular, and of tile machines, etc.

In the first place, with respect to the mechanical composition of a good tile clay, it should be free from stones, and when cut with a knife should present a uniform, greasy-looking surface, free from the appearance of coarse sand. Secondly, when a portion of it is bruised in a mortar and mixed with water, and the water, after remaining in the mortar five minutes, is poured off, with the finely divided matters suspended in it, and the washing is repeated so long as the water, after five minutes of rest, carries away any suspended matter, there should remain in the mortar not more than 5 to 10 per cent. of sand. A strong tile-clay will possess the properties just mentioned, and when carefully managed, and molded in the tile machine by an experienced workman, will be found well adapted to the manufacture of thin, light tiles and pipes. Such clays, however, require careful "handling," and, from drying imperfectly in the sheds, frequently crack in the kilns; they are also exceedingly difficult to burn, requiring a strong heat. Pure pipe clay and porcelain clay are the most infusible of all forms of clay and consist merely of two substances, silica, or the earth of flints, and alumina. The ordnary clays, however, used in making bricks and tiles, contain, as already stated, in addition to the two substances mentioned, other matters, which greatly modify these characters, and especially their fusibility. These substances, which act as fluxes, are oxide of iron, lime, magnesia, and the alkalies potash and soda.

When the silica present is not in a state of very minute division, when it forms coarse gravel, it interferes with the plastic qualities of the clay. On the other hand, when a very large proportion of alumina is present, the clay is indeed exceedingly tenacious, but at the same time, when molded into tiles, dries

with great difficulty, and frequently retains so much water when placed in the kiln that the result is, when it is fired, great numbers of the tiles are cracked. The most rapidly drying clays are those which upon washing with water are found to yield some finely-divided sand; and the obvious method of improving the quality of those clays which crack in the kiln, is to add to them a proper amount of fine sand. In the manufacture of bricks and heavy pipes of clay, this is especially necessary.

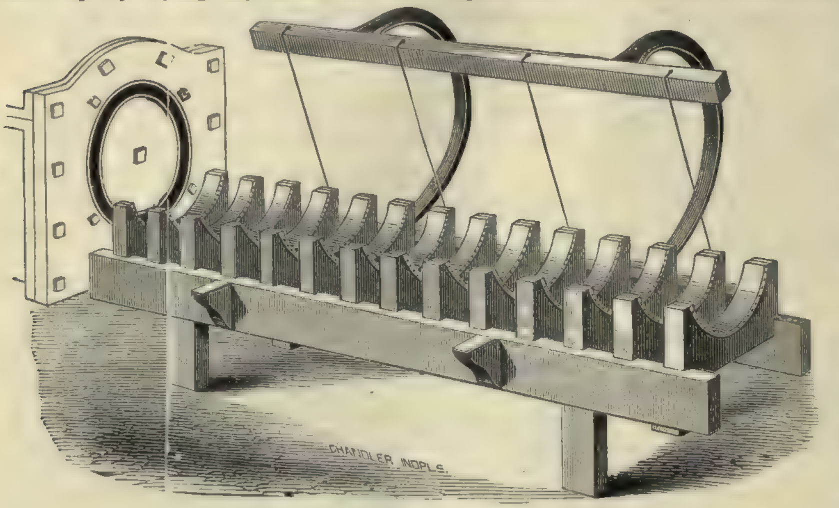


FIG. 1.—*Cut-off to Tile Machine.*

Clays which contain a considerable amount of any of the substances which act as fluxes (lime, etc.), when too strongly heated, melt and run, and therefore require that a comparatively low temperature should be applied. The infusibility of such clays may be increased by the addition of more infusible clays, or fine silicious sand. Frequently the lime is found forming nodules in the beds of clay, and may then be separated by mechanical means, as by screening the clay. In such cases, the clay should not be puddled previous to screening, as by such means the crushed lime would be diffused through the mass. Very pure clays are to be preferred for the manufacture of thin pipes and delicate earthenware articles, but at the same time they require a greater temperature to be applied in the kiln, and thus increase the cost. In such cases, it has been found useful to add some fine ground lime or chalk to the clay in the pug mill, which increases its fusibility and also gives the article a finer surface.

Tiling, or stone pipe, is the best material in the world for walling wells, and is much used in bored wells. Such tubing keeps out perfectly all surface water and all worms and insects. With the ordinary brick or stone wall these things constantly drop in; and rotting insects, worms, toads, etc., are no more welcome in our wells than in our water-pails or in our drinking glasses at the table. By all means, therefore, tube your wells with brick or stone tiling, with the joints so cemented that not a particle of foreign matter or decaying substance can fall into the water, which you expect to drink, or use in cooking. Such wells never need cleaning; but if by some rare accident something should get into a tiled well that ought not to be there, it can be easily cleaned out without removing the tubing.

The illustrations in this article represent the Eureka drain tile machine, cut off and die for making brick, made by Chandler & Taylor, Indianapolis, Indiana. There are many machines of similar construction now in the market for making tile, but this is regarded as one of the best. Fig. 3. represents a hand machine made by R. R. Foote &Co., Chicago.

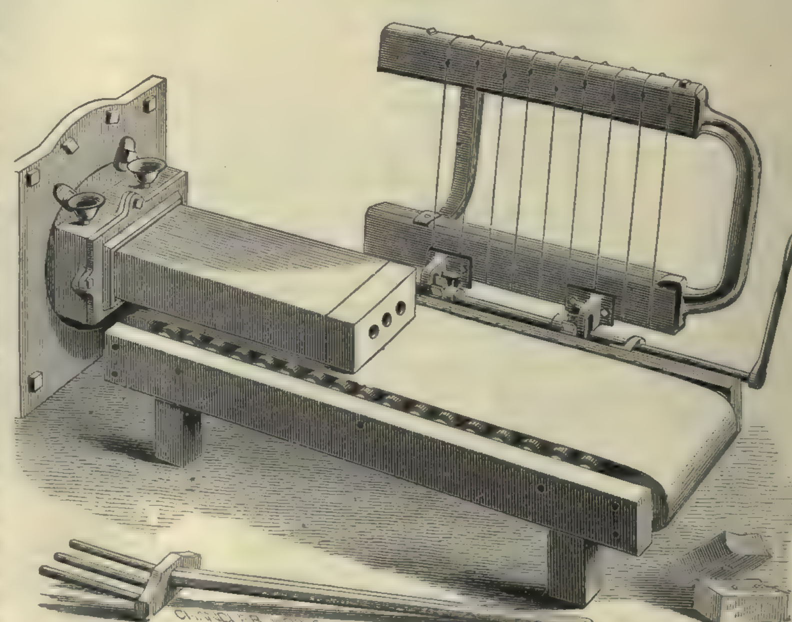


FIG. 2.—*Die for Making Brick.*

NECESSARY SIZE OF TILE. From Allen's "American Agriculture" we obtain the following: "An acre of land in a wet time contains about 1,000 spare hogs-

heads of water. An underdrain will carry off the water from a strip of land about two rods wide, and one 80 rods long will drain an acre. The following table will show the size of the tile required to drain

FIG. 4.—*Tile Machine.*

an acre in two days' time (the longest admissible) at different rates of descent, or the size for any larger area:

Diameter of Bore in Inches.	Rate of Descent.	Velocity of Current per Second in Inches.	Hogsheads Discharged in 24 hours.
2	1 ft. in 100	22	400
2	1 " " 50	32	560
2	1 " " 20	51	900
2	1 " " 10	73	1,290
3	1 " " 100	27	1,170
3	1 " " 50	38	1,640
3	1 " " 20	67	3,100
3	1 " " 10	84	3,600
4	1 " " 100	32	2,500
4	1 " " 50	45	3,500
4	1 " " 20	72	5,600
4	1 " " 10	100	7,800

The above table is calculated for smooth tile, well laid.

Tillage, breaking up, turning over, stirring, pulverizing, and otherwise working the soil, preparatory to the raising of crops from seeds,offsets, or other germs. The principal operations of it are plowing, grubbing, harrowing, rolling and hoeing; and a very complete, close series of them occurs in summer-fallowing. See the articles Plowing, Plow, Harrow, etc.

Timber, in the sense of a forest, see article Forestry; for measuring, see Lumber; for value in fuel, see Fuel. In the sense of the material, or wood, we will give the most important imformation here.

STRENGTH OF WOOD, PULLED LENGTHWISE,

Each rod being one-fourth of an inch square.

	Pounds.
Ash, toughest, broke with	1,000
Locust,	1,280
Elm,	837
Pitch Pine,	750
Beech and White Oak,	718
Cedar,	712
Maple and Chestnut,	656
White Pine,	550
Walnut,	487
Poplar,	437

Broken sidewise, one inch square, one foot long.

	Pounds.
Hickory,	270
White Oak, seasoned,	240
Ash,	175
Chestnut,	170
Yellow Pine,	150
White Pine,	135

A support (in pillar form) an inch square will bear the following weights before being crushed: Oak, about 4 tons; pine, nearly 2 tons; elm, over 1 ton; best cast iron, 57 to 58 tons; cast copper, 58 tons; fine brass, 81 tons; hard brick, 1 ton.

GREEN AND DRY WOOD. Fresh green wood loses about a third of its weight in seasoning, equal to 156 gallons in every cord. The burning of one cord of green wood absorbs as much heat in evaporating this water as would be sufficient to heat 780 gallons from freezing to boiling. Seven cords of dry, hard wood have as much heating power as eight of green. The farmer who draws 50 cords of green wood on his wagon, draws over 20 tons more of water than in dry wood.

PRESERVING TIMBER. As a general rule it is preferable to soak with petroleum wooden structures above ground, and apply hot gas tar to wood which goes below the surface. The petroleum soaks well into the pores, and gives the wood the character of cedar; but long continued contact with the moisture of the soil tends to abstract or dissipate a part. Gas tar cautiously heated and applied to wood (the best way is to immerse the wood in a kettle of tar) remains mostly at the surface and forms an impervious coating. The most perfect preparation, doubtless, would be to get all the petroleum into the pores of the wood first, and then coat with the tar.

Charring is a common and cheap plan of rendering the surface of wood imperishable.

Wood may be preserved many years by the various processes of poisoning,—with arsenic, corrosive sublimate, nitric or sulphuric acid, etc.,—processes called "kyanizing," "foremanizing," etc., after their inventors, Kyan, Foreman, etc. These methods are effectual, but are somewhat expensive and dangerous. Such poisons are inserted in deep auger-holes, one to each post, for example, when green, and from a teaspoonful to a tablespoonful, according to the nature of the poison. The substance oozes throughout the wood, as it were saturating it so that no germs of decay can live in it. See page 451.

Time. The method by which our years and days are computed is called "Gregorian," after Pope Gregory XIII, who in 1582 made a change of 10 days,

decreeing that Oct. 5, that year, should be considered the 15th, in order to inaugurate a more correct system than had been in vogue since the days of Julius Cæsar (B. C. 45), called "Julian" time. The Gregorian method is the "New Style," while the "Old Style," or Julian, is still followed in Russia. Down to the present century, dates were often given even in our own language, thus: "Jan. 15, O. S.," equal to "Jan. 27, N. S.," if during the 18th century, 12 days having then to be added. By the old style nearly three days were lost every 400 years, whereas the present or Gregorian calendar will be practically correct for 2,500 years to come. It allows of no intercalary day (leap year) for the years ending in even hundreds, excepting the 4th (or 400th). All the other years divisible by four without a remainder are leap years, when February is given 29 days. Leap year is also called "bissextile" (twice sixth), from the old Latin custom of putting in the intercalary (or "extra") day twice as the sixth before the calends (first) of March,—that is, while Feb. 24 of common years was the sixth before the first of March, in leap years the 25th was also called the sixth before the first of March.

Questions often arise concerning the recurrence of certain days,—for example, when will the 4th of July come on Sunday again? When will five Sundays come again in February? What day of the week was Sept. 27, 1864? etc. Most such queries can be answered by calculating from the fact that 28 years completes a cycle of all these things,—the number 28 being the product of 4 (years to each leap year) by 7 (days in the week). Some of these phenomena recur seven times within the 28 years, some four times and some once. Abbreviated revolving calendar cards have been invented, of easy operation, by which any of these questions can be answered in a moment, without any calculation.

TIME OF DAY. A good almanac will give the variation of the sun from true clock time for each day in the year. The sun is on the meridian (shadow at noon-mark) at 12 o'clock on only four days in the year: all other days it varies from it, to all points with 16¼ minutes. See Sun-Dial. Sun time is sometimes called "apparent" time, and clock time is often called "mean" time. To find the true time, first ascertain the true meridian by fixing up two points of sight with the north star, notice the variation of the sun from true clock time by the almanac, and set your time-piece by the noon-mark. In these days of railroads, however, when most people are governed by them, "railroad time" is found the most serviceable.

TIME BARGAIN, an agreement to buy or sell goods at some definite time in the future at a fixed price.

TIME, LEGAL, to which certain actions at law are limited. See Limitations, page 944.

Timothy, or **Herd's Grass**. See page 598.

Tin, a silver-white metal, extensively used in coating thin sheet-iron, which also is then called "tin." The metal tin, when pure, is very malleable, is harder than lead, is about 7⅓ times heavier than water, and melts at 442° Fahr. The poisonous matter and bad taste which get into water and other liquids standing in tin vessels come from the solder of the seams and joints, or from impurities in the tin, and not from the pure tin itself. This fact gives a hint to every housekeeper, who, if inclined to be decent and have a due regard to the health of all concerned, will know what to do. Fruit and all other edible articles sold in tin cans at the groceries are apt to be more or less poisonous.

TO MEND TINWARE. Take a sharp knife and scrape the tin around the leak until it is bright, so that the solder will stick. Then sprinkle on a little powdered resin (they have liquid solder to sell, but resin will do as well); lay your solder on the hole and with your soldering-iron melt it on. Do not have the iron too hot or the solder will not adhere to that. After two or three trials you will succeed very satisfactorily. See Solder.

TO TIN OVER RUSTY SPOTS on tinware, take a quantity of muriatic acid and dissolve all the zinc in it that it will cut; then dilute it with one-fourth soft water and it is ready for use.

TIN CANS. A good use to be made of old tin cans is to make flower-pots of them in the house and bird's-nests of them out of doors.

Tincture, a spirituous solution of a vegetable, animal or saline substance. Sometimes, however, but rarely, we have aqueous and ethereal tinctures. Nearly all tinctures are alcoholic extracts from some vegetable substance, made for medicinal purposes. In the progress of medicinal practice, more tinctures and less of the crude material are given in treatment at the present day than formerly. In making a tincture, the ingredient, which should be kept separate from all other substances, should be reduced to a coarse powder and placed with proof spirits in a closed vessel, and kept at a temperature of about 80°, and frequently shaken. From seven days to several weeks will be required. Home-made tinctures, if the work is carefully conducted, are more reliable than those of the drug-stores.

Tine, the tooth or prong of a fork.

Tire, the iron band which binds together the fellies of a wheel. See page 190 and article Wagon.

Tissue (tish'u), the texture or grouping of anatomical elements of which any part of the body is composed. Thus we have muscular, nervous, bone, etc., tissues; and in botany we have woody, cellular, etc., tissues. The study of tissue structure has been carried to a great extent for some years past, so that it has a distinct scientific name,—"histology;" and many changes in medical science have correspondingly been made.

Toad. It inhabits darkly or deeply shaded places in summer, and lies dormant in an excavated hole

during winter. It couples in the water in March and April. The female produces innumerable small eggs, united by a transparent gelatinous substance in two strings, which are often 20 or 30 feet long; and the male assists with his hind feet in extracting these eggs. The common toad feeds on flies, ants and other insects, and therefore does good and no harm in gardens. The several species have different notes or sounds in spring. It is preyed upon by buzzards, owls, snakes, and some other animals. It begins to breed at four years of age, and commonly lives upwards of 15 years, but has been known, in some curious instances, to attain a remarkable longevity.

Toad-Flax, called also "Butter and-Eggs" and "Ramsted," is a slowly spreading but persistent weed. When rare, and cultivated only in gardens, its flower was considered interesting; but, like the dandelion, it has become too common to be longer interesting. The flowers are in part of the color of butter and in part of the yolk of eggs; hence one of its names. It spreads by its creeping roots, which are eradicated with difficulty.

Toadstool, vegetable growths upon other decaying vegetable matter. They are of the nature of fungus, the latter term being the scientific name for all plants in this branch of the vegetable kingdom, from the largest size down to the microscopic. The species of microscopic fungi are very numerous. The larger forms, with which we are more familiar, are of no practical consequence. The edible forms are called Mushrooms, which see, page 983.

Toast, bread cut into slices and browned, and generally buttered and served with other delicacies.

MOCK CREAM-TOAST. Melt in 1 quart of morning's milk, about 2 ounces of butter, a large teaspoonful of flour, freed from lumps, and the yolks of 3 eggs beaten light; beat these ingredients together several minutes; strain the cream through a fine hair sieve, and when wanted heat it slowly, beaten constantly with a brisk movement; it must not boil or it will curdle and lose the appearance of cream; when hot, dip the toast; if not sufficiently seasoned with butter, add salt; send to the table hot, in a gravy bowl, the cream which is not taken up by the toast.

GERMAN TOAST. Cut thick slices of bread,—bakers' is the best; dip them each side in milk enough to soften, then dip in beaten egg; put in a pan greased with just sufficient butter to fry; fry till brown as an omelet, then serve, well sprinkled with white sugar. Two eggs would be sufficient to dip nearly a dozen slices of bread. Like pancakes, the hotter the toast the better.

MILK TOAST. One quart of milk; when it comes to a boil thicken with 1 teaspoonful corn starch; add salt. Toast the bread a light brown; butter each slice, put layers of toast in a covered dish, and pour on the thickened milk, then more toast and milk, and so on till the dish is full; cover, let stand five minutes, and serve.

Tobacco. As this plant can be raised with profit, in nearly all sections of the Union, we give here its method of culture.

CULTIVATION. The seed is first sowed in beds, in late winter or early spring, at the rate of a tablespoonful to every two square rods. The seeds are so minute that sowing evenly is scarcely attainable without first mixing it with three or four times its bulk of sand, ashes or fine mold. The bed should be either of newly cleared land or of soil on which has been burned a heavy coating of brush. It should then be kept entirely clear of weeds for six or eight weeks, when they will be ready to transplant to the field.

In the preparation of the ground in the field, quite as much judgment and care must be exercised as in the preparation of the seed bed. Thorough preparation of the soil will tell on the future crop just as certainly as carelessness will result in failure. It is important, therefore, to start right and keep right to the end of the season. The tobacco plant is very exacting in the matter of soils, and will be content with none but the best. He who cannot supply this want might as well not undertake the cultivation of the crop. Under proper treatment and favorable conditions tobacco will do well on many soils; but the best tobacco is, with very few exceptions, grown on limestone land. There seems to be something especially conducive in this geological formation to the production of choice cigar tobacco. A warm, friable soil, such as is commonly known among farmers as a sandy loam, resting upon a limestone foundation, is much the best tobacco land.

The plants should be set below the general level of the row, as by future hoeing the higher portions should be cut down to a level. All other cultivation should be the same as that for corn or other hoed crops, thorough and frequent. No weeds dare be allowed at any time. In an average season the plant will mature sufficiently by the early part of August to dispense with further cultivation of the ground, as the plants shading it will check the growth of weeds.

Whenever the plant develops from 14 to 16 leaves, break off the top: don't cut it off. This arrests the further production of leaves, but will promote the growth of suckers, which will have to be removed after attaining a length of three or four inches, as often as they appear.

It may be well to refer here to two formidable enemies of the plant, *viz:* the black cut-worm and the green tobacco worm. The former will attack the roots of the plant as soon as it is put into the ground. The depredations of this worm sometimes necessitate frequent re-planting. They must be hunted and destroyed until they disappear, which they will do as the season advances. The last named generally appears about July 1, and feeds on the leaf until the crop is secured in the sheds. In fact, they frequently, if not picked off clean, cling to the leaves after the stalk is hung up. About these there is but one advice to give: pick them off and destroy them, going over the field for this purpose daily, as the ravages of

the green worm do more to injure the quality, perhaps, than any other thing. See pages 885-6.

Usually, from two to three weeks from the time of topping, the plant will mature and be ready to cut. Uniform size of leaves and a stiffness of the leaf, making it liable to break by bending and handling, are the surest signs of maturity.

Cut after the dew is off, but not during the middle of the day, when the sun is bright, as you must guard against burning while it is undergoing the wilting process, preparatory to spearing and handling in the removal to the shed.

When sufficiently wilted, the plan most in practice is spearing or stringing upon laths four feet long, five or six plants to the lath, and then, removing the same into sheds, hang up for curing. The distance between the lath, general arrangement of shed and management thereof, as to ventilation, admission of light, etc., must be attended to. Air and light, having a great influence on the curing and fixing of color, must be used to the best advantage in catering to the tastes of the trade.

In removing plants to the shed after cutting, various devices are used. Sleds, wagons of various styles, or any way in which you succeed without breaking or bruising the leaf, is a good plan; and the quickest way, with these ends accomplished, is the best.

By the middle of December and after, whenever the plant is sufficiently pliable by moisture to strip or handle it without injury, you can strip it; assorting leaves is one of the prominent features in the stripping process. All solid leaves should be kept separate as wrappers, and these sorted into hands of ten or twelve leaves, each hand tied at the butt by a single leaf. All leaves in the same hand should be of uniform length. The hands should then be assorted with reference to length into two or three sizes. All defective leaves should be treated alike and put up separately, the respective qualities being bulked separately ready for market.

The yield per acre is generally from 1,500 to 2,500 pounds.

VARIETIES. The varieties of tobacco are numerous, not less than a dozen being cultivated in America. The most fragrant are produced in Cuba, and are almost exclusively used for cigars. They command several times the price of ordinary kinds. The leaves of New England tobacco, being thin and tough, are largely used as cigar wrappers. The tobacco of Virginia, Maryland, Kentucky and some adjoining States is peculiarly rich and high-flavored, and is most esteemed for chewing. Much of the peculiar flavor and value of tobacco depends on the soil and the preparation or sweating of the plant after drying. Highly manured land does not produce the best flavored tobacco.

EVILS OF THE USE OF TOBACCO. We wish to make some observations upon many of the evils, both direct and indirect, which arise from the use of this weed. We do this more as a preventive, to keep the young men from becoming addicted to its use, rather than to induce those who have the habit fastened upon them, to quit its use.

Tobacco is a native of the West Indies. Romanus Paine, who accompanied Columbus on his second voyage, seems to have been the first to introduce tobacco into Europe as an article of luxury. Paine is said to have lived a vagabond life, and died a miserable death.

The natives called it *Peterna.* The name tobacco is derived from the town of Tabaco, New Spain. The Latin name, *Nicotiana Tabacum*, is from Jean Nicot, who was a French ambassador from the court of Francis I. (born the year tobacco was introduced by Paine) to Portugal. On the return of Nicot, he brought and introduced to the French court the narcotic plant, and popularized it in France. Thence it was introduced all over Europe, but encountered great opposition. Sir Walter Raleigh introduced tobacco into England about 1582.

History informs us that a Persian king so strongly prohibited its use, and visited such severe penalties upon its votaries, that many of his subjects fled away to the caves, forests, and mountains, where they might worship this matchless deity free from persecution. The czar prohibited its use in Russia under penalty of death to smokers, mitigating snuff-takers' penalty to *merely slitting open their noses!*

In Constantinople a Turk found smoking was placed upon a donkey, facing the beast's rump, and, with a pipe-stem run through his nose, was rode about the public streets, a sad warning to all tobacco-smokers. King James thundered against it. The government of Switzerland sounded its voice against it till the Alps echoed again.

But in spite of opposition and the vileness of the article, it has worked itself into general use, next to that of table salt,—and to-day a majority of the adult male population of our Christianized and enlightened United States are its acknowledged votaries!

In reference to the use of tabacco the late Horace Greely made the following remark: "I do not say that every chewer or smoker is a blackguard; but show me a blackguard who is not a lover of tobacco, and I will show you two white blackbirds."

IT BEGETS LAZINESS AND NATIONAL RUIN. Upon this feature of the use of tobacco, Sir Benjamin Brodie, a distinguished physician of London, says: "A large proportion of habitual smokers are rendered lazy and listless, indisposed to bodily and incapable of much mental exertion. Others suffer from depression of the spirits, amounting to hypochondriasis, which smoking relieves for the time, though it aggravates the evil afterwards.

"What will be the result if this habit be continued by future generations?"

Tobacco is ruining our nation. Its tendency is to make the individual user idle, listless and imbecile. Individuals make up the nation. Those nations using the most tobacco are the most rapidly deteriorating.

Once the ships of Holland plowed the waters with a broom at the mast-head, emblematic of her power

to sweep the ocean. Behold her now! "Her people self-satisfied, content with their pipes and the glories once achieved by their grandfathers." Look at the Mexicans, and the lazzaroni of Italy. "Spain took the lead of civilized nations in the use of tobacco, but since its introduction in that country the noble Castilian has become degenerated, his moral, intellectual, and physical energies weakened, paralyzed, and debased. The Turks, descendants of the warlike Saracens, are notoriously known as inveterate smokers, and to-day they are characterized as an enervated, lazy, worthless, degenerate people."

Go about the shops, and bar-rooms, and billiard-halls of our own community, and see *our* lazzaroni. What class do they principally represent—the active and virtuous, or the idle and vicious?

HEREDITARY EVILS OF ITS USE. Man stuffs himself with tobacco poison. It becomes a part of him,—muscle, blood, bone! Like begets like, and behold the tobacco-user's children,—puny, yellow, pale, scrofulous, rickety, consumptive. Many years ago it was estimated that twenty thousand persons died annually in the United States from the use of tobacco. Nine-tenths begin with tobacco catarrh, go on to consumption, and death. Upon this same subject Dean Swift said:

"The diseased, enfeebled, impaired, and rotten constitution of the parent is transmitted to the child, which comes into the world an invalid, and then, being exposed more directly to the poisonous effects of this pernicious habit of the parent, its struggle for life is exceedingly short, and in less than twelve months from its birth it sickens, droops, and dies, and the milkman's adulterated milk, especially in cities, is often made the scape-goat for this uncleanly, if not sinful, habit of the parent."

MEDICAL PROPERTIES. Tobacco is a violent acro-narcotic, sedative, diuretic, emetic, cathartic, and errhine. The peculiar principle is a violent poison, one drop of which, placed upon the tongue of most animals, being sufficient to produce death. On this account a person can become a slave to its use, so that the greatest pleasure seems to consist in continuing the use of it rather than in abandoning it; and the system, becoming thus gradually and insinuatingly filled with its elements, is liable to succumb to premature old age, debility, nervousness and susceptibility to fatal diseases which seem very remote from what could be caused by tobacco.

Like other poisons, tobacco is a surer thing to kill with than to cure; hence its value as a vermin destroyer, in the orchard, the garden and the house. In many receipts for these purposes tobacco is referred to throughout this work. In some skin diseases also, where vermin are to be destroyed, tobacco is often employed.

Toilet. The ordinary business of the toilet is too well known to require that we should go into all the details respecting it; nor shall we attempt to unveil all the profound mysteries of the cosmetic art, by

which almost miraculous effects are daily promised, but seldom performed. Our object is chiefly to point out some circumstances that concern the preservation of health or convenience.

The term toilet is originally French (*toilette*), and is derived from *toile*, any thin stuff. It appears to have been first applied to a fine covering of linen, silk, or tapestry spread over a table in a bed-chamber, or dressing-room, to place the dressing things upon, such as dressing-boxes, mirrors, perfumes, combs, pin-cushions, brushes, razors, etc.

One of the chief objects of attraction in the affairs of the toilet is the care of the skin, the keeping of which in a condition to perform its important functions has been shown to be essential to health by numerous medical writers. The principal means by which it is effected are the use of the bath, and frequent ablution.

COSMETICS. The desire of being agreeable has, no doubt, led to the invention of cosmetics. Under this term are usually comprehended all the expedients invented to soften the skin, to maintain its transparency, luster and freshness, to give color to the complexion, to prevent or efface wrinkles, to whiten and clean the teeth, to stain the hair and eyebrows, and, in short, to improve the appearance of the face and hands.

The term is derived from a Greek verb, to adorn. The Greek ladies, we are told, studied much the use of cosmetics, as the women of the East do at the present day; hence, we see frequently advertised various nostrums under the title of some Eastern name. When we consider the anatomical structure of the skin, and how easily it absorbs substances applied to it, it is evident how careful we should be not to use any deleterious materials for the face and hands, and that we should know accurately the nature and composition of all substances recommended by perfumers. The intimate connection between the functions of the skin and those of the stomach were not so well understood formerly as they are in the present day; and hence many practices were resorted to in the use of cosmetics that are now known to be very improper. Nevertheless, all cosmetics are not to be condemned equally; some are, perhaps, harmless, and others are occasionally useful. We shall illustrate this by a few general remarks. Of paints for the face, which are occasionally employed, some, as we shall show, are highly dangerous; and those which are not so have an injurious effect, if used constantly, in stopping up or clogging the pores of the skin. Those cosmetics which owe their efficacy to vinegar and alum, or any other acids and astringents, are often for a time efficacious, giving a firmness and luster to the skin; but this effect is merely temporary, for they in time alter its texture, dry it, and produce premature wrinkles; they are, therefore, better avoided. Mucilaginous cosmetics, such as barley water, oat-meal, etc., have not this inconvenience; they render the skin more supple, softer, and more polished. Pastes and ointments sometimes produce good effects in cer-

tain states of the skin. They are generally laid on the face and hands, and remain on all night, contributing to restore the suppleness and elasticity of the skin; but the fatty substances that form their basis ought to be well purified. Some consider the wax that sometimes enters into the composition as too drying and irritating, and recommend fresh cream or glycerine as better. As a general rule, it is prudent to avoid the use of all cosmetics the composition of which is a secret or unknown, which will, of course, exclude all those which are advertised with high-sounding names. Some of these produce astonishing effects at first but ultimately ruin the skin, destroying its natural functions, and, consequently, seriously injuring health.

All medical men teach that the best way of improving the skin is to improve the health generally by temperate living and moderate exercise.

Complexion. A standard volume lies before us giving 49 recipes for improving the complexion, and eminent authorities on etiquette and the laws of health are also on the table before us, earnestly exhorting every one to discard all such things. It may be true that both health and etiquette require us to forego the use of all cosmetics; but for the convenience of those who are determined to use such things, we give two or three of the best. Pimples on the face are best avoided by a strict observance of the laws of health. Burnt grease (made in frying), sugar in any form, spices, most medicines, and acrid substances befoul the "blood," and the latter undertakes to throw them off through the skin in the form of pimples, boils, insensible perspiratlon, etc.

Wash for the Face. The following will be found an excellent wash for the face. It contains nothing injurious and imparts a clear alabaster appearance to the skin. This recipe has been sold by agents in different parts of the country for five and ten dollars, and we are acquainted with ladies who thought it an excellent investment: Bay rum, 3 ounces; glycerine, 2 drachms; flake white, 3 drachms; prepared chalk, 2 drachms; cologne spirits, ½ grain; and soft water, 1½ pints.

Another that has met with a large demand is made as follows: Four ounces of bay rum, 1 ounce of flake white, 1 ounce of glycerine, and 8 ounces of rain-water. Mix and color with the least bit of carmine.

Paints for the Face. There have been many mixtures of paints put upon the market for painting the face. They are not now, we are glad to say, so generally used as formerly. Pearl white is one of these. It is a preparation of bismuth and is extremely injurious to the skin. Pearl powder was another. Instead of its being pearls ground to powder, it was, we believe, made of French chalk powdered, and perhaps mixed with pearl white or bismuth.

With respect to red paints, vegetable reds alone are safe to use; they are dyeing substances, and are harmless,—such as those made from cochineal, safflower, carthamus, sandal wood and Brazil wood; but the mineral reds, such as minium or red lead, and vermilion or cinnabar (a sulphuret of mercury), are poisonous, and ought to be entirely excluded from the toilet, together with every composition into which they enter as an ingredient. All these metallic preparations, and also ceruse, or white lead, destroy the texture of the skin, cause wrinkles, and compel those who begin their use to continue the practice, although dangerous. The consequences of this are nervous affections, and perhaps palsy.

There is no standard color of the face which one should seek to attain or to admire, other than that which one would have by living strictly. Thus, in the present stage of human development, some would have rosy or ruddy cheeks, some swarthy and some of a mixed or undefined color.

Fleshy Face. European painters and sculptors, from time immemorial, have invariably represented the beautiful human form as having plump, round cheeks, and thus have formed the tastes of the masses, both in the old country and in America, for the beautiful human face to be in no other shape than "plump," fleshy. This habit of thought is confirmed by the fact that when a person becomes an invalid he loses flesh, rosiness of cheek and becomes lean and cadaverous. At the same time it is well known that nearly all the hard work of the world is done by lean men, who have no rosy cheeks, although many of them have a ruddy complexion. We leave the reader to put the above three facts together, with as many others as he can, and reason out his own conclusions.

We are aware that "falling in love" overrides all other considerations, and that nature, by a law of compensation, continually endeavors to recover a normal development; and that, according to this law, a person having one extreme of physical form or feature, is apt to seek as a companion for life one who has the opposite extreme,—that the thin-faced is most apt to prefer the full-faced, and *vice versa.* One's constitution will color all his views concerning matters of taste, despite all the advice we can give here; and we have therefore devoted our space to things without the domain of taste.

We have very fully treated of the care of the hair, teeth and of perfumes, pomades, etc., under their respective heads.

Tomato (to-ma′to or to-mat′o), a vegetable bearing a well-known fruit, formerly known as love-apple. It is a native of South America, and until within a comparatively short period of time it was considered as unfit for food and even by some as poisonous. It is now cultivated throughout the land and is regarded as a most healthful food, although few persons are pleased with its taste at first. This must be cultivated, which, however, is not very difficult with most persons. The vine is very susceptible to frost, but is easily cultivated.

Cultivation. Sow in March or April in the hot-

bed or in pots in a sunny exposure in the house; when desired to make healthy, stocky plants, they may be transplanted or repotted when about two or three inches high; when five or six inches high, if the ground becomes warm, transplant to the open ground, on a cloudy or rainy day if possible; if not, the young plants should be liberally watered and shaded from the hot sun. For a heavy crop, a warm, dry, sandy loam, only moderately rich, is best. To have the fruit ripen as early as possible in preference to a heavy crop, select rather light, poor soil and a sunny location. Trimming off the branches and top and training to a stake are believed by many to promote earliness; propagation by slips is said also to aid in this. Root-pruning has been systematically demonstrated to be very injurious. Set the plants four feet apart each way, upon mounds of earth, to allow the foliage to open and let the sun in amongst the fruit. A cheap trellis made by driving three stakes around the plants and encircling them with three or four barrel hoops, makes a very nice support for training. The burying of the removed leaves immediately around the plant is a good practice, both by insuring full disturbance of the soil, and by the presenting of a fertilizer progressed precisely to the point of fruit-making. The portions buried decay rapidly, and are rapidly assimilated.

FIG. 1.—*Gen. Grant Tomato.*

For field culture it is best to plant on rather poor land and manure in the hill with a shovelful of rich compost. This gives the plant a thrifty start, and when the roots get beyond the manure the growth of the plant is checked and fruitfulness induced. If you are growing for the factories you must grow such varieties as they wish. The crop will prove a profitable one at 25 cents a bushel, which is about the factory price, and when, as is sometimes the case, a scarcity in the market brings the price up to 75 cents or a dollar, they are largely profitable. When tomatoes are grown by the acre the large green worm (pages 863–4) often causes serious trouble. Hand-picking appears to be the only remedy. We have a valuable aid in this work, in a small Ichneumon fly; its little white cocoons are often seen sticking to the back of some unfortunate worm. Such cocoons should never be disturbed.

FIG. 2.—*Paragon Tomato.*

To ripen late tomatoes, pull the plants having green tomatoes on them, before the commencement of frosts, and hang them in a well ventilated cellar.

VARIETIES. Of the many varieties mentioned by seedsmen we will give but about two dozen of the best.

Livingston's Acme. A purple variety like the Paragon.

Paragon. Ripens perfectly around the stem, and is the largest round tomato in cultivation.

Conqueror. Handsome, somewhat resembling the Canada Victor, but not as large, solid or always early; vines small.

Canada Victor. Excels in ripening nearly all its crop early.

Cook's Favorite. Round and solid.

Gen. Grant. Smooth, symmetrical and solid.

Trophy. Magnificent.

Golden Trophy. A yellow, rapid, free grower.

Hathaway's Excelsior. Spherical, early, solid, of excellent quality and very productive; skin rather thin.

Hubbard's Curled Leaf. Probably a strain of Early York.

Early York. Very early, dwarf and productive; irregular in shape.

Foote's Hundred-Day. Extremely early; fruit small and irregular.

Keyes' Early Prolific. Medium size in large clusters.

Large Red Smooth. The standard kind; good for market.

Little Gem. Small, but extra early.

Red Cherry. Flavor unsurpassed; fruit small.

Yellow Cherry. For preserving and pickles.

Tilden. Large, smooth, thick-meated, high-flavored and first class on low, rich soil.

Alpha. One of the best to ripen.

Triumph; Orange Field. A new variety of rich, fruity flavor.

Yellow Fig. Pear-shaped and is preserved as figs.

Strawberry, Ground Cherry or Alkekengi. Grows enclosed in a husk within which it will keep all winter; excellent for preserves.

Currant. Resembles long bunches of currants; for ornament only.

Several other ornamental and curious varieties are advertised by seedsmen.

To make tomato catsup, see page 195; to can tomatoes, see page 185; to preserve them, see page 1067; to pickle green tomatoes, see pages 1034–5.

TO COOK TOMATOES. Peel and put them into a stew-pan; put in a little salt and stew them for half an hour; then turn them into a deep dish with buttered toast. Another way of cooking them is to put them in a deep dish, with fine bread crumbs, crackers pounded fine, a layer of each, alternately; put small bits of butter, a little salt and pepper on each layer. Have a layer of bread crumbs on the top. Bake it three-quarters of an hour.

Ton, 2,000 pounds. This is sometimes called the "short ton." in contradistinction to the old "long ton" of 2,240 pounds, still in use in England. Spelled *tun*, the word denotes a cask, like a pipe or puncheon.

Tongue (tung). It is important for all to know that a white-coated tongue, with red edges, denotes fever of some simple type, which ought to be cured in a day or two; and that a brownish coat on the tongue indicates typhoid or other serious conditions, which require more skilled and prolonged treatment.

According to Dr. John M. Scudder the coated tongue indicates an impairment or arrest of digestion; and the tongue uniformly of a deep red, either smooth and glossy or covered with a brownish or dark filthy matter, indicates an excess of the salts of the blood. In such cases he gives acids to counteract this excess. The broad pale tongue, with a pasty-white or yellowish coat, indicates a defect of the salts, and in medical treatment calls for alkalies.

Defective digestion, from late suppers, gluttony or want of exercise, often occasions a deposit on the tongue during the night. This should be scraped off with a knife or scoured off with a brush and water.

To Cook Beef Tongue, see page 78.

Tonsils, almond-shaped bodies, situated on each side of the rear portion of the mouth, or about opposite the uvula, or "soft palate." They are, in the adult, about half an inch in length, consist of follicles, and yield a viscid mucus to facilitate swallowing. Their inflammation is the disease called tonsillitis, or quinsy. The symptoms are soreness, pain in swallowing, swelling of one or both tonsils and fever. Sometimes the disease grows to be very severe, even occasioning death by suffocation. A dose of citrate or sulphate of magnesia, or some other cooling aperient, should be given the first day; then wine of ipecacuanha, 20 drops every three hours, with frequent draughts of flaxseed tea or flaxseed lemonade. Poultice with flaxseed meal to which lard and laudanum have been added. When the poultice is changed, bathe with liniment of ammonia, or soap liniment to which aqua ammoniæ has been added. If still severe and not certainly suppurating, a very small blister may be applied, or the part may be painted with tincture of iodine. When an abcess is evidently forming poultices will be better, until it is ready to open from within. Do not undertake to lance a suppurated tonsil unless you know how to avoid cutting the internal carotid artery.

Tools: see Implements.

Tooth: see Teeth.

Top-dressing, a manure of any kind spread upon plowed land without being turned in; or a fine, or comminuted or thoroughly reduced or special manure sown or equally distributed upon grass land. Common kinds of top-dressings are ashes, road-dust, gypsum, common salt and the nitrates of soda and potash. Liquid manure is always used as a top-dressing. See article Manure.

Tornado, a wind which is so violent as to destroy property or life. The word "hurricane" has a similar meaning, but is sometimes limited to winds of slightly less violence than a tornado. In these days of newspaper sesquipedalianism, "cyclones" threaten to whirl the other two words out of use.

The only practical remarks we can make concerning tornadoes is to tell how we may best avoid them. They generally come during the thunder-storm season of the year, namely, May and June,—the former month mostly in the South and later further north. When the sky is threatening, watch the clouds southwest of you, as tornadoes generally travel northeast. When you see a dark, funnel-shaped cloud in the southwest, moving slightly toward the north, run to the southeast; if it seems to be southing, run to the northwest. By these means you will get out of its track,—nearly always. But if it seems to be making straight for you, go into a cellar, to the west side of it, and if convenient place heavy boards or pieces of timber over you, leaning them up against the wall. A death-like stillness of the air prevails just before a tornado.

Tourniquet (tur′ni-ket), a surgical instrument for stopping the course of blood in a limb, by exerting a strong compression upon the principal artery. The purpose is, of course, to prevent bleeding in case of dangerous wounds and in surgical operations.

Township, the district or territory of a town: in the older States it is often called simply "town." In most of the States the township is six miles square, but in some it is five, seven or ten miles square. Some "townships" are, of course, necessarily fractional, as those along rivers, lakes and the boundary line of counties or of the State.

Townships are numbered from a base line and a "principal" meridian, fixed by the Government. Thus, "T. 5 N., of range 2 W." denotes the 5th township north of the base line in the 2d range west of the (numbered) principal meridian.

Townships are divided into square miles called "sections," and these are numbered commencing at the northeast corner, thus:

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Township.

The sections are further subdivded into "quarters,"

which are a half mile in extent on each side, thus:

N. W. qr.	N. E. qr.
S. W. qr.	S. E. qr.

and these are still further subdivided by private parties, into "halves of quarters," "quarters of quarters," etc.

The inhabitants of townships are invested with certain powers for regulating their own affairs, such as repairing roads, constructing ditches, providing for the poor, etc. The township is subordinate to the county.

Traces, the chains or heavy leather straps (tugs) by which the team draws the load. They extend from the hames to the whiffle-trees, and are sometimes divided into two sections, one of leather and the other a chain.

Trachea (tra-ke'a), the scientific name of the windpipe. It is coming into more common use, with the advance of popular education. Inflammation of the trachea is called tracheitis, and surgical incision of that organ is called tracheotomy.

Tracheotomy, the formation of an artificial opening in the windpipe. This is an operation seldom required and should never be attempted by a non-professional person not acquainted with the art and science of surgery. We therefore give no description of it.

Track-Cleaner, attachment to a mowing machine to throw the cut grass away from that which is uncut.

Training is a general term applicable to many things, as the training of children, of horses and other animals, and of plants. Grape-vines, tomato-vines, fruit-trees, etc., are trained to stakes, trellises, walls, etc. The training of vines and trees to espaliers (lattice-work) is much practiced in the old country. For the training of domestic animals, see name of the animal in its alphabetical place. For the training of children, see Children and Education.

Transplanting, removing trees or other plants from one place to another, to continue their growth in a new place. The principles to be observed with each plant are indicated in their proper places, but there are a few general principles to be observed which we note here.

Nursery preparation for the successful removal of trees is made by several transplantings, shortening their roots from time to time, so as to limit the growth of single strong roots and increase and concentrate fibrous ones around the collar and the short main roots proceeding from it. In removing trees from the forest, either take them in winter with a large amount of frozen earth, or two or three years before removing cut around and confine the roots somewhat, partially or wholly cutting off the large downward roots. Repeat and perfect the operation each year for the two or three years following, and the fourth year it can be safely removed without difficulty. Swamp trees have no roots extending down deep. Make the diameter of the ball of earth in the proportion of one foot for each inch of diameter in the stem of the tree at a foot above the collar.

Prune closely at the time of transplanting, cutting away from their heads from one-fourth to one-half their weight, about in proportion to the waste of root, carefully shortening and opening them. All climbing shrubs will be benefited by being cut down to the ground, so that the growth of the plant will be entirely new. The same is true of most varieties of bushy shrubs, particularly the Azaleas, wild roses and the laurel (Kalmia), which, though an evergreen, is in this respect an exception to its class. This process, however, is not to be rigidly applied to those plants we select for the sake of their stems already formed; but it will be found good for most kinds from the woods, and very often also for nursery plants, particularly if they have been over-forced, or are transplanted when in leaf and wilt upon your hands, or from any cause are weakened before being re-set. It also relieves us from the necessity of seeking for handsome plants, as they will grow naturally, and therefore prettily, when, having sufficient room, they grow anew.

It is not the safest to remove evergreens in early spring. Transplant them either in winter, with the frozen earth about them, or be so prepared as to keep a large quantity of earth about their roots without displacing any of them; or, defer their removal until late in spring or early summer.

From the time the roots are out of the ground to the time the young trees are set, keep the roots moist and out of the sun and dry wind. This is especially important with evergreens. Do not dig the holes till the trees are nearly ready to set, as the soil, when freshly dug, is in better condition.

The spreading of the roots, filling in the soil, mulching, etc., and transplanting large trees by aid of a two-wheeled cart, are fully illustrated on page 511.

Traveling. It has been our aim to make these volumes as practical and useful to the farmer as possible. They have been prepared for him and his family and are intended to embrace the treatment of every subject likely to be of interest or value to him in the pursuit of his noble calling; and we feel that some valuable remarks can be made upon the topic of traveling, embracing the theme of visiting cities, etc. It is well known that people from the country often experience embarrassment on going into a city,

and also have more or less difficulty in finding persons whom they wish to see, or places they desire to visit, and also are often beset by confidence men and sharpers. It is therefore the intention of this article to furnish such information and suggestions as will enable the farmer to travel safely, and to the best advantage, see the most and avoid the innumerable sharks and traps always found in cities awaiting the unwary. It is not expected that one who has been reared amid rural scenes, where the herds and flocks roam at will over large pastures, where the growing fields, the picturesque foliage of timber regions, or the barren expanse of wintry scenes only greet him, will know all the ways of city life. His business has only called him over the sparsely traveled country roads, and occasionally to the country village. Never hampered or crowded, never dazzled with the gilt and glitter of the city or bewildered by the colossal and magnificent buildings, how is he to know the manner in which his fellow-beings live who are crowded together by the hundreds of thousands? How is he to guard himself from the innumerable artifices, tricks and traps talented but unprincipled men are continually setting for and practicing upon the unwary? In every big city there are hundreds and even thousands of men and women, who live in luxury and plenty entirely off the men who visit the cities and are unaccustomed to the devices of these sharpers and swindlers. Knowing that most farmers visit cities occasionally, or contemplate such a trip, it is our desire, as above mentioned, to provide them with such information of all these things that they may be thoroughly fortified against the arts of swindlers of all kinds, as well as to know the best means of traveling, seeing sights, etc.

Packing the Sachel. It is very important to have in your sachel everything you will need while away from home, and it is quite impossible to do this at a moment's warning, without some method, and we know of no better one than the following: Take a card and write on it, at leisure, in a clear, distinct column, the name of every article which you will want while away from home. This may be done by taking a list of everything in your bag, and adding to it as any omission is discovered. Then, whenever you are about starting on a journey, glance along down this list and see what you want this time. You may thus pack a bag and get ready at any time in five minutes, and never forget an article. As a sample of such a list, we give the following, from which anything wanted is at once selected:

Watch,	R. R. Guide or Map,	Shaving Tools,
Match Box,	Lunch,	Money,
Pocket Compass,	Collars,	Tracts, Cards, etc.,
Spy Glass,	Cravats,	Paper,
Door Fastener,	Shirts,	Ink,
Thread and Needle,	Stockings,	Pencils,
Hair Brush,	Gloves,	Envelopes,
Drinking Cup,	Overshoes,	Postage Stamps, etc.

Then in starting or in changing cars, remember the three words, "*Overcoat, Sachel, Umbrella.*"

On the Train. We shall now take up the topic of traveling, which is by no means an unimportant feature of a visit to the city, or a journey anywhere. To make it as pleasant, as interesting, as free from fatigue and as rapid and safe as possible, should be the aim of every one. After determining what day you intend going you should find out the time at which your train leaves your station. You should then be there a sufficient time before the arrival of the train to get your ticket, have your baggage checked and everything ready for the trip. A rush for the train and hasty departure is sure to leave something behind or undone that will annoy you during all your trip. Another thing to guard against is getting on a way or mail train, if there are through express trains running over the road. Most railroads run slow trains, which not only run slow, but stop at every station, and also have their fast express trains which stop only at long intervals, and the rate of speed of which is much faster.

One other thing to determine is, whether you wish to travel during the night or day, or to arrive in the city at night or morning. Where the journey can be made within 12 hours, business men, in order to save time, travel at night; but if one wishes to see the country through which he passes, he should aim to make the greater part of his journey, if it takes longer than 12 hours, during the day time. Should you arrive in the city in the evening you can repair to your hotel and have a good night's rest, and be prepared for business or running around the next day.

Should you desire to travel at night, or your journey is longer than can be made in one day, you will find a sleeping car attached to almost all night passenger trains. These afford the greatest ease and comfort to those who take berths in them. These cars are especially constructed to travel smoothly, and are provided with everything that the traveler could wish to lighten the fatigue of a journey. Upon either side of these coaches is constructed a double row of berths, one over the other. The berths or bunks in these are known as upper and lower berths. These are large enough to accommodate two persons, and are provided with spring mattresses and all the bedding necessary for warmth and comfort. There is no difference as to the furnishing or comfort of the upper or lower berth, but for convenience in getting in and out the lower one is preferred. Those near the center of the car are preferable to those at the ends, over the wheels.

During the night the porter will polish your boots, and on arriving in the suburbs of the city, and all the passengers are up and have made their toilet, he will visit you with a brush to dust your clothing. After this is completed he will expect pay for putting your boots in order. From ten to twenty-five cents will satisfy him. The inevitable colored porter is one of the fixtures of sleeping cars, and it is quite impossible to free yourself from giving him the expected change.

Arrival in the City. The train having arrived at the city depot, you will have ample time to get off it. Do not attempt to alight as soon as the train enters the city, simply because it stops. It will likely do this several times before reaching the main depot. The

train-men will give you due notice when the train has reached the depot, and not until then; so retain your seat until you hear them announce the name of the city.

If, while on the train, you have purchased an omnibus or transfer ticket, or one is attached to your railroad ticket, go to where the line of omnibuses are standing, show your ticket and you will be directed to the proper one. Upon nearing the city a gentleman usually passes through the train to supply omnibus (or "bus") tickets that will carry you to any hotel, and also take your baggage. This gentleman will take up your railroad baggage check and give you one of their own. These bus and baggage lines will transfer yourself and baggage to other railroad depots if you are passing through the city. Should this be the case, or should you have a trunk, it will be the better plan to have the transfer thus made, or be taken to the hotel.

On arriving at the depot do not let the noisy hackmen, hotel and railroad men get you excited or impose upon you. If you know definitely where you want to go and do not wish to take a bus or hack, inquire of the depot or city policeman, and he will direct you. Should the distance be great he will likely direct you to the street-car line that passes nearest you and the place to which you desire to go. Do not have anything to do with strangers at the depot, or, indeed, as a rule, any place. Generally make your inquiries of policemen or in stores. Not that there are no honest, true-hearted people in cities, for as a matter of fact, the most noble of men, as well as the most depraved, dwell there; but remember that sharpers are ever watching the entrance of strangers into the city, and they are the most likely to put themselves in your way to direct you.

AT THE HOTEL. Having arrived at the hotel it is your first duty to place your name and residence upon the hotel register. The clerk will then assign you a room. If you have been traveling long and have had no opportunity of "washing up," ask to be shown to your room, where you may make your toilet. If you have a lady with you, enter the hotel at the ladies' entrance, go to the parlor or ladies' waiting room, where you may leave her and go to the office, register your name and that of the lady, and have rooms assigned.

HOW TO FIND A PLACE IN A CITY. In all cities are issued annually city directories, containing the names of all men, and also of ladies who are engaged in business, or are widows, with the street and number of their residence and place of business, and also stating their business or occupation. These directories are to be found in hotels, drug stores, banks, large stores and in many offices. So, if you wish to find the residence of any one, step into any of the above places and consult a directory. Should the party have moved since the issue of the directory, by calling where he lived at that time his whereabouts can generally be obtained.

Do not hesitate to inquire of policemen in reference to the location of buildings or streets, etc., you desire to find. It is their duty to answer all such questions, and when approached respectfully will seldom fail to give full and explicit information. You may make simple inquiries of any one and you will seldom be misled. Repeated inquiries will generally enable one to reach his destination safely, however secluded or out of the way it may be. Generally you will find the names of all streets upon the lamp posts, situated at the corner of each street. These are unerring guides and should be consulted.

CONFIDENCE MEN. There are in all cities a miserable class of men who live upon the credulity of the people from the rural districts—not alone farmers, but even business men of villages. These individuals are known as "confidence men," because their plan is to work upon the confidence of their victims. They are sharp, oily-tongued, well-dressed rascals, and while plying their vocation avoid the police and the law. They are such experts in reading human nature that they seldom miss their man. Should they by mischance approach the wrong man they perceive the fact so quickly, and are so slick and cunning, that they do not commit themselves.

It is needless to say that these men should be avoided, like so many hyenas, as in fact all inquisitive strangers should be. As the plan adopted by these men are similar in all cities, and in general do not change, especially in the initiative steps, we will briefly give the mode they pursue, so that they may be the more certainly pointed out and avoided.

First, they place themselves on some prominent street and watch for their victim. They easily "spot" him, as a stranger in a city is easily pointed out by an expert. They approach him smilingly, extending their hand, say "Why, how do you do, Mr. Jones? When did you get in?" Jones does not happen to be the name of the man approached, who is somewhat surprised to be thus familiarly addressed, and immediately says, "My name isn't Jones;" or, "You are mistaken; my name is Brown." The confidence man will then look very much surprised and exclaim, "Indeed, isn't this Alexander Jones, of ———, Iowa?" This remark generally, though unwittingly, draws from the rural resident the place of his residence, when, after slyly obtaining from him two or three other facts he desires for a cue, the confidence man, assuring him that he very much resembles his friend, Mr. Jones, will apologize for thus accosting him, and then walk away. This man has played his part, and done it successfully. It remains for another to do the victimizing. The unsuspecting victim is satisfied with the explanation and passes on, and is soon buried in the throng and absorbed with the strange sights.

He has been carefully watched, however, and ere long he is again escorted, by one who makes no mistakes as to name, or place of residence, etc. This time the "pal," or companion of the former confidence man, who has been given the "cues" obtained, approaches the farmer or gentleman from the country village, smilingly extends his hand, familiarly ad-

dresses him by his proper name, inquires as to his health, when he came in, etc. The victim is perfectly confounded that he should meet one among strangers who knows him so well. He may reply that he does not remember him, and certainly does not know him, but the confidence man is equal to the emergency, and laughingly and familiarly asks him if he don't remember ————, son of ————, the village banker, or prominent merchant, as it may be. Now the farmer knows the man referred to quite well. He is an honored and wealthy citizen of his neighborhood, and he is glad to meet with his son, who has been away from home for some time, etc., as his story goes. Then, to still further gain the confidence of his victim, he inquires about several of the leading men of his village or neighborhood, men whom the farmer well knows. Why, he knows them perfectly well, and will speak as familiarly of them as a relative could.

The names of these men are obtained from commercial reports, and were looked up after his residence was known. By this time the crooked man of the city has almost complete control over the rural resident. It is a strange fact, but nevertheless true, that a person from home will be friendly and confidential with a man whom he never associated with or cared for when at home, should he chance to meet him in the city. Another strange fact is, that he will take up with and have confidence in an entire stranger of the city, if he was ever through his neighborhood or knows only the names of some of its prominent citizens.

The "confidence man" having ingratiated himself with his victim, will then proceed with his game. He will offer his services to show his friend around the city. This is considered as a great kindness by the farmer, as he has a desire to "do the city," and to have some one to point out and give the history of all places of interest, guide and protect him in the crowded streets.

Thus far the proceedings with confidence men generally are similar. After they have thus won the confidence of their victims they have various methods of entrapping them. These we cannot describe, as they are too numerous and diversified. Suffice it to say, however, when once a man is thus in their clutches, they are sure to get his money. If not one way they will another: so, as a last resort, when they have failed to borrow money, have checks cashed, play faro and other games, entice them into lottery schemes, "snide" auction houses, etc., they will make their victim yield his purse by intimidation or by actual force.

The only safe way is to avoid making up with strangers in cities. Never believe a man of business, or of leisure, either, for that matter, who is not an intimate friend of long standing, cares enough for you to waste his time showing you around for nothing. Be careful not to tell your name, place of residence and full history to any stranger. Give no one any cue to work on you. Turn a deaf ear to the oily-tongued stranger who professes to know you. In fact, let your motto be, "have nothing to do with strangers in the city."

Hiring a Carriage. Should one desire to be driven over the city in a carriage, you may always find public hacks standing on certain streets or in certain locations. While the price for the use of them is regulated by the city, yet you should make a special bargain beforehand to be driven to certain places or for a stated length of time, else, knowing you do not belong in the city and would rather pay considerable more than have trouble with them, they will often charge you an exhorbitant price.

Money, etc. Perhaps a word should be said in reference to the manner of carrying money when traveling. In the first place, no one is ever justified in carrying a large amount of money about his person. There is no need for any one to run such risk, both of loss of money and bodily injury. The larger portion of the money should be carried in the inside vest pocket, and should never be taken out on the street or in crowds. Sufficient change may be carried in the outside vest pocket or in the pantaloons pocket for small and frequent expenses. Never make a show of your money as some foolishly do, for then you are only inviting some one to rob you.

On taking a trip to the city, if you have occasion to use a large amount of money, buy a draft from your nearest banker upon the city to which you are going if possible, payable to your order. No other person than yourself then will be able to draw the money on it; consequently if lost, or stolen, it cannot be cashed, and you do not lose what it represents at the bank. This, however, necessitates some difficulty upon your part, for you must then be identified at the bank upon which you hold the draft. If you are not known by any one in the city you could not depend upon cashing it, for it is very difficult for one to identify himself at the counter of a city bank. Should this be the case, however, take a letter of introduction from your village merchant to the wholesale house in that city with which he does business. This will introduce you to them, when they will in turn identify you at the bank, or draw the money for you. Generally you will find such city business men quite accommodating, and will often put themselves to much trouble to please a country customer. While this mode of carrying money may entail more trouble, one thing is certain, it is much the safest way.

Some have money in small amounts, or postal money orders, or bank checks or drafts, sent to them from time to time and to the different points in their tour, as they may need funds. This is a safe method, but, depending on friends at home and the vicissitudes of mails, etc., the money or postal order is sometimes too slow to arrive.

Miscellaneous Hints. In pacing along some of the prominent streets of a city you will often hear through an open door an auctioneer hard at work crying off a watch, or a piece of jewelry, or it may be an oil painting. He claims he is offered only a few

dollars for what is worth ten times the amount. However this may be, or why city authorities permit such places to run, let your motto be, to have nothing to do with them. Do not enter the door, for once you get into their web you will find it difficult to extricate yourself. Of course, should you be in company with a friend long a resident of the city, you could safely go with him to these, as well as some other places to see the inside of city life, but do not attempt it alone. You may be never so smart, and in your own neighborhood a leader, etc., but remember these fellows, many of whom have brilliant intellects, do nothing else but study up schemes to entrap the uninitiated.

Never buy jewelry or any kind of goods of men standing on the streets. These are of an inferior quality, and no cheaper than you could buy the same goods at responsible stores.

Never be drawn into any kind of game, with cards or anything else, with strangers or new acquaintances. These are only devices to rob you of your money.

In visiting a theater, it is well to purchase your ticket early in the day, or even the day before, if you know where you want to go, that you may have a better choice of seats.

The deportment while in theater, if with a lady, is given on page 412. If you go to any theater let it be a first-class one, and secure a good sitting. The auditorium of a theater is generally divided into parquet, parquet circle, balcony and gallery. The first two are regarded as the best, except, perhaps, the first row or two in the balcony.

In getting on a street car, if at the crossing of a street, always go to the further crossing in the direction the car is going, as the car is not permitted to stop in the middle of the street crossing. Never go to the conductor with your fare; let him come to you; rest assured he will do that. If you wish to get off at any place you are not familiar with, tell him so when he calls for the fare. Should he then perchance carry you by, he will send you back on next car free. It is the better way never to step from the car until it stops; but should you do so, always jump with the car or facing the way the car is going.

The places of interest in most cites to visit are parks, public buildings, theaters, museums, board of trade, large churches, monuments, some of the leading stores, public libraries, principal manufactories, etc. Besides these each city will have some particular features or sights of interest peculiar to itself. A view of some of the magnificent private residences will often prove very interesting. It is well to purchase a "guide" to the city, which is a pamphlet, with map, being a directory of the streets, parks, etc., and describing the principal points of interest, and telling how to reach them. They generally cost 25 cents. Cheaper ones are to be had, but do not give so much information.

Tray, a small trough or wooden vessel, sometimes scooped out of a piece of timber and made hollow, for various domestic uses, as for making bread in, chopping meat, and the like. Also, a flat, broad vessel on which dishes, etc., are carried; a waiter or salver.

Treacle (tre'kl), a viscid, uncrystallizable syrup, which drains from the sugar-refiner's molds; sometimes called sugar-house molasses. The word "treacle," however, is often used for molasses. Formerly the word denoted also a medical compound for the prevention and cure of bites of poisonous animals.

Tread-Power, a machine on which an animal walks, to produce power for working purposes. It may be either an inclined disc wheel or a wooden slat belt; the latter is by far the most common at the present day. See page 822.

Trees: See Forestry and the respective trees.

TO MEASURE THE HEIGHT OF A TREE. To do this there are several simple but interesting methods.

1. Set up a straight, measured pole some distance from the tree, in ground which is on a level with the base (collar) of the tree; then place your eyes near the ground opposite the tree, and pass along until, in sighting, the top of the pole coincides with the top of the tree; measure the distance from your sighting point to the pole and to the tree, and then by simple proportion you can calculate the height of the tree, thus: As the distance from your eyes to the pole is to the height of the pole, so is the distance from your eyes to the base of the tree to the height of the tree. Example: Say the pole is 5 feet high, the distance from your sighting point on the ground to the stake when the top of the latter coincided with the top of the tree, 6 feet, and from the same sighting point to the base of the tree 96 feet; then 6:5: :96:80. Eighty feet is the height of that tree.

2. Measure the shadow (when the sun or moon shines) of a measured stake, and also the length of the shadow of the tree at the same time; then, by simple proportion as above, the answer is obtained. Thus, if an 8-foot pole casts a 5-foot shadow when the tree casts a shadow 60 feet in extent, then 5:8: : 60:96. That tree is 96 feet high.

3. Set a stake in the ground when the sun or moon is shining, and wait till its shadow is of the same length as itself; then the shadow of the tree will be of the same length as *it*self.

4. Make a quarter circle out of a thin board; suspend a plummet from the corner (what would be the center of the circle) of this piece, holding this corner up; walk back or forth with this in hand, taking sight along one of its straight edges to the top of the tree until the plumb line hangs down mid-way of the arc (curved side); then your distance from the tree will be its height.

Trefoil, literally, three-leaf; one of the names of clover, given on account of its having three leaflets to each leaf.

Trellis, a frame of cross-barred work, or latticework, used for various purposes, as for screens or for supporting plants.

Trembles, milk-sickness. This is not milk-fever, but a poison from a certain weed, which affects cattle and man. See page 238.

Trench Plow, a plow cutting deep furrows and bringing the sub-soil to the surface, as distinguished from a sub-soil plow, which only loosens the sub-soil and leaves it below the surface.

Trevis or **Break,** a contrivance for confining horses or cattle for surgical operations or medical treatment. It consists mainly of four strong posts set in the ground and braced by stays. Rings, padded bars, etc., are attached according to the needs of the case.

Trichina (trick-i'na), a small worm that sometimes infests swine, and persons who eat the flesh of swine so infested. Its attack is generally fatal; see page 871.

Trichiniasis (trik-i-ni'a-sis) or **Trichinosis** (trik-i-no'sis), the disease produced by the trichina. No special remedy is known for this generally fatal disease. The general fever which always accompanies trichiniasis is, of course, to be mitigated by the same general processes which are adopted for other fevers.

Trimming, of horses: see page 732.

Tripe, the entrails; also. the large stomach (paunch) of ruminant animals, when prepared for food. To prepare it, sew it up, after it is turned inside out; be careful to sew it up tight, that no lime get into it; now have a tub of lime-water, the consistency of good, thick whitewash; let it remain in from 10 to 20 minutes, or until when you take hold of it the dark outside skin will come off; then put it into clean water, changing three or four times to weaken the lime, that the hands be not injured by it; then with a dull knife scrape off all the dark surface, and continue to soak and scrape several times, which removes all offensive substances and smell. After this let it soak 20 or 30 minutes in two or three hot waters, scraping over each time; then pickle in salt and water 12 hours, and it is ready for cooking; boil from three to four hours, cut in strips to suit, and put it into nice vinegar, with the various spices, as desired; renewing the vinegar at the expiration of one week, is all that will be required further.

Tripoli (trip'o-ly), an earthy substance originally brought from Tripoli, Africa, used in polishing stones and metals. It is principally silica, and consists almost wholly of the cast shells of microscopic organisms. In using it, it is first reduced to a very fine, impalpable powder, like wheat flour to the touch.

Trocar or **Trochar,** a surgical instrument for evacuating fluids or gas from cavities, as dropsy. See page 230.

Troll (trole), to draw a hook along on the surface of the water for the purpose of catching fish. See page 477. The word has also other meanings.

Trot, to move faster than in walking, as a horse or other quadruped, by lifting one fore-foot and the hind-foot of the opposite side at the same time. For trotting horses and speed in trotting, see pages 682 and 1164.

Trout, several species of fish. See page 475.

Truck, a small wooden wheel, not bound with iron; a cylinder; a low carriage for removing heavy freight; barter, or small commodities; luggage.

Truss, a bandage or apparatus used in cases of hernia, to keep up the reduced parts and prevent further protrusion, and for other purposes; also a frame of timbers for fastening or sustaining a beam or a roof, etc.

Tuber, a fleshy, rounded stem or root, usually containing starchy matter, as the potato or arrow-root; a thickened root-stock or subterraneous portion of a stem. It is difficult to determine whether a tuber, in botanical terms, is a root, a stem or *sui generis.* Irish potatoes grow on subterranean stems, which are very different from the roots; but the sweet potato and Jerusalem artichoke seem to be more nearly roots. All tubers have eyes for the production of new plants. In anatomy, the word denotes a knob or tubercle; a swelling or knot.

Tuberose.

Tubercle (tu'ber-kl), in anatomy, a natural small projection; in pathology, a small mass of diseased matter, as a wart or other form of excrescence. Most notably this accompanies, in the lungs, a form of consumption, called hence "tubercular consumption." A lung tubercle is at first hard, grayish or yellowish translucent or opaque, and afterward gradually softens, excites suppuration in its vicinity and seeks an outlet from the body.

Tuberose (tube'roze or tu'ber-ose), a liliaceous

WILD TURKEY.

plant with a tuberous root. The flower is beautiful and exquisitely fragrant It is not a rose, and the second pronunciation given above is therefore more probably the correct one. In florists' catalogues often the scientific name is given,—*Polianthes tuberosa.* This should not be confounded with *Polyanthus*.

Tug, a trace, or drawing strap, of a harness. For a spring tug link, see page 638.

Tug-wheel, a horizontal water wheel driven by the percussion of the stream against its floats, and not submerged in water.

Tulip, a very popular early flower, of many varieties.

Tulip-tree, a valuable, well-known timber tree, often wrongly called "poplar,', "white-wood," etc. It is common in the older States, but scarce in the Northwest.

Tumbling-rod, the rod which connects the motion of a horse-power with that of a thrashing or other machine.

Tumor, a local and irregular enlargement in the root, stem, branch, bud or leaf of a plant. It arises in some instances from obstruction in the ascent of the sap, but in most in puncturing by insects in the deposition of their eggs. Some of the most common instances of it are clubs on the roots of cabbages, knots and bunches on the stem and branches of oaks and elms, and excrescences and galls on the buds and leaves of various common trees and shrubs.

A tumor is also a chronic swelling or hard abscess on any part of an animal's body. Some tumors are caused by bruises and others by accidents, and some by interior disturbance of the system, by a corrupted state of the fluids, by general debility of constitution, or by various kinds of atmospheric influence and agency; and many, which originate in widely different ways, have a widely different character, and require a widely different treatment. Tumors which are much inflamed, but do not tend to suppuration, should be treated with cooling applications, such as a solution of sugar of lead, or a lotion of Goulard's extract in water; inflamed tumors which tend to suppuration should be accelerated toward a crisis by means of fomentations and poultices; hard, indolent tumors, which are neither inflamed nor painful, but either simply inconvenient or precursory to some worse development, should be roused to activity by rubbings of stimulating liniments, iodine ointment, or even blistering ointment, and very hard or quite inert tumors of the nature of wens can be properly removed only by excision.

Tun, a large cask. See Ton.

Turf, that upper stratum of earth and vegetable mold which is filled with the roots of grass and other small plants, so as to adhere and form a kind of mat; called also sward and sod. Figuratively, the race-ground. The word also denotes peat, a vegetable mold used as fuel.

Turkey. This fowl, which, on account of the excellent flavor of its flesh, is the *entree par excellence* on all festal occasions, especially Thanksgiving day and Christmas, seems to be of Mexican origin. The wild turkey of the United States is of a different species from our domestic turkey.

The male wild turkey of the United States is three and a half to nearly four feet in length, measures almost six feet in expansion of wings, and weighs 15 to 40 pounds. The female is somewhat smaller.

The habits of these birds in their native wilds are exceedingly curious. The males, called "gobblers," associate in parties from 10 to 100, and seek their food apart from the females, which either go about singly with their young, at that time about two-thirds grown, or form troops with other females and their families, sometimes to the number of 70 or 80. These all avoid the old males, who attack and destroy the young whenever they can, by reiterated blows upon the skull. But all parties travel in the same direction, and on foot, unless the dog or the hunter or a river on their line of march compels them to take wing. When about to cross a river, they select the highest eminences, that their flight may be more sure, and in such positions they sometimes stay for a day or more, as if in consultation. The males upon such occasions gobble obstreperously, strutting with extraordinary importance, as if to animate their companions; and the females and the young assume much of the same pompous manner, and spread their tails as they move silently around. Having mounted, at length, to the tops of the highest trees, the assembled multitude, at the signal note of their leader, wing their way to the opposite shore. The old and fat birds, contrary to what might be expected, cross without difficulty, even when the river is a mile in width; but the wings of the young and meager, and, of course, those of the weak, frequently fail them before they have completed their passage, when they drop in and are forced to swim for their lives, which they do cleverly enough, spreading their tails for support, closing their wings, stretching out their neck, and striking out quickly and strongly with their feet. All, however, do not succeed in such attempts, and the weaker often perish.

The beginning of March is the pairing season, for a short time previous to which the females separate from their mates, and shun them, though the latter pertinaciously follow them, gobbling loudly. The sexes roost apart, but at no great distance, so that when the female utters a call, every male within hearing responds, rolling note after note in the most rapid succession,—not as when spreading the tail and strutting near the hen, but in a voice resembling that of the tame turkey when he hears any unusual or frequently repeated noise.

Where the turkeys are numerous, the woods from one end to the other, sometimes for hundreds of miles, resound with this remarkable voice of their wooing, uttered responsively from their roosting places. This is continued for about an hour; and, on the rising of the sun, they silently descend from their perches, and

the males begin to strut for the purpose of winning the admiration of their mates.

If the call of a female be given from the ground, the males in the vicinity fly toward the individual, and whether they perceive her or not, erect and spread their tails, throw the head backward, and distend the comb and wattles, shout pompously, and rustle their wings and body-feathers, at the same moment ejecting a puff of air from the lungs. While thus occupied they occasionally halt to look out for the female, and then resume their strutting and puffing, moving with as much rapidity as the nature of their gait will admit. During this ceremonious approach, the males often encounter each other, and a desperate battle ensues, when the conflict is only terminated by the flight or death of the vanquished. The usual fruits of such victories are reaped by the conqueror, who is followed by one or more females, that roost near him, if not upon the same tree, until they begin to lay, when their habits are altered, with a view of saving their eggs, which the male breaks, if he can get at them. These are usually from 9 to 15 in number, sometimes 20, whitish and spotted with brown, like those of the domestic bird. The nest consists of a few dried leaves placed on the ground, sometimes on a dry ridge, sometimes on the fallen top of a dead leafy tree, under a thicket of sumach or briers, or by the side of a log. Whenever the female leaves the nest, she covers it with leaves, so as to screen it from observation. She is a very close sitter, and when she has chosen a spot will seldom leave it, to prevent its being discovered by a human intruder. Should she find one of her eggs, however, sucked by a snake or other enemy, she abandons the nest forever. When the eggs are near hatching, she will not forsake her nest while life remains.

The females are particularly attentive to their young, which are very sensitive to the effect of damp; and consequently wild turkeys are always scarce after a rainy season. The flesh of the wild turkey is much superior to that of the domestic bird; yet the flesh of such of the latter as have been suffered to roam at large in the woods and in the plains is in no respect improved by this partially wild mode of life.

To capture wild turkey, see page 631.

Breeds. The principal breed of turkeys are the White, the Norfolk, black all over, the Cambridge, of all colors, the Bronzed (opposite page), the Buff and the Narragansett, a metallic black. The comparative quality of these breeds are given in tabular form on page 528.

The varieties of the domesticated turkey are not very distinct; and as to their relative value it is, perhaps, difficult to give any decisive opinion. Some suppose the White turkey is the most robust, and most easily fattened. Experience has, however, shown to the contrary. The pure white are very elegant creatures; and though very tender to rear, are not so much so as the white pea-fowl. Most birds, wild as well as tame, occasionally produce perfectly white individuals, of more delicate constitution than their parents. The selection and pairing of such have probably been the means of establishing and keeping up this breed. With all care they will now and then produce speckled birds and so show a tendency to return to the normal plumage. It is remarkable that, in specimens which are in other respects snow-white, the tuft of the breast remains coal-black, appearing, in the hens, like a tail of ermine, and so showing as a great ornament. The head and caruncles on the neck of the male are, when excited, of the same blue and scarlet hues. The bird is truly beautiful, with its snowy and trembling flakes of plumage thus relieved with small portions of black, blue and scarlet. They have one merit—they dress most temptingly white for market; but they are unsuited for miry, smoky or clayey situations, and show and thrive best where they have a range of clean, short pasture, on a light or chalky sub-soil.

The bronze and copper-colored varieties are generally under-sized, and are among the most difficult of all to rear; but their flesh is, certainly, very delicate, and perhaps more so than that of other kinds, —a circumstance, however, that may partly result from their far greater delicacy of constitution, and the consequent extra trouble devoted to their management.

The brown and ash-gray are not particularly remarkable; but the black are decidedly superior, in every respect, not only as regards greater hardiness, and a consequent greater facility of rearing, but as acquiring flesh more readily, and that, too, of the very best and primest quality. Those of this color appear also to be far less removed than the others from the original wild stock. Fortunately, the black seems to be the favorite color of nature; and black turkeys are produced far more abundantly than those of any other hue.

The "American Standard of Excellence" requires Bronze turkeys to weigh 25 pounds and 16 pounds, for the cock and hen, respectively; Narragansett turkeys must weigh 25 pounds and 15 pounds; White turkeys, 20 pounds and 12 pounds; Buff turkeys, 20 and 12 pounds; Black and Slate turkeys, 20 pounds and 12 pounds.

Rearing Turkeys. Turkeys are too large birds for confinement; it is never necessary or beneficial to place them under glass; they are strong, hardy and robust, and require only an open shed to roost under, and a warm, sunny run about the barn or other farm buildings; they will not endure confinement, not even when young, if long continued.

The choice of a cock is very important, inasmuch as the sire gives the stamina of constitution, establishing size and weight, and stamping the plumage with accuracy. It is important, also, to be particular as to the choice of hens; in fact both male and female should possess individual qualities of the highest order as is possible to obtain them. The sire should be large, in full vigor, free from any defect, with a haughty, erect carriage, standing nearly upright when wings are folded, the body balanced on stout legs and carried

BRONZE TURKEY.

well forward, with a round, full, plump bearded breast. The hen should also possess constitutional vigor, a neat trim form, a well balanced body, round full crop and plump breast. She should also have stout legs, be proud in movements, wings folded smoothly against the sides, and carriage upright, quick and active. The turkey cock is good for breeding at two years old, and the hen at one year, but better at two. The cock will last for two years or more, when to prevent too close breeding he should be changed. The mating of such birds, when other conditions are favorable, is usually attended with good results. It would be well to encourage their familiarity so as to induce the hens to resort to and lay in the sheds or prepared nests about the premises, particularly in spring, else the danger is when they steal their nests far from home, their eggs become the prey of skunks and other enemies. Only one visit by the cock is necessary to fertilize all the eggs of the season; but the first 12 or 15 will have the best constitution.

While turkey hens continue to lay, the first lot, say about seven, may be set under common hens and the turkey hen can cover and hatch the rest herself. When they are hatched it is not necessary they should be fed that day. Allow the yolk food taken into the stomach time to perform its natural office. Its chemical action purifies and enriches the blood, and cleanses the digestive channels. All eggs set should be marked, as the hen often lays several after commencing incubation. Turkey cocks that are inclined to destroy the eggs and chicks must be kept away. During incubation, the hen should be removed daily from her nest, to be fed, or to feed, or she will starve. See that she returns within 20 minutes. No one should visit the hatching-house or the nest of the sitting-hen except the regular attendant, else she will be frightened and be made to break some of the eggs. Chicks break from the eggs from the 26th to the 29th day of incubation. If the eggs are in a very dry place, they should be sprinkled with water once or twice a day. The second day before the hatching is expected, feed the hen plentifully, clean the nest, etc., leave a supply of food and water where she can reach it, and then do not disturb her until the chicks are out. Clear away the shells, but never take the chicks away, nor force them to eat. To teach the chicks to peck, have two chicks of the common fowl hatched at the same time with the brood, which may be placed with the young turkeys, and they will teach them. Give them water and milk by touching their beaks with it.

Turkeys hatched and reared by the common hen are more quiet and home-like in their habits, but are never so large and valuable as the birds that hunt their living and gather the sweet, succulent grasses and insects that dwell in the meadow lands. This staying at home gives them a stunt from which they seldom recover. Daily exercise strengthens and spreads the limbs, and gives a broader expanse to the body which is not gained by mere food alone. For all their roving propensities, the turkey is a bird that seeks considerable ease and rest. The first move is to get out of sight and hearing of home; then at midday, or rather as soon as the sun comes out hot and scorching on a summer day, they draw up under the deep shade and rest until toward nightfall, while the home broods with the domestic hen have been on the move from the first rise of day, and continue ever on the alert until sunset.

Turkeys require warm, dry weather, and young turkeys should always be kept out of cold rains. Their house should have a clean board floor. Broods to be wholly successful should never be out of the shell before the first of June, when they will be ready to meet the great harvest of insects that are afloat at this season. It will not answer to put a boy at the business of attending the flocks unless he be an apt one and has a fondness for the occupation or a strong interest therein. As a general thing people raise turkeys at a loss because they are determined to raise them in their own way. Their wills are the strongest, and the birds suffer in flesh while the owners depreciate in pocket. The turkey's way is the best, only we must teach, govern and control the natural habit in a quiet manner, and still not cross the desires of the mother to so great an extent as to cause a restraint which she will not endure.

The first food should be of the same nature as the yolk, as a sudden change might prove fatal. Next should be sour milk boiled to a curd and fed a little at a time and often. As they grow older the curd may be mixed with oatmeal or middlings for a variety. Beets, onions, dandelion tops, etc., cut fine and fed a little at a time will keep them in thrift. Give a little lime occasionally, to prevent diarrhœa. After they are four or five weeks old, buckwheat, crushed corn, or other grains may be given. They should from the time of hatching be kept in a warm, dry and clean place and not be allowed to occupy the bare ground. For this purpose chaff, cut straw or dry sawdust will do. Let them out in the morning after the dew is off the grass, and put them in nights where it is dry and warm.

See that your turkeys come home every night. At first, if you raise them with a turkey mother, you will have to hunt them up and drive them home, but if you feed regularly every morning and always at night they will soon learn to come home regularly as cows. After they have fully feathered, and have thrown out the red on their heads, which usually occurs at about three months, young turkeys are hardy, and may be allowed unlimited range at all times; and from this time on as long as the supply of insects lasts, they will thrive on two meals a day. Keep your turkeys growing right straight from the shell, and you will find that it will pay when pay-day comes. Some farmers, as soon as their young turkeys are feathered up, turn them out to get their own living the best way they can until a few weeks before Thanksgiving, and then stuff them for a few weeks, and wonder why they do not equal in weight those of their neighbor who has kept his turkeys growing all the time from

the day they were hatched. If, however, the market is to be later, say about Christmas, they must not be allowed any more liberty after they are to be fed for market, but rather kept confined as much as possible in darkness, letting in light whenever they are fed.

A farmer frequently wants to know the fair price for turkeys alive, when the price is fixed by the butcher, or by the middleman, who buys for the large city market. New York and Chicago take turkeys simply bled and picked. The New England markets, with better taste, want the crop and entrails out. The average loss in dressing will be about one-fifteenth for the former markets, and about one-tenth for the Eastern markets, a little more for small, immature birds, and a little less for large, well-fattened turkeys. An old gobbler weighing 31¾ pounds alive, after loss of blood and feathers weighs 29½ pounds, losing one-fifteenth; when ready for roasting, 28½ pounds, a loss of about one-tenth. This bird, at 20 cents a pound, would come to $5.70. Sold by live weight at 18 cents it would come to $5.63. This would leave only seven cents for butchering and dressing, which is below the cost. The difference, then, between live and dead weight in turkeys raised for the Eastern market is not over two cents a pound. Lively middlemen ask a deduction of three or four cents. The farmer may as well know that the difference in value is only two cents, and claim it.

To Boil a Turkey. Stuff a young turkey, weighing 6 or 7 pounds, with bread, butter, salt, pepper, and minced parsley; skewer up the legs and wings as if to roast; flour a cloth, and pin around it. Boil it forty minutes, then set off the kettle and let it stand, close covered, half an hour more. The steam will cook it sufficiently. To be eaten with drawn butter and stewed oysters.

To Roast a Turkey. Pluck the bird carefully and singe off the down with lighted paper, break the leg bone close to the foot and hang up the bird and draw out the strings from the thigh. Never cut the breast; make a slit down the back of the neck and take out the crop that way, then cut the neck bone close, and after the bird is stuffed the skin can be turned over the back and the crop will look full and round. Cut around the vent, making the opening as small as possible, and draw carefully, taking care that the gall bag and the intestine joining the gizzard are not broken. Open the gizzard and remove the contents and detach the liver from the gall bladder. The liver, the gizzard and the heart, if used in the gravy, will need to be boiled an hour and a half, and chopped as fine as possible. Wash the turkey and wipe thorougly dry, inside and out; then fill the inside with stuffing, and either sew the skin of the neck over the back or fasten it with a small skewer. Sew up the fowl, fasten it upon a spit, and roast it before a moderate fire three hours. If more convenient, it is equally good when baked. Serve up with cranberry or apple or turnip sauce; squash, and a small Indian pudding, or dumplings, boiled hard, will make a tolerably good substitute for bread.

Dressing for Turkey. Mix thoroughly a quart of stale bread, very finely grated; the grated rind of a lemon; quarter of an ounce of minced parsley and thyme, one part thyme, two parts parsley; and pepper and salt to season. Add to these one unbeaten egg and half a cup of butter; mix all well together and and moisten with hot water or milk. Other herbs than parsley or thyme may be used if preferred, and a little onion, finely minced, added if desired.

To Select Turkeys. See page 966.

Turmeric (tur'mer-ic), an East Indian plant, the root of which is used to dye a lively yellow color, and for medicine. It has a slight aromatic smell and a bitterish, slightly acrid taste. The name "turmeric" has also been applied to blood-root and yellow puccoon.

Turnip. This vegetable belongs to the mustard family of plants, and is therefore characterized by a large proportion of sulphurous and nitrogenous elements of nutrition. The turnip is always both healthy and healthful, affording water which, in its physiological relations, is purer than any that comes from earth or sky. Over nine-tenths of the turnip is purified, "organic" water, and all the nutriment which it contains (less than one-tenth) is appropriated and assimilated by the animal organism, there being nothing deleterious in it to stand in the way. It is therefore good food for both man and beast, although it is counted among the "heavy" articles of diet for man, requiring strong digestive powers, and as food for milch cows it gives a disagreeable flavor to the milk.

Fig. 1.—*Early Flat Red Turnip.*

Cultivation. For an early crop sow as soon as the ground can be worked in the spring in shallow drills 14 inches apart; the ruta-baga 30 inches apart; if dry, give water; as the seed is very fine it should be covered but slightly except in very dry weather. Select a rich old pasture, or other light and if possible new soil, and manure with plaster and ashes, or phosphates; a sprinkling of these substances as the plants are just appearing above ground will also aid in keeping off insects; if, however, insects should eat off the young crop, sow again immediately, or give the matter entirely up for the season. The insects on the under side of the leaves are plant lice. Douche them with a strong suds of whale-oil soap, by the use of a syringe or swab.

The crop may be sown at any time after the weather becomes settled in the spring, but for stock feeding the last half of July will be best suited, both for the convenience of gathering and because the turnip favors cool, moist weather, which the late fall months

furnish. The ways that turnips can be sown and yet not require a special preparation of the land are many. We know a farmer who, after the last hoeing of his potatoes, scatters the seed thinly along the rows, and when the potatoes are dug the dirt is pulled back into the last hill, and the turnips are not disturbed. The fine soil that works down about them rather helps than injures them, and a big crop of turnips usually results. Sowing among the corn is another not objectionable method, for the turnips will not draw very much upon the soil until after the corn is cut up, and the after crop will prove a far more profitable one than planting pumpkins among the corn and far less injurious to the development of the ears. Among root crops, ruta-bagas hold a favorable position, but cannot be sown broadcast with any certainty; and if labor is to be taken into account, the turnip is the crop requiring the least labor. If the turnip is to be fed to stock, it is not necessary to cut off the tops, especially if you have a root cellar where a low, even temperature can be kept, and the green relish of the leaves together with the bulb will cause them to be eagerly devoured. With turnips, fed tops and all to sheep, and a small additional quantity of fodder, either oats or corn, the amount of hay required for a flock of sheep will be very small. If farmers would make up their minds to give this root a trial, their superior feeding qualities would meet with prompt recognition.

Fig. 2.—*Early White Egg Turnip.*

Fig. 3.—*Early Strap-leaved.*

Of the early varieties, thin the plants to six inches apart and the ruta-bagas to one foot. For fall and winter use, the early kinds should be sowed the latter part of July, just before a rain if possible, and the ruta-bagas the latter part of June, using from one to one and a half pounds to the acre. Late turnips can be permitted to grow until the ground freezes in late autumn. As Swedish or Russian turnips and ruta-bagas are synonymous terms, we include their varieties in the following list:

Varieties. Early Strap-Leaf. The best white turnip for table use.

Early Red-Top. Sweet, mild, fine and rapid grower; very early and popular.

Early Wite-Top. Differs from last only in color.

Pomeranian White Globe. Fine, round, thick.

Golden Stone. Yellow flesh, fine, handsome.

Carter's Stone or Stubble. Almost as early as White-Top, but much thicker; handsome.

White Egg. A new variety, large, handsome and a good keeper.

Improved Yellow Globe. Fine for family use or field culture.

Yellow Aberdeen. One of the best for winter and spring use.

Long White Cow-horn. Carrot-shaped, fine-grained and sweet; matures quickly.

Long Red Tankard. Productive; excellent for cattle.

Jersey Navet. Long, growing entirely under ground, is very early, sweet and excellent for table use.

Ruta-Bagas. Hardley's Swede. One of the largest; short-necked; very fine.

American Ruta-Baga. Popular every way.

Large White French. A white ruta-baga.

Sweet German. White, good; a first-rate keeper.

Skirving's Purple-top Ruta-Baga. The standard field variety.

Sutton's Champion. A favorite with stock breeders.

To Cook Turnips. Peel off the outside; if you slice them they will boil sooner; when tender take them up and mash them with butter, or boil and serve them whole.

Turpentine, an oily-resinous substance exuding naturally, or on incision, from pine, larch, fir, etc.

Common Turpentine. The produce of the *Pinus palustris*, pine trees of North Carolina and other States, also from Norway and the north of Europe.

Oil of Turpentine. This is commonly called the spirits of turpentine, and is used very largely in horse and cattle diseases, both for internal administration and external application.

Oil of turpentine is a powerful stimulant, diuretic and antispasmodic, and is therefore used in colic in the horse, in puerperal apoplexy in cows and in general debility in all animals. As an external embrocation, it is very efficient when combined with an equal portion of sweet oil, but very dangerous when applied alone to the skin of the horse. The horse will become restless and in some cases utterly unmanageable.

Dose. The doses of oil of turpentine for horses and cows are from one to two ounces, always mixed with its own bulk of oil, especially for horses. For dogs affected with tape-worm, half to one drachm is the dose, mixed with the yolk of an egg.

Tweed, a light twilled cotton or woolen fabric used for summer clothing.

Twill, a fabric woven with diagonal lines or ribs.

Twitch, in the treatment of horses, is a stick with a looped cord at one end, made for the purpose of twisting up a horse's nose or ear, to keep him quiet during the administration of medicine or a surgical operation.

Typhoid (ti'foid), resembling typhus. See Fever.

Typhus (ti'fus), a continuous fever, lasting usually from two to three weeks, and attended with great prostration and affection of the brain.

U

UDDER, the milk-bag of a cow or other mammal. Its care, treatment, etc., are given in various connections in the articles Cow, Butter and Milking.

Ulcer, a sore discharging a corrosive pus. It is found principally on the natural surfaces of the body, while an abscess is a similar sore in an accidental cavity. There is nothing better for ulcers than to soak them well with warm water. A strong tea made of the narrow dock and taken internally, and used as a wash, is an excellent remedy for old ulcers. Some are cured by the application of astringents. Either one of the following, made into ointment with hog's lard or into washes, is also recommended: Adder's tongue, agrimony, archangel, smartweed, cuckoo pint, blue bottle, burdock, bryony, soapwort, celandine, centaury, chickweed, cinquefoil, comfrey root, mugwort, cudweed, dog grass, water dock, figwort, flax-weed, foxglove, glasswort, ground ivy, ground pine, tormentil, tansy, bugle, scurvy grass and nightshade.

Treatment of Running Sores on the Legs. Wash them in brandy, and apply elder leaves, changing twice a day. This will dry up all the sores, though the legs were like a honey-comb. Or, poultice them with rotten apples. But take also a purge once or twice every week.

Ulcers in the Mouth. If the ulcers are not of a syphilitic origin, a local wash of carbolic acid or permanganate of potassa will speedily cure them,—say 1 part of acid or permanganate to 100 of water. If they are, however, syphilitic, the wash of carbolic acid, perhaps 2 or 3 times as strong, in combination with internal treatment, will be found beneficial; the wash may be used 3 tmes a day.

Umbilicus (um-bil'i-cus), a round cicatrix at the center of the abdominal region; the navel. Umbilical cord, the navel-string.

Umbles (um'blez), the entrails of a deer; hence, sometimes, entrails in general. Called also humbles and nombles (pronounced *num'blz*).

Underdraining. This is a term applied to any covered drains, in which the flow of water may be more or less continuous. These may be made of stone, brush, slabs, boards or any other material, but tile is by far the best. See Draining.

Undershot, moved by water passing underneath: said of a water-wheel, and is the opposite of "overshot."

Underwriter, one who takes the risks of marine insurance.

Universal Joint, a sort of double hinge connecting two rods at an angle, admitting motion in any direction.

Uræmia, a corruption of the blood by the presence of urea, which is an element of urine; or, as we might say in brief, urine in the blood.

Urea, as extracted from urine, is a pearly white substance, in transparent plates, inodorous and of a cool taste; it is very soluble in water or alcohol. It has been used as a diuretic. Uræmia results from some other disease, particularly of the kidneys. These fail to secrete the urine properly, and the latter is unduly retained in the blood. Of course, then, the treatment consists in removing the primary malady. Sweating is the most important process in reducing uræmia, if not even of treating the disease which causes it. Lemonade is a good drink in these affections, and the best medicines are probably cream of tartar and Epsom salts.

Urethra (u-re'thra), the canal through which the urine passes out. Inflammation of the urethra is a very common disease, and is caused by acrid substances in the food or drink, by much riding, by sexual abuse, etc. The most important thing to do, therefore, is to abstain totally from all possible causes,—from everything that might do violence to the parts. On chemical theories many persons, even physicians, will advise taking something to sweeten the urine, as a diuretic potassic salt; some advise other things which affect the urine, while, indeed, almost everything on the face of the earth will affect it. When you get over the trouble the credit of the cure will be claimed for the last drug you took. Don't experiment with drugs.

Urine. The diseases of the urinary system are many, and those which can be treated at home are given in these volumes, as Diabetes, inflammation of the Bladder, Kidneys, Urethra, etc.

Diuretics are drugs which promote the secretion of urine. The best are these: Sweet spirits of niter, 1 fluid-dram, in water; saltpeter, 10 to 30 grains, in powder or solution; acetate of potash, 1 to 2 drams, in water; bi-carbonate of potash, 10 grains to a dram; cream of tartar, 1 to 3 drams; parsley root, 15 grains, in gelatin capsules; Indian hemp, 1 to 2 fluid-ounces of the decoction, twice daily; wild carrot, fleabane, buchu, dandelion, juniper berries, Spanish flies, copaiba, etc.

Usury, excess of interest over the amount allowed by law.

V

VACCINATION (vax-in-a'shun), the inoculation of a person or animal with vaccine virus (the poisonous element of cow-pox) as a safeguard against small-pox, or its fatality in case of attack. We cannot go into a discussion here as to whether vaccination does ward off the dreaded disease of small-pox, or whether the evils or danger of introducing some other disease, as scrofula, is not greater than the benefit derived; for these are points upon which some differ. Suffice it to say, however, vaccination is practiced by most people. Formerly it was only performed on individuals at long intervals, even if at all after the first time, which is usually when a child; but at present, especially in cities, many persons are vaccinated every year or two, and school children are rigidly inspected two or three times during the season. It is claimed that when the vaccination "will take," the subject was not exempt from small-pox, and therefore many persons are repeatedly vaccinated as a test. Often persons are vaccinated five or six times before the desired effect is reached. The exact reason for this is not easily explained.

The operation is usually performed upon the fleshy part of the left arm, between the shoulder and elbow. It may be done by pricking the skin with a lancet and inserting the virus, or cutting several little gashes just through the skin, so that blood will be easily squeezed out, but not run from the wound. The virus is then bound to this or put on, and a piece of court plaster placed over the wound. When the virus from the cow is used, which is undoubtedly the best, the little point upon which it is put should be moistened and then rubbed over the wound until the virus is transferred from it to the flesh. After this the court plaster is placed over the wound, and care should be taken that it be not rubbed off. The third day after the operation the wound appears red and a little swelled. Upon the fifth day a little round or oval vesicle is seen, filled with a transparent fluid. Upon the eighth day the vesicle will have considerably enlarged. Its color is yellow or pearly, with a depression in the center. The skin around its base is reddened. This also extends for some distance over the arm, and a little pain is felt. The shoulder joint is stiff and sore and a lump forms under the arm, which, for a time, will be slightly sore. At this time the scab begins to dry up and in from seven to ten days falls off, leaving a round scar marked with indentations.

The vaccine matter to be employed must be good, and when one is suspicious of its purity, it should not be used. By far the best, and which is becoming in general use, is the points containing the virus from the cow. These must be fresh to be effective. In using virus from the arm of another, it should be only from a very healthy person, and quite young. This may be taken from the pustules between the sixth and eighth day after vaccination. The scab may be preserved for a long time within a piece of beeswax, being thus hermetically sealed.

ANIMAL VACCINATION. This theme is receiving some attention, and indeed is creating a deep interest in agriculture as well as medical circles, because of the prospect it affords of reducing cattle diseases to a minimum. Upon this subject Prof. Pasteur, of France, delivered a lecture before the medical congress in London in August, 1881. Sir James Paget, in thanking him in the name of the medical congress for his address, said that he had done for the lower animals what Jenner did for the human race. France, says Prof. Pasteur, loses every year by splenic fever animals to the value of 20,000,000 francs. In the course of his remarks the eminent Frenchman said:

"I was asked to give a public demonstration of the results already mentioned. This experiment I may relate in a few words. Fifty sheep were placed at my disposal, of which 25 were vaccinated. A fortnight afterward the 50 sheep were inoculated with the most virulent anthracoid microbe. The 25 vaccinated sheep resisted the infection, while the 25 unvaccinated died of splenic fever within 50 hours. Since that time my energies were turned to meet the demands of farmers for supplies of this vaccine. In the space of 25 days we have vaccinated in the departments surrounding Paris more than 20,000 sheep and a large number of cattle and horses. If I were not pressed for time I should bring to your notice two other kinds of virus, obtained by similar means. These experiments will be communicated by and by to the public. I cannot conclude without expressing the great pleasure I feel at the thought that it is as a member of an international medical congress assembled in England that I make known the most recent results of vaccination upon a disease more terrible, perhaps, for domestic animals than small pox is for man. I have given to vaccination an extension which science, I hope, will accept as a homage paid to the merit and the immense services rendered by one of the greatest men of England. I refer to Jenner."

Valerian, a European medicinal plant, the roots of which are used as a nerve stimulant and antispasmodic. Of the infusion the dose is ½ to 2 ounces; of the tincture, 1 dram; of the fluid extract, ½ to 1 dram. The ammoniated tincture is stimulating and antacid, and especially useful in hysterical cases. The valerianate of zinc, 1 grain twice a day, is most valuable in nervous headache. American valerian is the yellow lady's-slipper, which has similar effects, but is inferior to the above.

Valise (va-lees'): see Sachel and page 1254.

Valve, a lid for closing an aperture or passage, so as to open only in one direction.

Vanilla, a plant of tropical America, the capsule of which affords the delicious extract so well known in cookery and confectionery. As a medicine, vanilla is supposed to possess powers analogous to valerian, while at the same time it is far more grateful.

Vapor, the extenuated, gaseous form of a liquid or solid substance. Among the people the word generally denotes vapor of water, while among scientists a definitive phrase must accompany the word; as, "the vapor of alcohol," "the vapor of mercury," "the vapor of iron," "the vapor of water," etc. In a loose and popular sense the word "vapor" may denote any visible, diffused substance floating in the atmosphere, as smoke, fog, or the like. In the plural form, "vapors" has been used in the sense of a nervous disease which causes strange images to float before the mind, as hypochondria, depression of spirits, or the "blues," dejection, spleen, hysteria, etc.

Variety, in natural history, any form or condition of structure under a species which differs in its characteristics from those typical of the species, as in color, shape, size and the like, and which is capable of perpetuating itself for a period, or of being perpetuated by artificial means. A peculiarity, generally abnormal and not capable of perpetuation, is a "sport" and not a variety. Varieties differ from species in that any two, however unlike, will mutually propagate indefinitely, unless they are in their nature unfertile, as some varieties of rose and other cultivated plants; also, in being a result of climate, food or other extrinsic conditions or influences, but generally by a sudden development rather than a gradual one, and in tending in most cases to lose their distinctive peculiarities when the individuals are left to a state of nature, and especially if restored to the conditions which are natural to the typical individuals of the species.

The old way of producing new varieties was by the selection of the best seedlings from year to year. For example, several thousand seeds of the best fruit of the best trees are sown, the next generation several thousand of the best of these, and the next the best of these again, and so on, accompanied by good cultivation. This method with trees is still practiced to some extent, especially in Europe. With garden vegetables and all those plants that have to be propagated by seeds only, this is still the only practicable method. New varieties of potatoes are originated in this way, and are brought to perfection by a few years' propagation from the eyes of the tubers. Van Mons, of Holland, the originator of this method, found that pears, for instance, could be brought to perfection by this method in the fifth generation; other fruits in less time. Out of several thousand seeds planted, but one or two, on an average, will prove of superior quality. In some situations, under the care of some experimenters, there are occasionally several in a thousand; with others, not one in many thousands. Van Mons' theory was, we must subdue or enfeeble the original coarse luxuriance of the tree; and to aid this process, in transplanting young seedlings, we should cut off the tap-root and thereafter annually shorten the leading and side branches, placing the plants also in a crowded situation. In selecting the seeds, we should avoid those of old or grafted trees, and choose those of a tree which is perfecting its fruit rather than one which has finished its career of perfection.

Seedling varieties, as well as seedlings from hybrids (see next paragraph), have a strong tendency to revert to their original wild state; and were it not for our constant practice of selecting the best seed from year to year, all our improved trees and herbaceous plants would in a few years "degenerate" into their primeval wild condition. We use the term "degenerate" in an accommodated sense; for so far as concerns the plant only, its wild condition is its perfect condition, and what we call "improved" is improved only for the abnormal (relatively to the plant) purpose of producing fruit for us to eat.

Cross-Breeding, or Hybridizing. This is the more rapid method of originating and perfecting new varieties, and is practicable with all those species of plants which we propagate otherwise than by seed, as grafting, layering, cuttings, etc. It consists of the following process: When the tree blooms which you intend to be the mother of the improved race, select a blossom or blossoms growing upon it not yet fully expanded; with a pair of scissors cut out and remove all the anthers; the next day or as soon as the blossom is quite expanded, collect with a camel's-hair brush pollen from a full-blown flower of the variety you intend for the male parent, and apply it to the stigma, or point of the pistil, on the other tree. If the trees are exposed to bees or other honey insects, it will be necessary to cover the blossoms with a loose bag of thin gauze, or the insects may get ahead of you in the work of cross-fertilization. Watch the blossoms closely as they open, and bear in mind that the two essential points are, first, to extract the anthers carefully before they have matured sufficiently to fertilize the pistil; and, secondly, to apply the pollen when it is in perfection (dry and powdery) and while the stigma is moist. A very little practice will enable the amateur to judge of this point. For example, if you have an early but insipid and worthless pear, and desire to raise from it a variety both early and of fine

flavor, you should fertilize some of its pistils with the best flavored variety, of a little later maturity. Among the seedlings produced you may look for early pears of good quality, and at least for one or two varieties nearly or quite as early as the female parent and as delicious as the fruit of the other tree.

It is necessary to cross several flowers at once on the same trees or plants, and then select the best resultant.

It is not always by the first fruits of a seedling that it should be judged. Some of the finest varieties require a considerable age before their best qualities develop themselves, as it is only when the tree has arrived at some degree of maturity that its secretions, either for flower or fruit, are perfectly elaborated.

Ornamental plants are multiplied in their varieties by the same process as above described.

There are certain limits to the improvement of plants by the first or seedling method, and to the creation of new varieties by the second or hybridizing method. Some plants yield readily to "domestication," some yield not at all. What is strictly called a cross-bred plant or fruit is a sub-variety raised between two varieties of the same species. There are, however, some species which are so nearly allied as to be capable of fertilizing each other. The offspring in this case is called a hybrid or a "mule," and does not always produce perfect seeds. This power of hybridizing appears to be much more common in plants than in animals. The crossing must be between closely allied species.

The common practice of selecting the seeds of the cucumber or melon nearest the root for propagation, encourages earliness only, while it tends to diminish the size. The best plan, with reference to garden vegetables, is to let all the seeds or fruit on a good plant go on to maturity, and then select from the best.

New varieties are sometimes originated by simple transference to a new climate, and sometimes by disease. The latter are of no importance, and the former are adapted only to the new climate.

Varioloid, (va'ri-o-loid), modified small-pox. The "modification" is said to be caused generally by previous vaccination or inoculation. The symptoms are the same as those of small-pox, but not so violent, the issue not so fatal, and the treatment should be about the same, except that special measures to prevent pitting are not required.

Varnish, any vegetable gum or oil which will harden on exposure to the atmosphere and become impervious to water, as copal, linseed oil, etc. Varnishes may be conveniently divided into two kinds,—spirit and oil varnishes. Concentrated alcohol is used as the solvent of the former, and fixed or volatile oils, or mixtures of the two, for the latter. It is often dissolved in the alcohol to increase its solvent power. The essential oil chiefly employed as a solvent is turpentine, which should be pure and colorless. Pale drying linseed oil is the fixed oil generally used for varnishes, but poppy and nut oil are also occasionally employed. Among the substances employed in the manufacture of varnishes are turpentine, copal, mastich, lac (or "shellac"), elemi, dammar, sandarach, anime and amber, to impart body and luster; benzoin, to impart scent; gamboge, turmeric, saffron, annotto and Socotrine aloes, to give a yellow color; dragon's blood, to give a red tinge; asphaltum to give a black color and body; India rubber, to impart body, toughness and elasticity.

It is not expected that farmers should make their own varnishes. It is much cheaper for them to purchase of the druggist, or other dealer in paints, oils and varnishes, or of a cabinet or carriage maker, or of a painter. Tell him the exact purpose for which you want it, and insist on having the materials fresh from their air-tight reservoirs, so that the varnish will dry readily and thoroughly and be durable. In laying on the varnish, do not work it with the brush as you would paint, but lay it on with as few strokes as possible, even with one stroke, if you can thus make it even. Considerable care will be required in the mixing and laying on, to secure evenness and smoothness. It should not be left in heaps, as it were, in places, so that it will run, nor should the brush be passed over it after it begins to "set," as that roughens it. It sets perceptibly within a second or two, according to the kind of mixture.

Cruder compositions, of tar, asphaltum, lampblack, with linseed oil, for covering farm implements, are often called varnish. For varnishes for harness, see page 639.

Brushes for applying varnish should be cared for with the utmost pains. A good way to keep them is to suspend them by the handles in a covered can, keeping the points at least half an inch from the bottom and apart from each other. The can should be filled with a slow-drying varnish up to a line about a sixteenth of an inch above the bristles or hair. The can should then be kept in a close cupboard, or in a box fitted for the purpose. For keeping the brush over one night or two, however, water will be good enough, in place of the varnish. As wiping a brush on a sharp edge of tin will gradually split the bristles, cause them to turn backward, and eventually ruin the brush, the top of the can should have a wire soldered on and the edge of the tin turned over, or wire substituted in some way for the sharp tin edge. In taking brushes from the can, prepare them for use by working them out in varnish, and before replacing them cleanse the handles and binding with turpentine. Finishing brushes, however, should not be cleansed with turpentine, except in extreme cases.

Vase, a vessel, of various forms and materials, for domestic purposes, and anciently for sacrificial uses; especially, a vessel of antique or elegant pattern for ornaments; also, a solid piece of ornamental marble representing in form an ancient vase. At crockery and notion stores may be found an almost infinite variety of vases for ornamentation of homes.

Veal, the flesh of calves prepared for food. How to dress veal is described on page 963, and how to judge it, on page 965. To prepare calf's head and liver, see page 78. To cook veal, we select the following recipes:

ROAST VEAL. Make a dressing of bread crumbs, chopped thyme and parsley; a little pepper and salt, one egg and a little butter. If too dry moisten with a little hot water. Take a loin of veal, make an incision in the flap and fill it with the stuffing; secure it with small skewers and dredge the veal with a little flour, slightly salted. Bake in a moderate oven and baste often, at first with a little salt and water, and afterward with the drippings in the pan. When done, skim the gravy and thicken with a little brown flour. The breast and shoulder are nice cooked in the same manner; ask your butcher to make incisions for the stuffing. Serve with tomato sauce.

BROWNED VEAL. Put a piece of butter in a covered pan and place into it about three pounds of veal. Choose thick end of shoulder or loin; brown well for at least 20 minutes, sprinkle over a little flour and add some warm water, just to make a little gravy. Add also four slices of lemon, some mace, a little nutmeg, salt and whole pepper-corns. Place two pieces of bacon on the top of the meat, close up tight, and let gently simmer for three-quarters of an hour more. This dish must not boil fast. Take out the meat and strain the gravy over it. Trim with lemon.

VEAL CUTLETS. Let the cutlet be about half an inch thick. Chop some sweet herbs very fine; mix them well with the bread crumbs. Brush the cutlets over with the yolk of an egg, then cover them with the bread crumbs and chopped herbs; fry them lightly in butter, turning them when required. Take them out when done.

Another: Take slices from the broad end of the leg. Fry three or four pieces of salt pork and take them out; wipe the slices of veal dry; put them into the hot fat and fry them a nice brown. Serve with horse-radish.

KNUCKLE OF VEAL. Cut in small, thick slices, season with a little salt and pepper, flour lightly and fry it to a pale brown; then lay it in a saucepan and cover with water. Skim well. Simmer gently for two hours and a half, then thicken the gravy with a little flour and add a piece of butter, and salt to taste. Add a little catsup if desired.

VEAL POT-PIE. Take the neck, the shank or the breast neck of veal; boil them long enough to skim off all the froth. Butter the pot or try out some slices of salt pork; lay in the meat, with salt, pepper and flour; pour in enough of the water in which the veal was boiled to cover it; let it simmer about an hour and a half. Make a crust about 20 minutes before you are ready for dinner, with baking powder, as for biscuit; cut three slits in it, and put it over the top of the pot; let it boil every minute for ten minutes. Dish it immediately before the crust falls.

Vegetable, in science, is any plant, from the tree down to the microscopic organism, which grows by the assimilation of inorganic matter; in the culinary art and in dietetics, the word generally denotes those plants of which we eat the leaves, stems or roots, as cabbage, asparagus and sweet potato. In this sense it is understood that all vegetable articles of food are distinguished into "fruits, grains and vegetables." Melons, pumpkins, cucumbers, tomatoes, the fruit of the egg-plant, etc., might be denominated vegetable fruits, and peas and beans, vegetable grains.

In the proper places throughout this Encyclopedia are described at full length the raising, preserving, cooking, etc., of each vegetable.

Vegetable Oyster, salsify. See page 1110.

Vehicle (ve'hi-cl), any kind of carriage, cart, wagon or sleigh, considered as a thing in which goods or persons are carried.

Vein (vain), a blood canal in animal bodies, leading toward the heart. The blood in them is of a darker color than the arterial blood, and is not thrust along by pulsations, like the latter.

Velvet. This is certainly one of the richest of the silken fabrics. Its origin is not known, but it has been made in Europe for centuries. At first, its manufacture was confined to Italy, where, and also in Genoa, it was carried to great perfection. The manufacture then reached France, and afterward England. The name comes from the French *vellour*, which is derived from *velu*, covered with hair. Velvet is distinguished from every other kind of cloth by the soft *pile* on the surface, from which its great beauty results. It has this pile in addition to the usual warp and weft which it has in common with plain fabrics. The pile is occasioned by the insertion of short pieces of silk thread doubled under the weft, and which stand upright on its upper surface in such a multitude, and so crowded together, as entirely to conceal the interlacings of the warp and weft.

HOW TO CLEAN WHITE VELVET. If cut or unsewed velvet, take light bread crumbs that are perfectly free from grease; spread your velvet smoothly on a stand or table, and rub the crumbs over it all one way. Uncut velvet cannot be cleaned in this way.

TO RAISE THE PILE ON VELVET. Hold the velvet over a basin of hot water with the lining of the dress next to the water. The pile will soon rise. Or, heat an iron and cover it with a damp cloth, and hold it under the velvet on the wrong side. The steam will penetrate the velvet, and the pile can be raised with a brush.

Velveteen, an imitation of velvet in cotton. It is of various colors and much used for the same purposes as velvet, being much cheaper.

Velvet-Leaf, Indian Mallow, which see.

Veneer (ve-neer') to overlay or plate with a thin layer of wood or other material for outer finish or

decoration; as, to veneer a piece of furniture with mahogany or white walnut.

Venison (ven'i-zn or ven'zn), the flesh of game animals, especially the deer: used only in the latter sense in this country. It is prepared for the table as beef is prepared, but the following recipes are especially excellent:

ROASTED VENISON. A leg of venison should be roasted for an hour and a half if eaten on blazers; if on hot plates, three hours. The dry skin should be taken off before roasting with the fingers, not with a knife. The spit should be turned very often; when half done it should be basted with flour, butter and red wine, very frequently until done.

A SADDLE OF VENISON. A saddle of venison is much the best piece of the deer. It requires but half the time to roast this that it does the leg, for it is a much thinner piece. Dressed in the same manner as the leg.

A VENISON STEAK. Cut steaks from the leg an inch or three-quarters of an inch thick, broil them about five minutes; season with pepper, salt and butter. A cupful of the roast venison gravy, very hot, is nice poured over it; or half a cup of red wine, and half a cup of current jelly, thickened with a little flour and butter, boiled up and turned over the steak. It should be served very hot.

Ventilation, renewing the air of an apartment, hall, building or other enclosed place. See Hygiene, Residence, Barn, etc.

Veranda, a kind of open portico, formed by extending a sloping roof beyond the main building.

Verbena, one of the most popular flowers, both in the house and in the garden. There are several species and a great multitude of varieties. Several wild species prevail in this country, and are known as "vervain," a corruption of the word "verbena." The vervains are uninteresting weeds. In some localities they hybridize thoroughly. A "rust," caused by a microscopic insect, sometimes attacks verbenas, petunias, heliotropes, etc., and may be remedied either by water heated to 120° Fahr., or by syringing with a solution of half a pint of coal oil in two or three gallons of water.

Verdigris, (ver'di-grees), the bi-basic acetate of copper, a green, greasy substance formed on copper or brass vessels by contact with vegetable acids. It is poisonous, and has been employed as a medicine, as indeed has almost every other poisonous and filthy substance in existence, or that could be made by the art of man. Impure verdigris is sometimes used for a green paint. For treatment of one who is poisoned by it, see Vitriol.

Verjuice, the sour juice of crab-apples, of unripe grapes, apples, etc.; also, a kind of vinegar made from such juice.

Vermicelli (ver-mi-sel'ly) the flour of a hard, small-grained wheat made into dough, and forced through cylinders or pipes till it takes a slender, worm-like form. It is used chiefly in soups.

Vermifuge, expelling worms, that is, from the intestinal canal; said of medicines, as wormseed, tansy, pink-root and senna, male fern, pumpkin seed, cowhage, santonica, etc. See Worms.

Vermin, a mischievous animal; especially, noxious little annimals, including insects, as rats, mice, squirrels, minks, weasels, worms, flies, larves, lice, etc. See respective insects and animals, and the animal or object infested, and remedies, pages 865 and 870.

Vertebra (ver'te-bra; plural, vertebræ), a joint of the back-bone. "Vertebral column," the back-bone. "Cervical vertebræ," the bones of the neck,—7 in number, in man; the next 12 vertebræ are the "dorsal;" the next 5 are the "lumbar," in the region of the loins; and the last two, in the adult, are the *sacrum* and *os coccygis*.

Vertigo (ver'ti-go), swimming of the head; giddiness; dizziness. See Giddiness, page 570, and Headache.

Vesicle (ves'i-cl), a bladder-like vessel; a membranous cavity or watery pimple; a cyst; a cell. Vesicular eruptions characterize several contagious fevers and skin diseases.

Vetch, the name of several species of wild bean-like plants, good for fodder. Some species are cultivated in Europe.

Veterinarian (vet-er-in-a'ri-an), one skilled in the diseases of horses, cattle, sheep, hogs, etc.

Vial, a small bottle. "Phial" (pronounced fi'al) is an old form of this word.

Vices, of horses. See page 711.

Vine, a climbing or trailing plant. When unqualified the word denotes the grape-vine alone.

Vine-chafer, an insect infesting the grape See article Grape, and page 864.

Vinegar, literally, sour wine; in present usage, a fermented solution of sugar This fermentation is called "acetous," to distinguish it from the first stage of decomposition, called "alcoholic fermentation." A mixture of the natural acids contained in sour fruits and acetic acid, which is the base of vinegar, is superior to any pure vinegar as a condiment, though it may not make as good a preservative. It is likely that natural vegetable acids, citric and malic, for instance, will in the near future largely take the place of vinegar for table use.

Many otherwise intelligent persons are apparently entirely ignorant of the principles involved in the manufacture of vinegar from the substances farmers generally convert into it. They have cider, wine, or other fruit juices, and they desire to make vinegar out of them. They have noticed that these substances are sometimes converted into vinegar without apparent trouble, and they do not take

the trouble to examine into the conditions most favorable for effecting the desired change. They sometimes leave cider in close barrels in a cool cellar during several years and wonder that it does not change into sharp vinegar, as they have known the same substance to do in the possession of other people. They are presumedly ignorant of the fact that quite a high temperature and the presence of a large amount of air are necessary to change cider into vinegar. The sweetish alcohol which the cider or wine contains needs to receive an additional amount of oxygen from the air in order to become changed into vinegar. A man once kept two barrels of cider in the cellar two years, and it would not make vinegar. A friend told him to let it run through the open air. He did so, and in three days he had the strongest kind of vinegar.

The sourness of vinegar is ordinarily due to acetic acid, the latter constituting four to five per cent. of good vinegar. Vinegar made from wine contains also a little tartaric acid, and a minute quantity of acetic ether, which gives it a pleasant aroma. That made from cider contains also a small proportion of malic acid.

To Make Vinegar from Cider. The better the cider or other liquid that is exposed to the atmosphere, and the higher the temperature, provided it is not so high as to cause rapid evaporation, the quicker will the desired change take place. Cider kept in full, tight barrels and stored in a cool cellar may become converted into a tolerably strong vinegar, but a very long time will be required to bring about the change. If a vent is left in the barrel, or the bung is out, and some of the contents of the barrel is occasionally drawn out, the change will be much more rapid. If the barrel is removed from the cellar and occasionally moved from side to side, the conversion of the contents into vinegar will be much more speedy.

In all large establishments for making vinegar there are arrangements whereby the material is exposed over a large surface or a large amount of air is made to pass through the material. The temperature of the room where the operations are carried on is kept at the point most favorable for the union of oxygen with the alcohol of the liquid. It is not economical, however, to procure apparatus of this kind in cases where only a few barrels, or a single barrel, of cider or other material are to be converted into vinegar. It is cheaper in such a case to allow the operation to go on slower, and to dispense with the use of apparatus that costs considerable money and occupies a considerable space. In the opinion of many, vinegar made by the slow process gives a somewhat better flavor and is less likely to become cloudy than that made by any of the quick processes. A shed open on the south side furnishes a favorable place for generating vinegar. The generating barrels in a building or on the open ground should rest on supports raised at least a foot from the surface of the earth. They should not be more than two-thirds filled, as by leaving considerable space above the liquid there is a larger surface exposed to the action of the air. The bungs should be taken out of the vessels, and to prevent insects from entering them the holes should be covered with wire gauze or netting. If holes are bored in the ends of the barrels near the chine, that is, on a line with the bung, more air will enter, and the process of conversion into vinegar will go on faster.

If a few quarts of hot, strong vinegar be poured into a barrel and well shaken about before it is filled with cider, it will aid the generating process. The occasional addition of a small amount of strong vinegar to the contents of the barrel will favor the change into vinegar. The French, who are celebrated for making fine vinegar by the slow process, practice drawing off a portion of the contents of one vessel that has become quite sour and adding it to a barrel whose contents is still tolerably sweet.

From Brown Sugar. To ten gallons of rain-water add $1 worth of sugar; add one quart of good vinegar to this, and set it in a warm place. In three or four weeks you will have first-class vinegar.

From Molasses. To eight gallons of clear rain-water, add three quarts of molasses; turn the mixture into a clean, tight cask, shake it well two or three times, and add three spoonfuls of good yeast, or two yeast cakes; place the cask in a warm place, and in ten or fifteen days add a sheet of common wrapping paper, smeared with molasses and torn into narrow strips, and you will have good vinegar. The paper is necessary to form the "mother," or life, of the vinegar.

From Acetic Acid and Molasses. Acetic acid 4 lbs.; molasses, 1 gal.; put them into a 40-gallon cask, and fill it up with rain-water; shake it up and let it stand from one to three weeks, and the result is good vinegar. If this does not make it as sharp as you like, add a little more molasses.

From Honey. Put into warm water honey enough to make it a little sweeter than coffee is sweetened at table; tie a cloth over the top of the vessel and place on a bench out of doors in the sun; in four to six weeks it will be sharp vinegar.

From Potatoes. Boil potatoes, drain off water, add one pound sugar, two and one-half gallons of water, and a little hop yeast or whisky. It is sour in a short time.

Some claim that all that is necessary to make good vinegar is sweetened water, hot weather, frequent stirring, and air.

Vineyard (vin'yard), a yard for raising grapes.

Vinous (vi'nus), containing wine, or the aroma of wine.

Virus (vi'rus), in modern medical science, a morbid poison, as the specific contagion of small-pox, syphilis, etc.

Viscus (plural, vis'ce-ra), one of the organs contained in the great cavities of the body; any one of the contents of the cranium, thorax or abdomen; in

the plural especially applied to the intestines and other organs in the abdomen.

Vise, an aparatus for griping and holding things, closed by a screw. A cut of a convenient anvil and vise together is given on page 23.

Vitriol, a soluble sulphate of either of the metals; also, sulphuric acid, popularly so-called. "Blue vitriol," or "bluestone," is the sulphate of copper; "white vitriol," the sulphate of zinc; "green vitriol," copperas, or the green photo-sulphate of iron; "red vitriol." or "vitriol of Mars," the flesh-colored sulphate of iron; cobalt vitriol is also called "red vitriol." The "oil of vitriol" is sulphuric acid, so-called because it makes no noise when poured from one vessel into another.

POISONING FROM BLUE VITRIOL. The effects are, an acid, rough, disagreeable taste in the mouth; a dry, parched tongue, with sense of strangling in the throat; coppery eructations; frequent spitting; nausea; frequent desire and effort to vomit, or copious vomiting; severe darting pains in the stomach; griping; frequent purging; belly swolen and painful; skin hot, and violent burning thirst; breathing difficult; intense headache and giddiness, followed by cold sweats, cramps in the legs, convulsions, and death. Give white of eggs mixed with water (12 to one pint), to be given in wine-glassfuls every two minutes; or give sugar and water, or iron filings mixed with water, or very strong coffee, accompanied by small and repeated doses of castor oil. Other antidotes are bark, alkalies, gall nuts. *Treatment:* If there is much pain in the belly or stomach, apply leeches. Give large draughts of milk and water to encourage vomiting.

POISONING FROM WHITE VITRIOL. The effects are, an astringent taste, sensation of choking, nausea, vomiting, purging, pain and burning in the throat and stomach, difficult breathing, pallor and coldness of the surface, pinched face, cramps of the extremities, but, with the exception of the chloride of zinc, seldom death. For the two first give copious draughts of milk, and white of eggs and water, mucilage, and olive oil; for the third, carbonateof soda, and warm water in frequent draughts, with the same as for the other compounds. *Treatment:* Relieve urgent symptoms by leeching and fomentations, and for the vomiting give castor oil. For the chloride, use frictions and warmth.

Vomiting, TO ALLAY. Take sips of hot water, coffee, tea, or of any other hot drink which the patent likes best.

TO PRODUCE. Take salt and tepid water, as much as the patient can drink; or lukewarm water, a pint or more, accompanied, if necessary, by tickling the fauces (inside of the throat) with the finger or a feather; or tincture of lobelia, a dram of a solution of two ounces to the pint; wine of ipecacuanha (1 ounce to the pint), $\frac{1}{4}$ to $\frac{1}{2}$ ounce; tartar emetic, 1 grain; alum, 1 to 2 teaspoonfuls of the powder (especially good in croup); white vitriol, 30 grains; blue vitriol, 3 to 5 grains.

W

WAFER, a thin cake or leaf of flour and other ingredients, baked for eating; also, a small, round bit of colored paste, dried, formerly used in sealing letters.

Waffle (wofl), from same root as "wafer," and signifying a thin cake rolled out and baked hard, or a soft indented cake baked in a waffle-iron on coals.

TO MAKE WAFFLES. Take one quart of sour milk, three eggs, a little salt, flour enough to make a thick batter; rub a piece of butter in the flour the size of an egg before stirring it in, or the waffles will be tough; beat the eggs separately, stirring the whites in the last thing; one teaspoon of soda, and they are ready for the waffle-irons—to be eaten with butter or sugar, or anything else that will suit the taste. The irons must be buttered or greased with lard.

Wages. Below we give tables for computing wages by the week and month.

TABLE OF WAGES BY THE WEEK, COMPUTED ON A BASIS OF TEN HOURS LABOR PER DAY.

H'rs.	$1.00	$1.50	$2.00	$2.50	$3.00	$3.50	4.00	$4.50	$5.00	$5.50	$6.00	$6.50	$7.00	$8.00	$6.00	$10.	$11.	$12.
½	01	01¼	01¾	02	02½	03	03⅓	03¾	04⅛	04½	05	05½	06	06⅔	07½	08⅓	09	10
1	01⅔	02½	03⅓	04¼	05	06	06⅔	07½	08⅓	09⅛	10	11	11⅔	13⅓	15	16⅔	18⅓	20
2	03¼	05	06⅔	08¼	10	11⅔	13⅓	15	16⅔	18⅓	20	21⅔	23⅓	26¾	30	33⅓	36¾	40
3	05	07½	10	12½	15	17½	20	22½	25	27½	30	32½	35	40	45	50	55	60
4	06¾	10	13⅓	16¾	20	23⅓	26¾	30	33⅓	36¾	40	43⅓	46¾	53¼	60	66¾	73⅓	80
5	08⅓	12½	16¾	21	25	29⅛	33⅓	37½	41¾	46	50	54⅛	58⅓	66¾	75	83⅓	91¾	1 00
6	10	15	20	25	30	35	40	45	50	55	60	65	70	80	90	1 00	1 10	1 20
7	11¾	17½	23¼	29⅛	35	41	46¾	52½	58¼	64⅛	70	76	81¾	93¼	1 05	1 16¾	1 28¼	1 40
8	13¼	20	26¾	33¼	40	46¾	53¼	60	66¾	73¼	80	86¾	93¼	1 06¾	1 20	1 33¼	1 46¾	1 60
9	15	22½	30	37½	45	52½	60	67½	75	82½	90	97½	1 05	1 20	1 35	1 50	1 65	1 80
Days.																		
1	16¾	25	33½	41¾	50	58¼	66¾	75	83¼	91¾	1 00	1 08¼	1 16¾	1 33¼	1 50	1 66¾	1 83¼	2 00
2	33¼	50	66¾	83¾	1 00	1 16¾	1 33¼	1 50	1 66¾	1 83¼	2 00	2 16¾	2 33¼	2 66¾	3 00	3 33¼	3 66¾	4 00
3	50	75	1 00	1 25	1 50	1 75	2 00	2 25	2 50	2 75	3 00	3 25	3 50	4 00	4 50	5 00	5 50	6 00
4	66¾	1 00	1 33¼	1 66¾	2 00	2 33¼	2 66¾	3 00	3 33¼	3 66¾	4 00	4 33¼	4 66¾	5 33¼	6 00	6 66¾	7 33¼	8 00
5	83¼	1 25	1 66¾	2 08¼	2 50	2 91¾	3 33¼	3 75	4 16¾	4 58¾	5 00	5 41¾	5 83¼	6 66¾	7 50	8 33¼	9 16¾	10 00
6	1 00	1 50	2 00	2 50	3 00	3 50	4 00	4 50	5 00	5 50	6 00	6 50	7 00	8 00	9 00	10 00	11 00	12 00

EXPLANATION.—The figures at the top of the columns show the rate per week, while the figures in the columns indicate the amount per hour or per day. Thus if it is desired to find the amount per hour when working for $6 per week, we commence with the figure 1, in the left hand column under the head of "hours," and trace towards the right till we reach the column headed by $6, where we find 10 cents, the equivalent of one hour's labor at $6 per week. In like manner we find the price of several hours, one day, or several days.

TABLE OF WAGES BY THE MONTH, SHOWING THE AMOUNT OF WAGES FOR ANY NUMBER OF DAYS FROM 1 TO 26, AT ANY PRICE PER MONTH FROM $3 TO $28.

Days.	$3.	$4.	$5.	$6.	$7.	$8.	$9.	$10.	$11.	$12.	$13.	$14.	$15.	$16.	$17.	$18.	$19.	$20.	$22.	$24.	$26.	$28.
1..	12	15	19	23	27	31	35	38	42	46	50	54	58	62	66	69	73	77	84	92	1 00	1 08
2..	23	31	39	46	54	62	69	77	85	92	1 00	1 08	1 15	1 23	1 31	1 38	1 46	1 54	1 70	1 84	2 00	2 15
3..	35	46	57	69	81	92	1 04	1 15	1 27	1 38	1 50	1 62	1 73	1 85	1 96	2 08	2 19	2 31	2 54	2 74	3 00	3 23
4..	46	62	77	95	1 07	1 23	1 38	1 54	1 69	1 85	2 00	2 15	2 31	2 46	2 62	2 77	2 92	3 08	3 38	3 70	4 00	4 31
5..	58	77	96	1 15	1 34	1 54	1 73	1 92	2 12	2 31	2 50	2 69	2 88	3 08	3 27	3 46	3 65	3 85	4 24	4 62	5 00	5 38
6..	69	83	1 15	1 38	1 62	1 85	2 08	2 31	2 54	2 77	3 00	3 23	3 46	3 69	3 92	4 15	4 38	4 62	5 08	5 54	6 00	6 46
7..	81	1 07	1 34	1 62	1 88	2 15	2 42	2 69	2 96	3 23	3 50	3 77	4 04	4 31	4 58	4 85	5 12	5 38	5 92	6 46	7 00	7 54
8..	92	1 23	1 54	1 84	2 15	2 46	2 77	3 08	3 38	3 69	4 00	4 31	4 62	4 92	5 23	5 54	5 85	6 16	6 76	7 38	8 00	8 62
9..	1 04	1 38	1 73	2 07	2 42	2 77	3 12	3 46	3 81	4 15	4 50	4 86	5 19	5 54	5 85	6 23	6 58	6 92	7 62	8 30	9 00	9 69
10..	1 15	1 54	1 92	2 31	2 69	3 08	3 46	3 85	4 23	4 62	5 00	5 38	5 77	6 15	6 54	6 92	7 31	7 69	8 46	9 24	10 00	10 77
11..	1 27	1 69	2 12	2 54	2 96	3 38	3 81	4 23	4 65	5 08	5 50	5 92	6 35	6 77	7 19	7 62	8 04	8 46	9 30	10 16	11 00	11 85
12..	1 38	1 84	2 31	2 77	3 23	3 69	4 15	4 62	5 08	5 54	6 00	6 46	6 92	7 38	7 85	8 31	8 77	9 23	10 16	11 08	12 00	12 92
13..	1 50	2 00	2 50	3 00	3 50	4 00	4 50	5 00	5 50	6 00	6 50	7 00	7 50	8 00	8 50	9 00	9 50	10 00	11 00	12 00	13 00	14 00
14..	1 62	2 15	2 69	3 23	3 77	4 31	4 85	5 38	5 92	6 46	7 00	7 54	8 08	8 62	9 15	9 69	10 23	10 77	11 84	12 92	14 00	15 08
15..	1 73	2 31	2 88	3 46	4 04	4 62	5 19	5 77	6 35	6 92	7 50	8 08	9 05	9 23	9 81	10 38	10 96	11 54	12 70	13 84	15 00	16 15
16..	1 85	2 46	3 08	3 69	4 31	4 92	5 54	6 16	6 77	7 38	8 00	8 62	9 23	9 85	10 46	11 08	11 69	12 31	13 54	14 74	16 00	17 23
17..	1 96	2 61	3 27	3 92	4 58	5 23	5 [illegible]	6 54	7 19	7 85	8 50	9 15	9 81	10 46	11 12	11 77	12 42	13 08	14 38	15 70	17 00	18 31
18..	2 08	2 77	3 46	4 15	4 84	5 54	6 23	6 92	7 62	8 31	9 00	9 69	10 38	11 08	11 77	12 46	13 15	13 85	15 24	16 62	18 00	19 38
19..	2 19	2 93	3 62	4 38	5 11	5 85	6 58	7 31	8 04	8 77	9 50	10 23	10 96	11 69	12 42	13 15	13 88	14 62	16 08	17 54	19 00	20 46
20..	2 31	3 07	3 84	4 61	5 38	6 15	6 92	7 69	8 46	9 23	10 00	10 77	11 54	12 31	13 08	13 85	14 62	15 38	16 92	18 46	20 00	21 54
21..	2 42	3 23	4 04	4 84	5 65	6 46	7 27	8 08	8 88	9 69	10 50	11 31	12 12	12 92	13 73	14 54	15 35	16 16	17 76	19 38	21 00	22 61
22..	2 54	3 38	4 23	5 07	5 92	6 77	7 61	8 46	9 31	10 15	11 00	11 85	12 69	13 54	14 38	15 23	16 08	16 92	18 62	20 30	22 00	23 69
23..	2 65	3 54	4 42	5 31	6 19	7 08	7 96	8 85	9 73	10 62	11 50	12 38	13 27	14 15	15 04	15 92	16 81	17 69	19 46	21 24	23 00	24 77
24..	2 77	3 69	4 61	5 54	6 46	7 38	8 31	9 23	10 15	11 08	12 00	12 92	13 85	14 77	15 69	16 62	17 54	18 46	20 30	22 16	24 00	25 85
25..	2 89	3 84	4 81	5 77	6 73	7 69	8 65	9 62	10 58	11 54	12 50	13 46	14 42	15 38	16 35	17 31	18 27	19 23	21 16	23 08	25 00	26 92
26..	3 00	4 00	5 00	6 00	7 00	8 00	9 00	10 00	11 00	12 00	13 00	14 00	1500	16 00	17 00	18 00	19 00	20 00	22 00	24 00	26 00	28 00

EXPLANATION.—The figures at the right of the columns indicate the days of the month, there being 26 working days in the month, while the figures at the top gives the wages by the month. To find the amount for any given number of days, trace to the right from the number of days in the first column till you come to the column indicating the amount of wages, and that will be the amount of wages for the given number of days. For example, to find the amount of wages due for 13 days work at $16 per month: Find 13 in the column of days and trace to the right until you come to the column headed by $16, where we find $8, being the proper amount of wages for 13 days at $16 per month. Parts of days are computed by dividing the wages for one day, as shown at the top of the column which indicates the monthly wages paid. Wages other than those indicated are found by combining the amounts in the table. For instance, if for $30 a month just combine the $20 and $10 columns, or take three times the $10 column, etc.

Wagon. In the article Carriage we have treated of the various parts of such vehicles and the quality of material and workmanship that should be used and employed in their construction. These remarks in many respects equally apply to the wagon. It is therefore unnecessary to repeat such observations here. Every farmer should have a good, easy-running wagon and keep it at all times in fine order. The time thus saved in doing his teaming, to say nothing of the easy draft and comfort of an easy-going vehicle, will more than compensate him for the little extra care and attention required to keep it in proper condition. Besides some very extensive wagon manufactories here and there over the country, these vehicles are constructed to a greater or less extent in almost every village in the land. There have been some improvements of different parts during the past few years, but the general design is to combine lightness, and consequently easy running, with strength. Among other improvements that have been made is the Mortensen's circle-holder, or post, as shown by Fig. 2, which explains itself Among the numerous locks, or breaks, that have been invented, perhaps the one shown by Fig. 3, Hurlbut's patent, is the best.

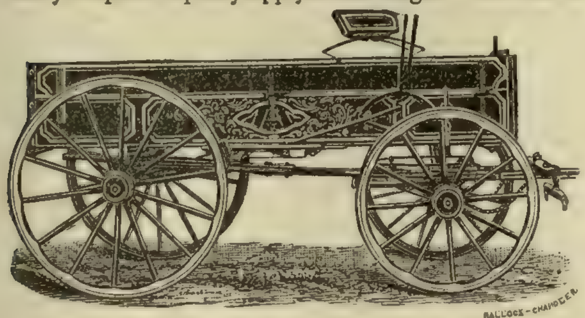


FIG. 1.—*Farm Wagon.*

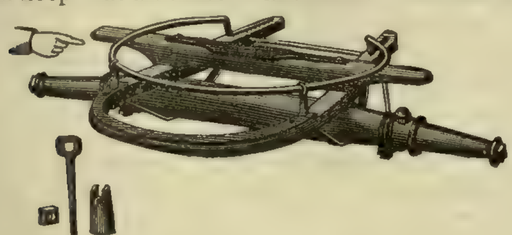


FIG. 2.—*Circle Holder or Post.*

FIG. 3.—*Lock with Whip Socket.*

GAUGE. The width of wagons in this country vary all the way from four feet, eight inches, to five feet, two inches, each section having some one gauge which prevails there. In clayey countries, where the roads are constantly inclined to work into hard ruts, it is very necessary that a teamster, in purchasing a wagon, should select one having the gauge which prevails in his community; and when intending to take a long journey with a wagon, it is of real importance to ascertain, if possible, what gauge prevails along his route, and obtain a wagon adapted to it. It would be a good thing to have but one gauge for the whole continent of America.

CAPACITY OF WAGON BEDS. Where the capacity of the wagon-beds is not indicated on the bed it may be found by the following rules:

If the opposite sides are parallel, multiply the length inside in inches, by the breadth inside in inches, and that again by the depth inside in inches, and divide the product by 2150.42 (the number of cubic inches in a bushel), and the quotient will be the capacity in bushels.

Should the head and tail boards, or either of them, be set in beveling, add the top and bottom lengths together and divide by 2 for the mean length, and proceed by the foregoing rule. Should the sides be sloping, add the top and bottom widths, and divide by 2 for the mean width, and proceed by the foregoing rule.

Should the contents be required in cubic feet, divide the product by 1728 (the number of cubic inches in a cubic foot), instead of 2150.42, and the quotient will be the contents in cubic feet.

TIRE. Teamsters and farmers generally prefer to have a blacksmith tighten their wagon tires; but when this task is undertaken by themselves, they must take care not to enlarge the fellies too much, else they will too much dish, and therefore weaken, the wheel. All tires should be bolted on, with eight bolts to the wheel. As soon as a tire is seen to become loose when on the road, it should be temporarily wedged with numerous thin pieces of wood, until an opportunity is obtained for more permanent repairs.

Tires three or four inches broad are advocated by many intelligent persons for use on clay roads.

SEAT. Spring seats generally go with new wagons from the manufactories, but by ill usage or otherwise they often become almost or quite worthless. The cheapest and best home-made spring seat we have seen is made by placing two or three thin but strong boards over one another, with cross-pieces between screwed on as far from being opposite one another as possible.

TO GREASE WAGONS. But few people are aware that they do wagons and carriages more injury by greasing too plentifully than in almost any other way. A well made wheel will endure common wear from ten to twenty-five years, if care is taken to use the right kind and proper amount of grease; but if this matter is not attended to, they will be used up in five

or six years. Lard should never be used on a wagon, for it will penetrate the hub and work its way out around the tenons of the spokes, and spoil the wheel. Tallow is the best lubricator for wood axletrees, and castor oil for iron. Just enough grease should be applied to the spindle of a wagon to give it a light coating; this is better than more, for the surplus put on will work out at the ends, and be forced by the shoulder bands and nut washers into the hub around the outside of the boxes. To oil an iron axletree, first wipe the spindle clean with a cloth wet with spirits of turpentine, and then apply a few drops of castor oil near the shoulder and end. One teaspoonful is sufficient for the whole.

Wagons are in market made with an oil tube in the axletree, near the base of each spindle and communicating with it, into which oil or soft grease can be deposited, as a source of supply during the use of the wagon. The tube has a little cap, to keep out the dirt, and this can be readily taken off and put on, as it is spiral, like those of kerosene cans. This contrivance is the same in principle as rules amongst all machinery, and is a great convenience, as it saves the trouble of taking off the wheels.

Wagon Jack. Many teamsters are so negligent as to have no convenience for raising the axles when the wheel is to be taken off, but resort to a rail and stick. Two boards, one fixed by a notch or hinge as a lever upon the other, need not weigh but three or four pounds, and should always be at hand. It is as simple to make as a figure-4 trigger for a quail trap. There should, of course, be adjustments, one for each axle; and the outer end of the lever board, or stick, can be held down by a cord extending from it down to the foot of the perpendicular board. By a little skill the two boards or pieces may be so adjusted together that the axle can be thrown a little over the end of the perpendicular board, toward you, so that it will hold itself without any cord. In this case, one piece should have a curve at the end to hold the axletree.

Wagon-Sheds. In the article on Barn, the designs of many of the buildings include wagon and carriage sheds, to which we refer the reader, but we desire to make a few observations of especial character in this connection. Every farm should be provided with a wagon-shed. This may be a plain building, but should be closely boarded and lined, and always kept well shingled. The size will depend upon the number of wagons and carts which are used on the farm. The ground-floor should be reasonably tight, and the floor over the wagons should be lined so as to prevent the entrance of dust into the lower room. Many sheds are left open in front, but we think it better to have doors. Certainly the sheds in which the nice wagons, carriages and robes are kept (which should always be separated by a close partition from the rest of the building) should have doors which can be locked, and in which things can be safely kept. This building should be raised but little above the surface of the ground, as it would be hard work to draw in the wagons if it were much higher than the land around it.

For a small farm a building 36 feet long, and 28 feet wide, with a partition running through it lengthwise two feet one side of the center, will answer very well. This will give one room 36x16 feet, which will be enough for 5 wagons or carriages, with room to pass between them in getting in and out, and another room 36x12 feet, which can be used for the storage of the mowing-machine, hay-tedder, horse-rake, plows, harrows, shovels, and other tools. It is best to have a partition dividing each of these rooms. In one corner a room 14 feet wide, inside of the posts, may be done off for the best wagon and top-carriage. This should be at least eight and a half feet high, so that it will take in a high carriage without letting down the top. If it is desired to save all possible expense, the other rooms, in which tools and wagons are kept, may be left open in front, but it is much better that the whole building should be enclosed. The height of these rooms need not exceed seven feet, and should not fall much below that figure. If such a building contains more room than is desired for the purposes named, the remainder may be utilized for a horse-stall.

The posts for this building should be 13 feet long. This is because the ground size proposed needs this height, in order to make a well-proportioned building, and also because the cost will be but a trifle more than it would if short posts were used, while the loft which will be found very useful, cannot be secured of suitable size without posts of about this length.

Wainscot, a wooden lining or boarding of the walls of apartments, made in panels. Imitation of such work by painting or calcimining is also called "wainscot," or "wainscoting," at the present day,—sometimes improperly called "dado."

Waistcoat, old name for vest: still in use in England. In this country the word "waistcoat" is sometimes used for an under-garment; as, a "flannel waistcoat."

Waiter, one who waits upon, as at table; a server or salver; a vessel on which something is carried, as dishes of victuals. A "dumb waiter" is a box drawn from one room to another by cords and pulleys, for the conveyance of small articles.

Waive, a law term signifying to relinquish voluntarily a right in court which one may enforce. Much of the cost of a lawsuit is often saved by "waiving process,"—that is, not demanding that notices and preliminary processes be served, but going at once into an investigation of the merits of the case.

Wakefulness, To Cure: see under the sub-head of Sleep, page 833.

Walks. In gardens, both flower and vegetable, and in lawns, walks should be as few in number as convenience will permit, and these should all be curving. Wavy outlines are more graceful than angular ones or mere checker work. See Landscape Gardening.

Lawn and garden walks may be made by digging a trench 18 inches deep, filling it within six or eight inches of the top with stones, and the remainder with clean gravel. But the following receipts for walks in yards and lawns are more elaborate:

To Make Gravel Walks. The bottom should be laid with lime rubbish, large flint stones, or any other hard matter, for eight or ten inches, to keep weeds from growing through, and over this the gravel is to be laid six or eight inches thick. This should be laid rounding up in the middle, by which means the larger stones will run off to the sides, and may be raked away; for the gravel should never be screened before it is laid on. It is a common mistake to lay these walks too round, which not only makes them uneasy to walk upon, but takes off from their apparent breadth. One inch in five feet is a sufficient proportion for the rise in the middle; so that a walk 20 feet wide should be four inches higher at the middle than at the edges, and so in proportion. As soon as the gravel is laid, it should be raked, and the large stones thrown back again; then the whole should be rolled both lengthwise and crosswise; and the person who draws the roller should wear shoes without heels, that he may make no holes, because holes made in a new walk are not easily remedied. The walk should always be rolled three or four times after very hard showers, which will bind them more firmly than could be accomplished by any other method.

Concrete Gravel Walk. Dig away the earth to the depth of about five inches, then lay a bottom of pebbles, ramming them well down with a paving rammer. Sweep them off as clean as possible with a broom, and cover the surface thinly with hot coal tar. Now put on a coat of smaller gravel (the first bed of pebbles should be as large as goose eggs), previously dipped in hot coal tar, drained, and rolled in coal ashes, with an intermixture of fine gravel, and roll it down as thoroughly as possible. Let the roller run slowly, and let a boy follow it with a hoe to scrape off all adhering gravel. Next put on a coat of fine gravel or sand, and coal tar, with some coal ashes, to complete the surface, and roll again as thoroughly as possible; the more rolling the better. It will take some weeks to harden, but makes a splendid hard surface, which sheds water like a roof. Do not use too much tar. It is only necessary to use enough to make the ingredients cohere under pressure, and a little is better than too much. Such a surface will last in a farm-yard a great while.

To Keep Walks Clean. The growth of weeds, grass, moss and worms, may be prevented by applying with a watering pot a weak solution of carbolic acid; it may not be stronger than a gill of the pure acid to a barrel of water. Coarse salt is also good. Moss and other small vegetation are best swept off by a wire broom; but such brooms, immediately after use, must be cleaned, dried and oiled, to keep them from rusting.

Wall-Eye, an eye in which the iris is of a very light gray or whitish color.

Wall-Paper. The green coloring in wall-paper is poisonous, and paper containing it should never be used. Sanitarians, in fact, declaim against the use of any and all wall-paper; but as such material is the cheapest method of ornamental finish of walls, it will continue in popular favor for some time.

When good papering is wanted, a skilled paper-hanger must be employed; otherwise "home talent" may be sufficient. To make paper stick to white-washed walls, make a sizing of common glue and water, of the consistency of linseed oil, and put that first over the surface with a brush.

Walnut. There are only two species of walnut in in America,—the Black and the White; the latter is called also Butternut. In England the term "walnut" comprises the hickory-nuts. The uses and value of the walnuts are well known. See Forestry.

Warblers, a large class of small singing birds, abundant in America.

Warbles, a disease of cattle, the product of the ox fly. See Gadfly.

Ward Robe, a small room where clothes are kept, or a portable closet for hanging up clothes; also, wearing apparel in general, or all the wearing apparel belonging to one person.

Warp, in wearing, the threads which are extended lengthwise in the loom, and crossed by the woof.

Wart, a small, hard tumor on the skin formed by an enlargement of its vascular papillæ and a thickening of the epidermis which covers them.

To give all the different receipts that have been recommended for removing warts, and to describe the *modus operandi* adopted by many in the process, would take a goodly sized volume. Almost every neighborhood has had its good old grandmother, who in some mysterious way, in a certain time of the moon, would remove the warts from the hands of the children of the vicinity. How this was done, or what the moon had to do with it, or why they always insisted upon going through a certain mysterious ceremony, we never knew; but generally in a short time afterwards the wart was missing. We give below a few simple but far more tangible recipes for removing these pests, as people of the present day seem to be wanting sufficient faith to practice any of the mysterious arts of stealing meat or a dishcloth and burying it or going to the old grandmother.

1. Anoint freely with castor oil before retiring each evening, for two or three weeks.

2. Dissolve as much common washing soda as the water will take up, and wash the warts with this for a minute or two, and let them dry without wiping. This repeated is said to destroy the largest wart.

3. Tie a thread around their base and let remain till they come off. Tighten it a little from day to day.

4. Procure a wild turnip out of the woods, cut a

piece of it off and rub the inside of it on the wart a few times, and in a short time the wart will be gone and will not leave any scar at all. If the wart is large and raw it will be a little sore.

5. Have a piece of thick paper with a hole cut in it the size of the wart. Put this over the wart and every morning let fall a drop or two of the strongest acetic acid through the hole upon the wart. If this does not succeed, oil of vitriol (sulphuric acid) dropped in the same way may.

6. Pare them down until the blood comes slightly and then rub with lunar caustic. This will cause some pain, but it is said to be a sure cure.

7. Wash the warts with the juice of milkweed, or celandine; or bruise these weeds on the wart.

8. Make a little roll of spider's web, lay it on the wart, set it on fire, and let it burn down on the wart. This is said to be a certain cure.

Washer, in mechanics, a circular piece of metal or leather placed below a screw head or nut, or within a linch-pin, for protection.

Washing Clothes. See Laundry.

Watch Dog. There is no particular breed of dogs by this name, but the best watch dogs are the Newfoundland, Mastiff and Bull-dog. See page 337.

Water consists of oxygen and hydrogen, eight parts by weight of the former to one of the latter. Absolutely pure water has an insipid, metallic taste. From 75 to 95 per cent. of all organic bodies (animals and plants) is water; but water, with the organic matter diffused through it as plants do the work, is more welcome to the physical economy of all vegetarian animals, including man, than is chemically pure water. See section on Water and Bathing, commencing on page 829, in article on Hygiene; and with reference to the laundry, see page 905; for watering stock, see respective animals. To purify water, see Filter and Cistern. There are many other methods, however, of purifying water, as the use of fresh charcoal alone, of alum, simple boiling, etc.; and water in cisterns may be purified by a little permanganate of potash, or by placing minnows therein to devour all the insects, etc.

Water-Closet, a privy. See Privy.

Water-Course, any rivulet, brook, slough or river, as a stream of water through the land and formed by nature. Land contiguous to streams is often washed away until serious loss occurs. This can be easily averted by the use of crib or pile breakwaters. The logs, which may be of any convenient length, are laid up and held in their places by notches, the whole being bound by the use of strong limbs with projecting knots and branches, placed in position to hold the upper logs before the stone is thrown in. Cribs should rest on brush placed top up-stream, and projecting somewhat into the stream beyond the crib's corner. The object in placing the tops up-stream is that they may catch the sediment and other floating substances on and near the bottom, and prevent washing under the crib, and eventually, perhaps, spoiling it, or making repairs necessary. The cribs should be placed at an angle of about 45° to the bank, the outer end being further down stream and on the longer side of the bend and mainly above it. Several may be needed. A breakwater of piles does equally well, but since a pile-driver costs money, stone cribs are usually preferred. They are cheapest if stone is plenty in the vicinity. If piles are used, they must be strongly planked on the up-stream side. The cribs will last longest. By this method land may be reclaimed by filling in below the breakwater.

Water-Cress, a mustard-like plant growing wild in wet places throughout the country; sometimes cultivated for an early salad.

Water-Cure, or **Hydropathy**, literally, treatment of the sick by the use of water. The system of practice formerly characterized as "water cure," or hydropathy, was largely hygienic, and at the present day is exclusively so, and has therefore assumed the latter name. See page 836.

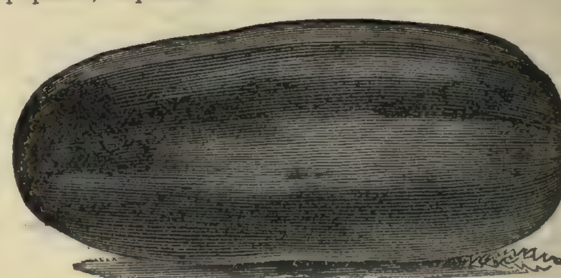
Watermelon. This luscious vegetable-fruit when healthy, ripe and eaten properly, is a first-class article of diet, or drink we might say. Its culture is precisely the same as that of the muskmelon. Its dietetic qualities are treated on page 548.

VARIETIES. Mountain Sweet. An old standard variety; one of the best still.

Mountain Sprout. Long, striped, with scarlet flesh; standard.

Phinney's. Hardy, vigorous and productive as any; early; flesh red.

Ice Cream, True White-Seeded. Very early and popular; superior.



Ice-Cream Watermelon.

Jackson or Strawberry. Delicious; seeds white, tipped with red.

Gipsy. Large and productive.

Black Spanish. Dark green; flesh red, sweet and rich.

Long Island. An old standard variety.

New Orange. Rind peels off like an orange; fine quality.

Landreth's Boss. An excellent variety.

Apple-Pie. Good only for making pies; grows excessively large.

Citron. For preserves only.

Water-Proof, impervious to water: said of roofs, garments and other coverings.

TO MAKE CLOTH WATER-PROOF, dissolve half pound of common soap in a gallon of boiling soft water and soak the cloth in it over night. Wring out, and soak ten hours in a solution of ten ounces of alum in a gallon of water. Wring out again, rinse in clear water, and thoroughly dry it.

TO WATER-PROOF LINEN, CANVAS, ETC. Three baths are prepared as follows: The first, by dissolving 1 part neutral sulphate of alumina (concentrated alum cake) in 10 parts cold water. For the second, boil 1 part light resin, 1 part soda crystals and 10 parts water, till the soda is dissolved; add 1/3 part common salt, to separate the water and collect the soap; dissolve this soap with an equal amount of good palm-oil soap in 30 parts water. This soap bath must be used hot. The third bath consists of water only. Soak the fabric thoroughly in the first, or alum bath; next pass it through the soap bath; and lastly, rinse in the water.

Water-Sprout, a rank, rapidly growing, succulent but fruitless sprout issuing from diseased fruit trees: called also "glutton."

Wattle, the fleshy excrescence that grows under the throat of a cock or turkey, or a like substance on a fish.

Wax, a fatty, solid substance produced by bees. In the article Beeswax the process for making and refining is described, and also that of waxing floors. In the article Canning the recipe for making sealing-wax is given, and grafting wax is given under its own head.

Weasel, a slender-bodied quadruped, well known for its love of the poultry yard. To the weasel family belong the mink, skunk, marten, sable, ermine, ferret, glutton, otter, wolverine and polecat.

Weather. Men, in all conditions of society, are led by motives of necessity or comfort to study the indications of the weather in the different appearances of the skies. The mariner, the shepherd, the farmer, the hunter, have the strongest motives to examine closely every varying appearance which may precede more important changes. The result of these observations forms a body of maxims in which facts are often stated correctly, but mixed with erroneous deductions and superstitious notions, such as the credulity of ignorant people always renders them ready to adopt. Hence the disposition to refer the ordinary changes of the weather to the influence of the moon, and even the stars, and to look for signs of approaching convulsions, even in the moral world, in horrid comets and strange meteors. The progress of science, which tends to separate the casual precursors from the real causes of phenomena, refutes these false reasonings, dissipates the empty terrors to which they give rise. and aims, by more patient, long continued and wide extended observations. to deduce the general rules by which the phenomena of the atmosphere appear to be regulated.

The value of a meteorological register depends on the accuracy with which it is kept. These observations are taken by experienced Government officials stationed at certain places, and their reports are posted daily in almost every postoffice within the United States. Indeed, these meteorological reports are relied upon throughout the country, and especially valuable are they to the commerce of the Great Lakes.

SIGNS OF RAIN OR STORM. Nearly all the "superstitious" "signs of rain" which have descended to us from the dark ages probably had their origin in the simple fact that just before a storm the atmosphere is such that nearly all animals act differently from their usual manner; and these actions were set down separately and disconnectedly, regarded with a sort of superstition, covered over with the creed of the observers, and thus woven together into a sort of system.

While there can be no credence given to the thousands of signs as above referred to, yet there are indications of changes of the weather that are based upon natural laws, which, if we understand, may often be great a help by forecasting the change. We quote the following observations on such changes from Prof. Henry G. Vennor:

"When the whole sky is covered with clouds, their further formation and increase in bulk and density is indicated by their descent to a lower level, and their decrease by their ascent. Accordingly, when clouds begin to sit down upon the tops of hills, it prognosticates rain; and when they begin to rise above the hills, it prognosticates dry weather.

"Mist extending upward from the surface of the earth on a summer morning foretells a dry, warm day. The country people call such a mist 'heat,' meaning thereby that it bespeaks a hot day. Such mists result from coldness, induced upon the earth's surface by the radiation of caloric during night, being propagated upward to the atmosphere in sufficient intensity to produce atmospheric over-saturation, and the precipitation of moisture in the forms of dew and mist. This only happens during calm, starry, cloudless nights, which are usually the concomitants, and among the most certain prognosticators, of dry, settled weather.

"When clouds are observed to break up into fragments and gradually to dissolve by evaporation, it indicates that the region of the atmosphere in which they float is under-saturated with moisture, and prognosticates dry weather. These clouds are called 'cotton-ball' clouds by sailors, for they resemble large masses of cotton. On the contrary, after a continuance of dry weather, when clouds are observed to form, or, when previously formed, are observed to increase in bulk and density, and also when small, detached clouds unite together and form larger clouds, it indicates that the causes immediately instrumental in the formation of clouds are in operation, and prognosticate that wet weather will soon follow."

Many persons are so wanting in their habits of observation, that if even a small cloud cuts off the sun-

shine for a few moments, they think it a sign of rain. They never look up to the sky to see what the nature of the clouds may be or to observe the general direction of the wind. Objects on the ground, as houses, groves, etc., will cause the wind to dodge about in all directions; and such persons often come into the house and report that the "wind" blows first one way and then another; that they "never saw such weather," and "there's no telling what is coming."

During the season of thunder-storms, if you see slowly coming up from the southwest white mare's-tail clouds, and soon reaching high over-head, and the air is particularly sultry, know that those high-fliers are connected with a thunder-cloud approaching you.

Weekly Cycle. One of the first principles to observe in weather phenomena is the fact that a cycle of change is completed each week, say from six to eight days; that is, it requires three or four days to work up a storm, and about as much more time to deliver it and become settled. Therefore, if it is fair weather to-day, it will probably be fair a week from to-day, with a storm or atmospheric disturbance between now and then. Of this we can be confident if to-day is about the middle one of the fair term (of three days). By this simple fact alone such weather prophets as Prof. Tice, of St. Louis, Mo., and Mr. Vennor, of Montreal, Canada, foretell the weather for years ahead and make up their almanacs accordingly. Therefore, if for example we have a rainy Sunday to-day, in a given section of the country, accidentally according to their almanacs, we have the next Sunday a rainy one, too, and so on for several in succession. Most persons have often noticed a succession of fair Sundays throughout a stormy season, or of rainy Sundays when most of the intervening time was fair.

Just as often, however, the weather is the reverse of those "professors'" almanacs; and when it commences the opposite, it will, according to the weekly cycle just referred to, continue so for a number of weeks. Their weather almanacs are calculated for a limited, but indefinite territory, which fact they fail sufficiently to announce. Who does not know that at any one time, for more than half the year, it is raining or snowing in ten to a hundred places at once in the United States, and that an almanac prophesying rain at that time will be correct for those ten to a hundred places, and incorrect for all the rest of the country?

Trade Wind. For all that portion of the United States lying east of the Missouri river, Kansas, etc., and north of the Gulf States, the prevailing current is from the southwest. By looking up to the highest clouds, one will notice them going northeast. This current is scarcely ever interrupted. Therefore all our rain or snow is really brought from the southwest, however it may strike the earth in falling. The ground current, during the thunderless rains and snows of fall, winter and spring, is generally opposite the trade wind, or upper current, and the rain or snow accordingly strikes buildings, etc., on the east side. When an easterly wind (apparently) "brings up a storm," one will at first notice the clouds to be heaviest in the southwest.

The upper current brings the moisture mainly from the Gulf of Mexico, circling around over the plains east of the Cordilleras; and on reaching an under-current from the East, which is colder, the moisture of the lower side of this upper current is condensed into rain or snow.

While the trade-wind brings us our summer showers as well as our rains and snows of fall, winter and spring, the former, being very limited in area, are not preceded by an easterly wind but for a short time; it is proportional, however, to the extent of the rain area. In this case the condensation is not caused by easterly counter-currents, but by descent of westerly or northwesterly currents.

Tornadoes. See page 1252.

Equinoctial Storms. Although the equinoxes are March 21 and Sept. 22, equinoctial storms are those which are occasioned by a change of season,—those of spring by the breaking up of winter and those of autumn by the ending of summer. In the spring the warm zone reaches this latitude, fights old Boreas with storms for a few weeks and obtains complete possession of the country in May; in autumn it is Boreas' turn to take posession. The collision of these two zones of cold and heat produces the tedious rains of March and November; but these rains do not by any means come all in these months; their range is over a whole season of about three months.

Clearing Off. This takes place by a west or northwest wind, which, being both cold and high, walks off with the storm-cloud southeastward. A thunder-storm, being small in area, clears off in a few minutes or an hour or two; but the equinoctials, which cover nearly all the country, require 24 hours or more to get away. We will, therefore, after a heavy eastern rain, have a west wind carrying heavy clouds over us a whole day, in the work of clearing the sky. Some of these clouds from the west, or ridges of cloud, will often be heavy enough to yield some rain. Often, in May and the summer months, some hours after a thunder-storm, an extraordinarily dark but rainless cloud will suddenly come up from the northwest. They appear frightful, and come up with a swift current, but they always pass over with very little wind upon the ground.

By thoroughly understanding the foregoing facts, and observing closely for several years, with written statistical memoranda, one will be able to foretell the weather with 90 to 95 per cent success for all practical purposes, the time covered by his prophecy varying from a few minutes to months, according to the area taken into view and the aspects considered.

Weather-Board, a board extending from the ridge to the eaves, and forming a close junction between the shingling of a roof and the side of the building beneath, usually at the ends where there is no cornice. "Weather-boarding" is the nailing of

boards upon a building, each one above lapping over one below, so as to exclude dust, rain and snow.

Weather-Cock, and **Weather-Vane**, anything so adjusted as to turn with the wind, to show its direction.

Weather-Strips, strips of wood or metal, generally bordered with rubber or cloth, and attached to the base of doors, to keep out the rain, snow and cold wind.

Weave. A horse is said to "weave" when he perpetually moves his head from one side of the manger to the other, like a wild beast in his den. It is caused by an irritable nervous system.

Wedding: see page 416.

Weeds, herbs which are in the way of more useful plants. The motto of practice with regard to all weeds is this: Kill all annuals as soon after the seeds have sprouted as possible, when they can be destroyed hundreds at a stroke; and as to perennials which have obtained a foot-hold, keep their leaves plowed or hoed under until their roots die. Don't allow a single leaf a half-day's breathing spell in the air. This motto condenses all that can be said on the subject, and all farmers well know the processes for carrying it into execution. For special remedies for Canada thistle and some other large weeds, see Thistle and Witch Grass.

Weeping Trees, those whose boughs hang gracefully downward, as the weeping willow, weeping birch, etc.

Weevil, a snouted beetle; a curculio. See Insects and the respective plants infested.

Weft, the threads which cross the cloth from edge to edge as it is woven; the woof.

Weights. Nearly every household has an arithmetic, containing tables of weights, with instructions how to use them. We, however, add the standard weights of a number of articles not contained in all text books.

The gross ton of 2,240 pounds was formerly in common use, but at present seldom used except by the United States custom houses and at the Pennsylvania coal mines.

A sack of wool is 308 pounds, or 22 stones. A pack of wool is 17 stones and 2 pounds, or 240 pounds, a pack load for a horse.

A truss of hay is, new, 60 pounds; old, 50 pounds; straw 40 pounds. A load of hay is 36 trusses. A bale of hay is 300 pounds.

A firkin of butter was formerly 56 pounds, but it is now packed in firkins of from 40 to 100 pounds.

A bale of cotton is 400 pounds, but in different States it is put up in different sized bales, varying from 280 to 720 pounds. Sea Island cotton is put up in sacks of 300 pounds.

A barrel of flour is 196 pounds; of pork, 200 pounds.

Weight of various substances per cubic foot:

	POUNDS.		POUNDS.
Cast iron........	450	Common soil, compact, about	124
Water...........	62	Clay "	135
White pine, seasoned, about.....	30	Brick "	125
White oak, about.	52	Stone "	170
Loose earth " ..	95		

A ton of sand is 25 cubic feet; of earth, 18; and of clay, 17.

Eighteen cubic feet of gravel or earth, before digging, make 27 cubic feet when dug. The bulk is increased one and a half times.

For a simpler system of weights than the one in vogue, see Metric System. For weight of the different commodities per bushel, see Bushel.

Weir (weer), a fence of stakes or twigs set in a stream for taking fish; also a dam, either for taking fish or for running a mill.

Weld, or **Dyer's Weed**, a plant grown in the old country for dyer's use, but not yet introduced into the United States as an industry. It is employed in dyeing cotton, woolen, mohair, silk and linen with yellow. Blue cloths are rendered green by being dipped in a decoction of it; and the yellow color of the paint called Dutch pink, is obtained from this plant. It is an imperfect biennial, and the crop is gathered by pulling up the entire plant.

Weld, to join metals by beating them together when heated and partially fused. To weld iron, see p. 876.

Wells. To the farmer the theme of procuring a supply of water is one of great importance, for plenty of pure water is absolutely necessary to comfort and health Where never-failing springs abound and the water not too strongly impregnated with mineral, of course they answer every purpose of the well, and often furnish the best of water; but these are found only at long intervals.

Location. In sinking wells upon the farm, great care should be taken to locate them where they will not receive the drainage of filth from the barnyard or other deposit of refuse. Special care should be taken in the location of the well from which the supply of water for the house is procured. In villages depending upon wells for water, it is not always possible to select the location for a well that meets entirely with approval, as the space is restricted, and the ground may not lie advantageously. In such a case the top loam should be removed down to the firm clay, and the space be filled with clay high enough above the surrounding surface to insure that all surface filth will be drained away from, and not into, the well.

But on the farm there is not usually any excuse for locating the well, for either house or stable use, where surface contaminations can enter. Nitrogenous compounds are evolved from decaying animal and vegetable substances near the surface, and these find their way into the water of wells. These salts are

detrimental, and, being very soluble, easily pass, held by water in solution, through the surface loam along the top of the clay; or, if the soil be sandy, the polluted water penetrates deep down, entering the well through the lower strata. Strange as it may appear, the instances of contaminated wells are frequent in the country, as is shown by authenticated reports. The adulteration of food is condemned, while this may be done with substances that are nearly inert, and measurably harmless, but at the same time the water supply is allowed to receive gross impurities—poisons that are dangerous to health in the house as well as in the stable.

Care should be taken also that wells be never located near a cellar or closet. Nor should any sink-drain or any other drain be allowed to pass near them. Typhoid and malarial fevers are often due to sewerage in wells.

DEPTH. In reference to the depth to which the well should be dug, we wish to say that they should certainly be put down to a sufficient depth when first digging, to furnish a constant supply of water; for if they strike springs that are intermittent they will often fail, and that too, at just those times when they are most needed. When there is water enough everywhere else these wells yield an abundant supply; But let a dry time come, so that the wells are really needed, and they will very soon fail. It is a very common fault with wells that they are not sunk deep enough. It is considerable work to dig a well, and the farmer does not want to do any more of it than is necessary. For this he cannot be blamed, but he should remember that while digging a well is the time all the work on it should be done. It is not nearly as expensive going to a great depth then as it is after the well has been tried and found too shallow. We have known some cases in which wells have been lowered after having been in use for years. Of course, it is better to do this if they fail in dry seasons than to try to get along with them as they are, but it is far the best way to make them right at first. A very dry time should be selected in which to dig a well. When the ground is full of water the labor of digging is greatly increased, and there is but little hope of securing a good well. If weak springs are struck they should be disregarded and the well sunk to where a strong and constant flow of water can be obtained.

Another very common fault with wells is that they are made too small. It is less work to dig a small well than a large one, but it is not nearly as good after it is dug. A small well is difficult to clean when it needs such an operation, and it will not hold nearly as much water as a large one. Very few farmers are aware of the difference in the capacity of large and small wells. A well three and a half feet in diameter will hold 59.981 gallons of water for every ten inches in depth, while a well six feet in diameter will hold 176.253 gallons for the same depth. As a general rule, there should be one well for the house and another for the barn.

DRIVE WELLS. They are made by simply driving down a stout iron tube. These are cheap and substantial, and never become foul. The principal objection is the impregnation of the water with a little iron. In regions where boulders or rock abound beneath the soil, it is not advisable to undertake to "drive a well." One Green a few years ago secured a patent on this system of procuring water, and since has been going over the country demanding large royalty from those who had previously made them. In the summer of 1882, however, Judge Wallace, sitting in Chamber, at Syracuse, N. Y., denied one of Green's applications for an injunction to restrain the use of this well, on the ground of prior use.

ARTESIAN WELLS. Boring the earth to obtain water has, of late, been practiced with great success, not only in this country but in Europe, and in many other parts of the world; and it is found to be a very great saving of expense. In consequence, many places are now supplied with this useful fluid where formerly it was entirely wanting. The operation is extremely simple. It consists in fixing a bit and cup alternately to long iron rods screwed upon each other, which are run by steam power or horse power. The operation is usually begun by digging a well six or eight feet deep, in the center of which the boring instrument is placed. The nature of this instrument depends upon that of the stratum to be penetrated, and it is changed accordingly when a stratum of a different degree of hardness is reached.

Borings are now made to the depth of several hundred feet, which supply a plentiful stream of water. If the original source from which the water comes be higher than the surface of the ground where the boring is made, the water will overflow; but if the source be at a lower level than the boring, then the water will not rise to the surface of the ground, and it will be necessary to dig a well to the depth to which the spring will rise; and this well serves as a reservoir to contain the water, which must be raised to the surface by a pump.

These wells sometimes furnish the purest water, and sometimes water that is rank with mineral ingredients. They are very costly in the first outlay, but they often prove also the most remunerative. Local circumstances determine this matter.

TUBING. The day of walled wells should pass quickly by; and every well not otherwise tubed should be tubed with tiling, manufactured for the purpose. See page 1244.

Wether, a castrated ram.

What-not, a kind of stand having shelves for books, ornaments and the like: a piece of furniture both of great utility and of ornament.

Wheat. The wheat plant is essentially a native of the temperate zones, lying between the parallels of 25 and 60 degrees of latitude. In the northern hemisphere the native habitat of wheat occupies a vast extent of territory in all the four great divisions of the earth. In Asia, the chief wheat-growing countries are

those lying between the Black Sea on the north and the heads of the Persian Gulf and the Red Sea on the south, embracing Armenia and Palestine, the cradle of the human race, Egypt and the countries bordering on the Mediterranean: also England. In America, the wheat districts are of boundless extent, a large portion of which still await the hand of man to bring them into cultivation. The valleys of the Mississippi, Missouri and Ohio alone, if brought into cultivation, are probably capable of supporting a population equal to a half of all the inhabitants of the world.

Soil. Either clay, marly or sandy loam, if limy and well prepared, is good for wheat. Lime is an important aid to the full and certain growth of wheat, checking its exuberance of straw and its liability to rust, and so steadily aiding to fill out the grain. A rich, mellow turf or clover lay is a good bed for it, or land which has been well manured and cleanly cultivated with roots or corn the preceding season. Fresh barnyard manure, if applied directly to the wheat crop, is objectionable, not only from its containing many foreign seeds, but also from its tendency to excite a rapid growth of weak straw, thus causing the grain both to lodge and rust. The same objection lies against sowing it on rich alluvial or vegetable soils; but in each the addition of lime or ashes or both will correct these evils. Gypsum and ashes together make a first-rate fertilizing mixture. A dressing of charcoal has in many instances been found an adequate preventive. Depth of soil is also indispensable to large crops. The wheat plant has two sets of roots, the first springing from the seed and penetrating downwards, while the second push themselves laterally near the surface of the ground from the first joint. They are thus enabled to extract their food from every part of the soil. Underdraining contributes greatly to the increase of crops, and surface drainage is absolutely essential. On heavy clay lands wheat is peculiarly liable to winter-kill unless they are well drained. This is owing to successive freezing and thawing, by which the roots, by "heaving," are either broken or thrown out. When winter-killing is extensive the worst spots may be sown with spring wheat. Although this will diminish the marketable value of the crop, it will be about as good for domestic use as when all is of one kind of grain.

Preparation of the Ground. The approved practice of good farmers is to plow only once for wheat. It used to be a common remark among shrewd, practical farmers that good wheat was rarely grown where land had been plowed to kill the thistles. To use their phrase, "it killed the nature of the land"—not a very accurate or scientific explanation of the result, but certainly a most expressive one. Stated more accurately, this excessive plowing reduced land to so fine a tilth that it held too much moisture. Hence in winter and spring the soil became compacted by the particles running together in a more or less thin mud. The frost hove out the roots of winter grain on all such land, while as soon as dry weather came the surface formed into a crust, which gradually hardened downward through the summer. It is little wonder that good crops of wheat could not be grown, unless in exceptional seasons, by such methods as these. The bad effect of excessive plowing in breaking up the natural water courses through the soil is now quite generally conceded. One deep plowing does not have this result, for unless the soil is entirely bare of vegetation the decay of the sod beneath the furrow tends to establish other water courses in place of those which the plow has interrupted.

Where stubble ground is plowed for wheat the same general principles hold good as for summer fallows. Half the failures of wheat on oat or barley stubble come from a second plowing, or such deep cultivation as to amount to the same thing. It is the common experience of farmers that stubble ground got in hastily and roughly gives better wheat than with more careful culture—often better than the pet summer fallow. This would not be so were not the labor so generally misdirected. Plow as early as possible. Work as much as possible with drag and roller, and, if you cultivate, go shallow, to disturb the decaying stubble as little as possible. By always cultivating shallow, and using the drag and roller as much as possible, a stubble ground can be made very nearly equal to the best summer fallow, and better far than the average of those which are thought to be most thoroughly (and deeply) cultivated.

Now, we will suppose a man plants a field with corn in the spring and raises a heavy crop, which takes a large percentage of the properties of the soil necessary for the production of wheat. The following spring he sows the same field with oats, and, if fortunate, harvests a good crop of oats, which, of course, makes another heavy draft on the soil. After this he plows his oat-stubble ground and sows it with wheat, having the very erroneous idea that it is in better condition for a wheat crop than a summer fallow. Well, what is the result? The next harvest will tell. If it is a good piece of land and all things are favorable, he may get from 10 to 15 bushels to the acre, and in addition to this he will get his land pretty badly run.

Next, we will suppose another man sets out with a determination to raise a crop of wheat and not make his land much the poorer for it. He believes in summer-fallowing. He selects a piece of clover sod the second year after seeding. In the month of June, when the clover is in full bloom, he goes in with his plow and a good heavy team and turns under a good growth of clover, about nine or ten inches deep. After this he keeps the top thoroughly pulverized to the depth of five or six inches, using first a common drag or harrow to level the surface; after this a wheel cultivator, with the aid of the sun and rain, is all that will be necessary until it is time for seeding, which is about the ninth day of September, when he takes his drill and sows about one and one-half bushels to the acre. In the spring following, in the month of March, he sows on the same field about 15 pounds of clover seed and 100 pounds of plaster to the acre;

and what is the result of his experience? As in the former case, let the harvest time answer. Well, harvest time comes, and if all things are favorable he finds that he has to harvest about 30, from that to 40, bushels to the acre. He also finds that he has his land thoroughly subdued with a good thick coat of clover on, and just as good, if not better, than it was when he commenced.

Turn as good a sod as possible under the furrow and afterward work altogether upon the surface. Work the ground often, for the more frequently it is stirred the shallower it can be cultivated, killing all weeds at the first rather than letting them take root, making deeper cultivation necessary. The old-fashion harrow, or drag, is one of the very best implements ever put into a summer fallow, and it would be a good thing if all fallows could be cultivated by that alone. The drag compacts the soil and rarely if ever scratches more than two or two and a half inches deep. The deep cultivation sometimes given by horse cultivators going down and turning up the soil four or five or more inches is little less injurious than the old-fashioned method of cross-plowing. We know too well why this deep cultivation is practiced. Weeds are allowed to grow in summer fallows until nothing but deep plowing will uproot them. Even then it is better to make the cultivator teeth sharp, so as to cut off obstinate roots, and then keep it no more than three inches deep. If the fallow is dragged once a week with a well-sharpened tooth-drag, it will cut off or break off thistle roots more perfectly than less frequent but deeper cultivation would do.

Next to a drag the roller is the best implement to use in preparing a seed bed for wheat, and for much the same reason. It compacts the soil and helps to make a fine tilth but shallow seed bed. The drag alone rakes the clods of earth on the surface, leaving it rough and uneven. This is not an advantage, as many have hastily guessed from a few experiments. Land left looking rough and full of hard clods of earth generally produce better wheat than where the surface is mellow and smooth. The reason is that these rough clods on the surface show frequent use of the drag; while the mellow, smooth surface shows more frequent use of the cultivator. Break these surface clods still more by going over after each dragging with a cultivator or clod-crusher, which will compact the soil but leave the surface in better tilth for a seed bed, and the wheat will be still better. The drill will bring up enough clods to the surface to protect the wheat all that is possible, and these ridges left by the drill should be left as nearly perfect as possible. A mellow seed bed, but a shallow one, is the result to be aimed at. With this mellow seed bed secured, we do not care how hard and unpromising the soil beneath may be. Winter frosts will mellow it sufficiently for the roots of wheat the second season, and if we could prevent it we would never have a wheat plant strike its roots deeper than three or four inches in the fall. Lateral extension of the root to hold the surface soil in a solid body to rise and fall together is what is wanted. With such a mat of roots as this, even the severest winter within our remembrance did not destroy nor greatly injure some fields of wheat, while others, apparently nearly as thrifty in the fall, but whose roots struck downward, were almost entirely winter killed. This lateral growth of roots is encouraged by keeping the under soil hard, and also by surface manuring and the use of commercial manures drilled in with the seed. In no other way can we account for the remarkable effects of light applications of superphosphate on wheat.

Sowing. A simple way of selecting good seed wheat is to throw the grain to some distance on the floor, and taking only such grains as reach the farthest. These grains are the plumpest and heaviest. By the use of sieves the largest grains will be selected; but rather than sow chess or very poor wheat, it will pay to pick over the seed by hand during the winter. Previous to sowing, a strong brine should be made of salt and soft water, and in this the grain should be washed for five minutes, taking care to skim off all light and foreign seeds. If the grain be smutty, this washing should be repeated in another strong brine, when it may be taken out and intimately mixed with one-twelfth its bulk of fresh, pulverized quicklime. This kills all smut, kills the weed-seeds and aids in rapid and early growth. When the seed is not smutty it may be prepared by soaking or sprinkling it with stale urine and afterwards mixing it with lime. This alone will prevent smut to some extent.

On well pulverized, ordinary soils, about five pecks of seed are sown to the acre; while rough land, clay soils and such as are very fertile require six to eight. The larger the grain, the greater the measure required, as the ground will take a certain number of grains whether they be large or small. Some kinds of wheat should be sowed heavier than others. As a rule, a larger quantity of seed produces an earlier growth of lighter straw and head, but does not increase the aggregate crop. The tendency of wheat to "tiller," or send out new shoots for future stalks, enables one to sow less to the acre by planting early, as the more time the crop has to grow in cool, moist weather, the more shoots it will send out to cover all the ground. Winter wheat, when sown very early, tillers in the autumn. The usual time for sowing in our Northern States is from the 10th to the 20th of September. If sown earlier, it is liable to attack from the Hessian fly, and if later, it does not have time to root as well, and is in more danger of being thrown out by frost or of winter killing.

Wheat may be sown broadcast or in drills, the latter being much the better way. Roll the ground, and clean out the water furrows. These furrows and drains should also be cleaned out, if needed, later in fall and in the spring. In Northern Europe it has been found a preventive against winter-killing on strong clays, to sow the wheat in the bottom of each furrow, six inches deep, and cover it with the succeeding one. The grain thus planted comes up as soon as in the fields sown broadcast and harrowed, grows

more vigorously, withstands the winters and produces large crops. Indeed, lightly plowing in wheat will produce a surer, larger and better crop than sowing broadcast and harrowing. But the best drills now in use cover the seed sufficiently for protection. Harrowing in the spring, although it destroys a few "stools," causes a more copious and rapid tillering and a better growth of grain, so that the labor is abundantly remunerative. On light soils, rolling the wheat both in fall and spring is highly advantageous. When the growth is luxuriant, decided benefit has attended feeding off the wheat when the ground is frozen. This, however, should be cautiously done, and only by light animals.

Wheat, and nearly all seeds, are found to be more productive when they are taken from a soil inferior to the one intended for sowing; and it is claimed that what is produced both in a warmer and colder climate will mature earlier. It is not essential that the fullest, largest grain be sown; and it is said that seed somewhat shrunken is more certain to give a good yield than the choicest seed. Grain designed for seed should be well ripened before harvesting.

Soils that are peculiarly adapted to wheat-growing should be sown with the finest varieties, which are of a more delicate character. In any given section of the country, experiment alone will determine the best varieties for that locality.

For drills, see article on that subject, page 366.

An experiment has been made in this country, with the following results: Of fifty grains deposited at the depth of eight inches only two came up, and these formed no heads; at seven inches one-fourth came up, but formed no heads. Ten of the fifty came up when covered five inches deep, but had defective heads. At four inches covering there were a few perfect heads, but most were defective. Of those covered three inches all came up; but the best yield was from those covered only two inches deep. The condition of the soil as to moisture is not stated, nor the state of the season, but we should infer it was moist, or those planted three inches would have been better than those at two. The same experimenter says he prefers to cover his wheat one inch and never more than two.

It is said by persons who have taken the trouble to compute it, that the average number of ears of wheat on an acre of ground is about 1,200,000, and this without reference to the quantity of seed. With thin seeding the stools thicken considerably, and with thick seeding they are thinned very much. This number would give about thirty heads to the square foot.

Chess and Other Weeds. Chess seed often abounds in wheat unnoticed, as its appearance resembles that of wheat, especially poor wheat. It is consequently often sown with seed wheat that is considered clean. When the wheat is winter-killed, the chess has an opportunity to take its place. Its seed may germinate in a decomposed wheat grain, and its roots seem to be the same as those of the wheat itself; and this fact has led some persons to believe that "wheat may turn to chess." Also, degenerate wheat grains, resembling chess seeds, are sometimes found in wheat heads; and this is another fact which has led to the same belief. In procuring seed wheat, if it is not already clean, it should be carefully picked over by hand during the leisure hours of winter.

Cockle seed is often present in wheat, and is even more difficult to be separated from it than chess seed. The weed is known by a showy red flower, and it is slowly making its way westward.

Probably the best plan is to raise seed wheat in a field which is entirely clear of chess, cockle, smartweed, etc. Those communities which are free of these pests can follow the business of raising seed wheat, to supply the market in that line.

Diseases. The principal diseases of wheat are smut and rust, both fungoid.

Smut should be removed by washing the seed wheat two or three times in strong brine and intimately mixing and coating the seed with quicklime. Take care to prevent a too long soaking in water or brine, as the swelling and germination of the grain should not be started before it is planted. Smut shows itself in the growing wheat by taking possession of the grains, filling them with a mushy, black substance without altering their size or proportions. On pressing the grain it bursts easily. It is sometimes called "bunt."

Rust is a reddish coating on the straw (that is, the growing wheat-stems), and is particularly bad in "muggy" close, hot, showery weather. There is no remedy for this trouble, but it may be somewhat mitigated by harvesting at once. General preventives may be found in selecting hardy varieties, elevated land and saline manures, as salt, lime, gypsum and charcoal. Fresh animal manures on wheat ground rather incline to create and aggravate diseases in the grain.

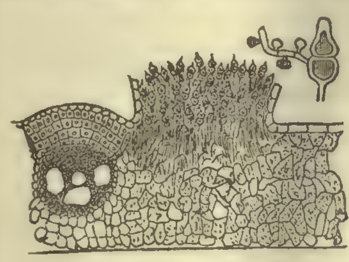


Fig 1.—*Wheat Rust, magnified.*

Insects. Several insects are very damaging to wheat, worse at some times and places than others. Small fields have sometimes been freed from the marauders by smudges in the evening along the windward side. The best thing to do, however, is to prevent the invasion of such enemies by selecting hardy varieties and inducing an early and vigorous growth. But late sowing best avoids the army worm. The Diehl variety is the best for early August sowing, and Clawson for late. Ashes and quicklime kill insects so far as they come into actual contact with them; but an application sufficiently abundant to kill off all the injurious insects would also kill the wheat. All insect enemies are migratory and come and go at their will; and all the remedies applied at the time of their

natural departure obtain more than their share of credit.

Army Worm. The young caterpillars come forth from the tiny eggs during the last days of June. They are an inch and a half in length when fully grown, black, striped with yellow and closely resemble a common cut-worm. They have six true legs and ten false ones. In general they are not noticed unless they appear in great numbers and are about half grown. At this time their food is swept away as by fire, and they migrate like vast armies; hence their name. In four weeks of gluttony they accomplish their growth and descend into the earth about two inches to pupate.

FIG. 2.—*Army Worm.* (Leucania unipunctata.) Larva, pupa and moth.

In about three weeks (in August) the moths come forth to mate and lay their 100 to 200 eggs. The moth is not very showy. It is an indistinct yellowish brown, with a central white spot and oblique rows of black dots on the primary wings. The back wings are dusky. It flies only at night, and is attracted by lights and sweets. They lay their eggs on grasses and the growing grains near the ground, in late summer.

The reason the army worm comes in vast numbers and only at intervals, is because their natural enemies, other predatory insects, become scarce. When the army worm becomes numerous, these other insects, which feed upon their eggs, also become numerous, on account of this increase of their natural food, and they in turn destroy the army worm.

The only remedy man can employ against this insect is to plow a deep furrow or a ditch around the field betimes, which will catch the caterpillars in their march and detain them for a time, and where, with a little straw or dry trash, one can burn them up. It is best to have the side of the ditch next to the grain smooth and perpendicular, so the worms cannot crawl up. If the army threatens to be a large one, the ditch should be deep, so that it will not fill up with the van and the rear pass over them into the field.

Chinch Bug. This is the most mischievous insect of all, considering its numbers and its constant presence. There are two broods in a season, the second brood hibernating: the latter, appearing again in the spring, makes it appear as if there were three broods each year. The first brood appears in mid-summer, and the second in the fall. Nearly every imaginable remedy has been tried, but nothing has proved reliable. Much cold rain destroys them to a great extent, and several species of lady-bird (pages 887–8) are their enemies; and it is said that piles of fodder, grass and straw and shocks of corn etc., are harbors for them and, if allowed to remain, encourage their preservation and propagation.

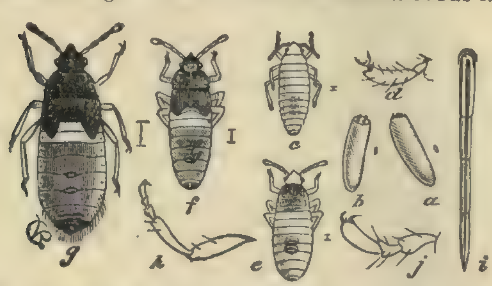


FIG. 3.—*Chinch Bug.* (Blissus leucopterus) *a* and *b*, eggs *d*, tarsus; *e*, larva after first molt; *f*, larva after second molt; *g*, pupa; *h*, leg; *i*, the beak or tubular mouth.

FIG 4.—*Chinch Bug*, magnified. Natural length indicated by the line in the cut.

Hessian Fly. There are two broods of this insect. The first deposits its eggs from early in April till the end of May, and the second appears in August and September. The eggs are laid on the leaves of the wheat, and the young maggots, which hatch in about four days, soon find their way to the base of the leaf, remaining between it and the stem near the roots. It appeared in this country during the Revolutionary war, when hireling Hessian soldiers were employed by the British against the colonies; and it was named as though introduced by those soldiers. The preventive measures have been summarized as follows:

FIG. 5.—*Hessian Fly.* (Cecidomyia destructor.)

1. It is advised to sow a part of the wheat early, and if affected by the fly, to put in the rest of the seed after September 20th, which will in most cases save the crop. By destroying the first brood the second will not appear.
2. Partially affected wheat may be saved by the use of fertilizers and careful cultivation, and if winter wheat, the fields may be recuperated in the spring.
3. It is stated that many of the eggs and larvæ may be destroyed by pasturing with sheep and close cropping of winter wheat in November or early in December.
4. It is advised to sow hardy varieties of wheat, especially those which tiller vigorously,—Diehl and Black Mediterranean for early August sowing and Clawson for late.
5. Lime, soot and salt are named as special remedies, and it is also recommended to rake off the stubble; but too close cutting and burning of the stubble may result in harm by destroying the useful parasites, of which there are several species. Plaster and other fertilizers, to produce a strong stock, so that there will be enough to feed the fly and produce good

wheat also. Indeed, it is claimed that nine-tenths of all the flies hatched are destroyed by these minute parasites.

6. Rolling and harrowing kills many of the larvæ, and some farmers rely upon this means alone.

Wheat Midge. This is a species of the same genus as the Hessian fly. It is not so numerous as formerly, having been diminished by its insect enemies. It is of an orange color, and so small as to escape notice. It appears in June. The eggs are laid on the chaff of the wheat head, next the grain, where the little orange-colored maggots soon appear, and by sucking the grain destroy it. The remedies recommended are: Get the variety of grain which is least subject to its attacks, and then sow fall wheat so early and spring wheat so late that the former may mature too early and the latter too late to be injured by it.

Harvesting. To make the whitest flour, wheat should be cut immediately after the lower part of the stalk becomes yellow, while the grain is yet in a state of dough, easily compressible between the thumb and finger. If cut early, a longer time will be required for curing before threshing or storing. But for good quality of flour and economy, the cutting should be delayed as long as is possible, not to waste any in handling. Some varieties of wheat have a light and open chaff, and obviously require cutting earlier than others. Instead of cutting wheat too early, and letting it remain for days, or even weeks, in the shock, at the risk of wind and rain, it would be better to allow it to stand longer before cutting, and when cut secure it as promptly and as perfectly as possible. Wheat is better to dry thoroughly in the straw, either in the barn or in the stack, before threshing; there is then little danger of its becoming musty. Farmers need not regret that this climate is not dry enough to produce the very highest quality of wheat. They do not want to sacrifice too much of quantity for extra quality, nor do they wish to sacrifice other agricultural products in order to raise exceptionally good wheat. As every person who will have a practical interest in the reading of this article has probably had more experience and knowledge in the use of reapers than it is possible for us to give him in print, we need say no more on this point; and indeed the same may be said of farming machinery in general.

When stored in the straw, the grain should be so placed as to prevent heating or molding. Unless very dry before stacking or carrying into the barn, it should be laid on scaffolds where there is a free circulation of air; or, when in large stacks, put in a central ventilating shaft. The latter can be made by placing a large bundle perpendicularly in the center and drawing it up as the stack advances. Additional security would be given by similar openings horizontally, at suitable intervals, so as to admit air all through it. If stacked in ricks, have them north and south, so that they will dry equally on both sides. To keep mice and rats out of the stack, build it upon posts which are capped by a piece of waste tin or sheet iron. Weevil can be limited to some extent by thorough cleanliness of the premises. In general, barn storage is better than out-door stacking, as it is easier there to ventilate and make whatever alterations are necessary to preserve the grain in good condition, and it can be kept indefinitely until the thresher can be had.

Threshing. While threshing "from the field," without stacking, saves considerable labor in one sense of the word, it is often impossible to economize the time and thresh all day from "dewy morn 'till dewy eve," as the proprietors of the machine feel obliged to do, without putting a great deal through too wet. Besides, all wheat, after harvesting, will have its sweat; and if it is threshed from the field immediately after harvesting, it will sweat in the bin and become musty; and it is said that even if it is immediately milled, its flour will become musty or sour. For machines, see article Threshing.

The straw and chaff of wheat should never be wasted. When the straw is clean and of good quality, it is good fodder for live stock during the winter, especially in time of scarcity, and is always valuable for this object when cut and mixed with meal or roots. It is also of great use for bedding for cattle and for innumerable other purposes. Finally, what is not otherwise used should be scattered over cultivated ground and plowed in. See Straw.

Storing and Marketing. Some farmers store in mills and depots. This we consider a very bad practice. Wheat stored in a mill will sometimes bring a higher price in a depot or in some other mill, and wheat stored in a depot very often will pay better to sell in the home market than it will to ship. Wheat stored is at the mercy of one man, or market, while if his wheat was in his own granary he could take advantage of all the markets, and sometimes of the markets of several villages. Every farmer ought to endeavor to be forehanded enough so as not to be compelled to sell his wheat at any particular time.

Varieties. The varieties of wheat are much more numerous than of any other description of grain, the result, no doubt, of the greater range of climates in which it has been cultivated. There are more than 30 varieties of wheat, and several hundred sub-varieties. But the latter term is probably often made to include merely such varieties as would be made in one season by a difference of locality or cultivation, or both. From a consideration of the ordinary modes in which nature operates, both in the animal and vegetable kingdoms, the strong probability is that all varieties of wheat are sprung from one parent stock, and that the differences now observable are the effects produced by climates, soil, and cultivation; for the differences which exist among varieties of the human race itself are even greater than those which prevail amongst well defined classes of wheat. Thus, all varieties of wheat may be arranged under one generic head, *Triticum*.

The bearded varieties are now very generally given

up, partly, we presume, because those in cultivation were found too late in ripening, and partly because they are much more disagreeable to handle in binding and shocking. The attacks of the fly in autumn have precluded the earlier sowing formerly practiced (in this latitude, about the first week in September), until about the 20th of September, and to prevent injury from rust the grain must ripen as early as possible. The varieties are thus narrowed to a few beardless early sorts, of which the white are preferred by millers, though the amber and red varieties seem to be hardier in unfavorable locations. Varieties known as the Red, May and White, may have been very popular and very generally sown until the last few years, since which time there has been much complaint of their deterioration. The varieties known as Alabama, Walker or Lima, have proved very satisfactory the last few years. The Tappahannock in certain localities, especially in timbered lands, has succeeded excellently. The Genesee, Mediterranean and Blue Stem are varieties frequently commended by growers in many parts of the country. But in all these names, there is really a vagueness and uncertainty that makes the mention of them carry no definite idea. There are a smooth white and a smooth red variety under the names of Blue Stem, and two Tappahannocks, and so on. It is even claimed by some that the now popular sorts are old ones re-named.

Spring and winter varieties can be interchanged by change of climate and cultivation.

Winter Wheat. In Western New York the Improved Flint is one of the best varieties, the grain being plump and white, and yielding a large proportion of choice flour. It is not easily shattered out of the head in harvesting. The White May of Virginia is still a good bearer and very heavy; it escapes rust by ripening early. The Wheatland Red produces well and ripens early. The Kentucky White-bearded, Hutchinson or Canadian Flint is very popular in Western New York, being hardy and productive, with a short, plump berry, weighing 64 pounds to the bushel; it does not tiller as well as some other varieties, and it shells easily. The White Provence is a favorite in some localities, being specially adapted to the finest calcareous wheat soils. The Blue Stem, including the Smooth White and the Smooth Red subvarieties, has been known to resist smut and rust in sections of the country where all other kinds were affected. The Mediterranean is a coarse wheat with a thick skin, yielding a dark flour. It resists rust and the fly, is a good bearer, and may be profitably grown where other choice kinds fail. The Egyptian, Smyrna, Reed, Many-Spiked, or Wild-Goose wheat is also a hardy variety, with a thick, heavy straw, which prevents its lodging. The Clawson, a new variety, is the most productive of all in Michigan. Throughout the West the Diehl and Fultz are very popular. Midge-proof, Amber, and other new sorts promise well. The Fife is the celebrated Minnesota wheat. The Prussian or Judkin looks like Fife, but the head is longer. It is a soft wheat with a very bright straw.

Spring Wheat. The Black Sea wheat is one of the most popular kinds at present cultivated. There are two sub varieties, the Red and the White or Silver-Chaff, both of which are bearded; the former is generally preferred. They are soft-strawed and liable to fall down. The Siberian, another valuable variety, produces a full, fine grain, is hardy and a good bearer. The Italian has been very popular, but is now giving place to new varieties. Other varieties, good for certain sections, are Sandomirka (a new Polish kind), Gold Medal, Red Mammoth, White Michigan, Oran, Odessa, April, Arnautka, Bismarck, Chamberlin, etc.; but some of these names may be synonyms for others.

New varieties of wheat are created by hybridizing, that is, impregnating the female flowers on one plant by the pollen from the male organ of another. By this means a product worthy of propagation is now and then brought forth. Observation will sometimes detect a new variety of wheat in the field, the result of accidental crossing. Propagation of new varieties may be done with incredible rapidity by dividing the plant. In one year, in England, one grain was made to produce 386,840.

Wheel. A friction wheel is one which comes between the principal journal and the box, to diminish friction. Grindstones are often hung on friction wheels.

Wheelbarrow. The common wheelbarrow, with movable side-boards, as here illustrated, is confessedly the best for general purposes about the garden and yard. Dirt barrows are simply of boards bent down into dish form and fastened on the usual barrow frame. For wheeling filled barrels of water, slops, liquid manure, vegetables, etc., it is best to have a two-wheeled cart with a frame coming down near the ground in front, to hold the barrel. Like a truck, the foot of this frame or platform can be run under a heavy barrel or box, by merely tipping the latter a little to let the platform under.

Garden Barrow

Wheezing. See Roaring, page 802.

Whetstone. It requires considerable study and practice to become able to select at a hardware store just such whetstones as one needs. There are stones composed of good, rapidly cutting grit, and there are others so fine as to be fit only for polishing, and are no better for the purpose than a soft brick.

To face oil-stones, take a piece of iron with an even face (it ought to be planed); on this plate scatter a little emery of fine sand, about as fine as No. 1½ sand-paper, add a little water and rub the face of the stone, renewing the sand or emery and water as the progress of the work may require, finishing with an addition of water without emery or sand. The task need occupy but five or ten minutes' time.

Kerosene is the best oil for whetstones; but on Ar-

kansas stones soap is best. Rub a piece of toilet soap with a little water over the surface of the stone until a thick lather is formed, and then allow this to dry. When to be used in whetting, a few drops of water will moisten the soap and place the stone in proper condition for use at once. See also Hone.

Whey, the watery part of milk, separated from the richer portion in the process of making cheese. The thicker part, thus coagulated, is called "curd." For "whey strainer," see page 246.

Whiffletree, or **Whippletree,** the cross-bar to which the traces are attached, in the hitching of a horse to a vehicle or load; called also "single-tree," and "swing-tree." The larger cross-bar in the rear of these, to even them, is called "double tree" and "evener." The iron bands on a single-tree or double-tree, with attachments for hitching, are called "clips."

Stay-chains are ordinarily used to keep the team even abreast; but a better plan has been invented, consisting of a single rod on each side, extending from the tongue back of the evener to the ends of the latter, where they connect with a bolt sliding in a slot longitudinal with the evener, and to which the single-trees are attached. When one horse starts too far forward, the rod on his side draws the bolt, to which his single-tree is attached, toward the tongue, thus giving him shorter leverage and therefore more of the load. The idea is, that, if a horse feels the weight of the load coming upon him promptly and with increasing force, as if from a spiral spring, he will be more apt to keep his place than when he feels no increase of draft until he has reached a certain distance.

Various devices in single-tree clips have been invented for greater convenience and safety in hitching, and some even for safety in cases of horses running away, which are not necessary for us to describe here. Every teamster, on seeing the apparatus itself, must judge for himself what he shall choose. Many of these devices are, in fact, of equal value, and there is no choice between them.

For plowing in orchards, it is important to have the outer clips rounding or covered with something elastic, as cloth or leather, to prevent barking the trees.

For three-horse eveners, see page 371.

Whip-saw, a large saw, worked by a man at one end, with a wooden spring at the other.

Whisk, a small brush; a culinary instrument for beating eggs, etc.

Whisky, a strong spirit distilled from the fermented mash of corn, barley, wheat, or other grains.

Whistling, or roaring, in horses: see page 802.

White Lead, carbonate of lead, used in painting and for many other purposes.

White Swelling, a formidable scrofulous swelling of some joint, generally of the knee or hip joint. Treatment, same as for scrofula.

White Vitriol, sulphate of zinc. See Vitriol.

Whitewash. Besides the directions and recipes given in the articles Calcimining and Painting, we wish to add the following recipes for making whitewash for both inside and outside use.

To Mix Whitewash. Pour boiling water on unslacked lime, and stir it occasionally while it is slacking, as it will make the paste smoother. To 1 peck of lime add a quart of salt and ½ ounce of indigo dissolved in water, or the same quantity of Prussian blue finely powdered; add water to make it the proper thickness to put on a wall. 1 pound soap will give gloss.

An Excellent Whitewash. Take half a bushel of unslacked lime, and slack it with boiling water; cover it during the process. Strain it and add a peck of salt dissolved in warm water, three pounds of ground rice boiled to a thin paste put in boiling hot, half a pound of Spanish whiting and a pound of clear glue dissolved in warm water; mix and let it stand two or three days. Keep in a kettle, and put on as hot as possible with a brush.

A Durable Whitewash. For one barrel of color wash, half a bushel white lime, three pecks hydraulic cement, ten pounds umber, ten pounds ochre, one pound Venetian red, quarter pound lampblack. Slack the lime; cut the lampblack with vinegar; mix well together; add the cement and fill the barrel with water. Let it stand twelve hours before using, and stir frequently while putting it on. This is not white, but of a light stone color, without the unpleasant glare of white. The color may be changed by adding more or less of the colors named, or other colors. This wash covers well, needing only one coat, and is superior to anything known, excepting oil paint. A rough board barn washed with this has been known to look well for five years, and even longer, without renewing. The cement hardens, but on a rough surface will not scale.

Brilliant Whitewash. Take half a bushel of unslacked lime, slack it with boiling water, cover it during the process to keep in the steam. Strain the liquid through a fine sieve or strainer, and add to it a peck of salt, previously well dissolved in water; 3 pounds of ground rice, boiled to a thin paste, and stirred in boiling hot; half a pound of powdered Spanish whiting, and a pound of clean glue, which has been previously dissolved by soaking it well; and then hang it well over a slow fire, in a small kettle with a large one filled with water. Add 5 gallons of hot water to the mixture, stir it well, and let it stand a few days covered from the dirt. It should be put on right hot; for this purpose it can be kept in a kettle on a portable furnace. It is said that about a pint of this mixture will cover a square yard upon the outside of a house if properly applied. Brushes more or less small may be used according to the neatness of the job required. It answers as well as oil paint for wood, brick or stone, and is cheaper. It retains its brilliancy for many years. There is nothing of the

kind that will compare with it, either for inside or outside walls. Coloring matter may be put in, and made of any shade you like. Spanish brown stirred in will make it a red or pink, more or less deep according to the quantity. A delicate tinge of this is very pretty for inside walls.

DURABLE WHITEWASH. Before putting in the lime, which should be unslacked, into the water, saturate the water with a little salt. This will make a wash that cannot be rubbed off, nor crack, and is very lasting.

Whitlow, felon: see Felon.

Whooping-cough: see Hooping-cough.

Whortleberry: see Huckleberry.

Will, is the legal declaration of a man's intentions which he wills to be performed after his death. It is either written or verbal. There is no form prescribed by law. Any language which clearly expresses the intention of the testator is sufficient. Any person, married or single, male or female, of sound mind and of sufficient discretion, liberty and free will, may devise his separate property or any interest he may have in any other. Wills should be signed in the presence of two witnesses.

Willow. About a score of species of willow are found native in the Northern States. Their principal use is to bind embankments and sand dunes, border streams, cover wet places in the form of copses, and one or two species to make baskets. The white willow was recommended many years ago for live fences in the wet grounds of the West, but the experiment proved worthless. To kill willows, cut them close to the ground in February or March to encourage the wood growth, and then cut again about the middle of the succeeding August. If any sprout after that keep them cut back and the roots must perish.

Winch, a bent handle or right-angled lever, for turning a wheel or grindstone, or producing rotary motion for other purposes.

Wind. The velocities of the various winds, as named, are as follows:

	Miles per hour.
1. Very light breeze	2
2. Gentle breeze	4
3. Fresh breeze	12
4. Strong wind	25
5. High wind	35
6. Gale	45
7. Strong gale	60
8. Violent gale	75
9. Hurricane	90
10. Most violent hurricane	100

See also Tornadoes, and Weather.

Wind Galls, soft but elastic swellings on the bone. See page 817.

Windlass, a revolving beam, worked with a crank, for raising heavy weights by a rope or chain.

Windmills. Windmills have been known for many centuries, but their simple and rude construction has required constant care in regulating to perform their required work, or prevent disasters from storms. Small windmills with fixed sails, if not more than four feet in diameter, and strongly made, may be used for pumping water on farms, without any self-regulating contrivance. If much larger, they should be supplied with a self-governor, and a simple arrangement to make them so, is to counterpoise by a weight the force employed to bring the sails against the wind. When the wind is moderate, the weight bears down and forces the windmill into a position to receive its full force; when it becomes more violent, the weight is lifted by it, and the windmill swings around with its edge against the wind, and its motion is thus lessened, or entirely arrested. Of this construction is the Eclipse windmill. In a third-class, of which the Halladay mill is a prominent representative, the circle of fans remains facing the wind at all times, but their degree of angle to the wind is regulated by centrifugal force, and the greater the velocity of wind, the more nearly the fans are turned edgewise to the current.

FIG. 1.—*Enterprise Windmill.*

The wind which sweeps overhead in every part of the country, possesses in the aggregate an immense amount of power, a force equal to many thousand horses being exerted everywhere, without being brought into practical use. Wind power has some special advantages. Water power exists in certain localities only; wind blows over the whole face of the earth. Wind may be employed in places where other kinds of power are not to be had, and more especially on broad level plains. In the Western States it has proved of great value. Its only drawback is the extreme irregularity of its currents. Hence the ingenuity of inventors in providing means to meet this difficulty by self-regulating contrivances.

The most useful wind is one that moves at the rate of about fifteen miles per hour, and at any velocity between eight and twenty miles it does good work.

Among the most prominent of windmill makers in the United States are the following, with a statement of some of the chief characteristics of their mills:

Mast, Foos & Co., Springfield, Ohio, manufacture the "Iron Turbine Wind Engine," the wheel and vanes of which are made of sheet-iron. It has what is termed a "solid wheel." It is self-regulating, turning edgewise to hard gales, and is made from 8 to 14 feet in diameter.

E. Stover & Brother, Freeport, Ill., make another solid-wheel wind engine, operating as a self-regulator in a similar manner, with details of construction to give it efficiency.

The Eclipse Windmill Company, of Beloit, Wisconsin, manufacture a solid-wheel windmill, which is regulated by turning the whole wheel edgewise to the wind in strong gales. There are several sizes, from 8 to 45 feet in diameter; the latter size, with wind 15 miles an hour, possesses a force of about 25-horse power.

Halladay's windmill has been in use more than 20 years. It is a steady-running, self-regulating windmill, admitting of a diameter of 60 feet, which, with a wind of 15 miles an hour, has 40-horse power. The power varies from one-half-horse power for the smallest (eight feet in diameter) to 40-horse power for the largest, with wind 15 miles an hour.

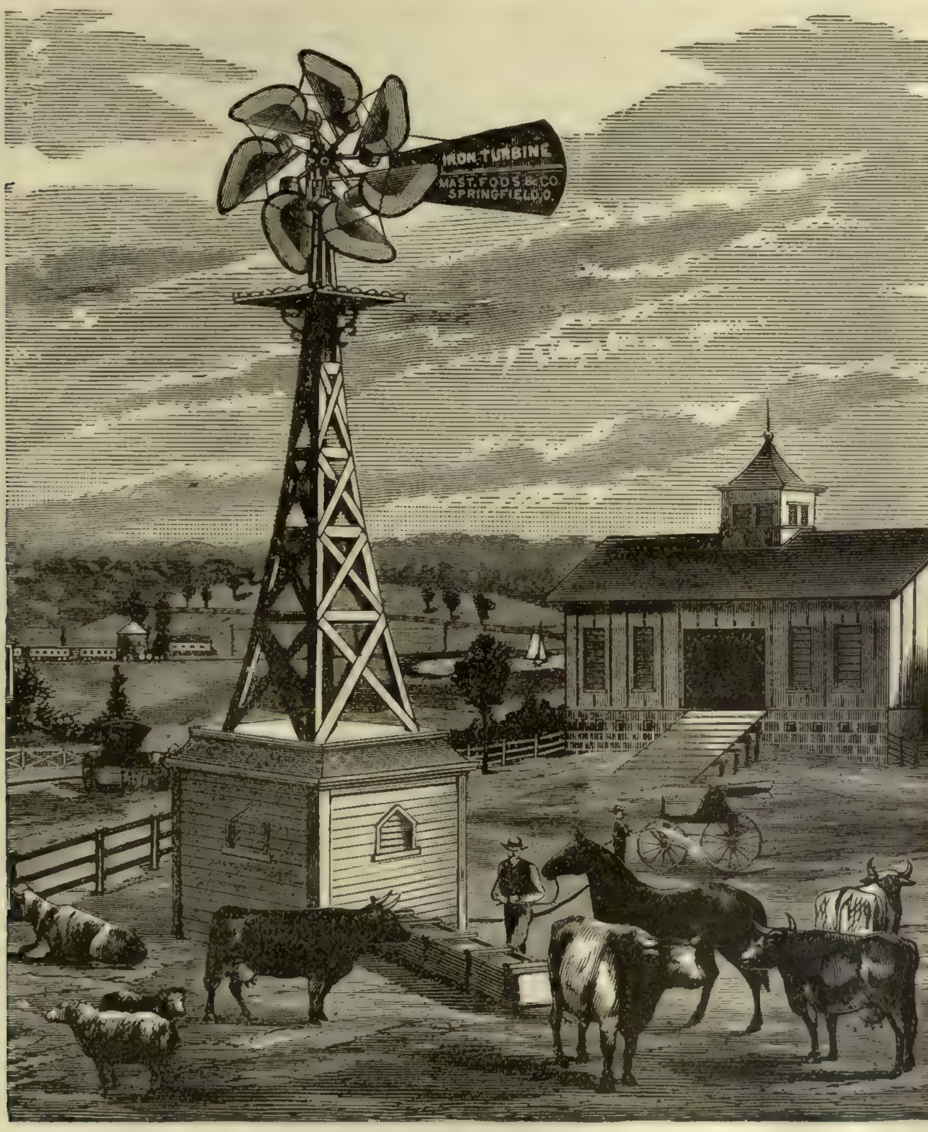


FIG. 2.—*Turbine Windmill.*

The Challenge Mill Company, of Batavia, Ill., construct an efficient windmill, which is made self-regulating by the combined action of centrifugal force and of the pressure of the wind. A movable weight on a regulating lever (within reach of a person on the ground) can be adjusted to hold the mill against a re-

sistance effecting from 10 to 40 revolutions in a minute, and no increased velocity of the wind will change the speed of the mill.

The Sandwich Enterprise Company, Sandwich, Ill., make the Enterprise Windmill (Fig. 1), which is claimed to have a perfect automatic regulator.

Besides these there are Leffel's Improved Iron Windmill, made at Springfield, O., Nichol's Centennial Windmill, made at Batavia, Ill., etc.

Window. A window not properly made or taken care of is the source of considerable trouble.

SASH-SUPPORTER. The cheap five-cent spiral springs generally used as sash-supporters are unreliable. They often give way, and occasion one, in raising or lowering the window, to meet with some accident, as the mashing or cutting of a finger, or a hand, breaking of a pane of glass, etc. On the other hand, there are costly ones which are but little better, as they require the use of one hand to hold them while the other is engaged in raising or lowering, and the sash sometimes slips from one's hold and goes down with a "slam," frequently causing the same accidents as with the cheap catch. There are sash-supporters in market, costing 10 to 25 cents, which will hold a sash tight at any point you may happen to let go, whether purposely or accidentally. They also hold the sash tight when it is fully down, so that the wind cannot rattle it. What is called the Simmons sash-supporter is one of this kind. A simple strip of spring steel, slightly bent and secured on the edge of sash frame bearing against the jamb or casing, is cheaper, operates as well, but is probably not so durable. Suspending windows by weights, with pulley and cord, is popular, but is costly, and in case of breakage of the cord, difficult to repair; neither does this plan hold the sash tight to prevent the wind from rattling it.

"DOUBLE-GLASS" windows are those which have two panes of glass in each place, with a half or quarter inch of air confined between them. This method preserves the warmth in the room and is a great saving of expense in fuel. Single-glass windows cool off the air in a room more rapidly than any person would suspect, unless he should actually test the matter.

IMBEDDING. Glass should always be "imbedded," in windows. This means that the rabbet is first filled with putty and then the pane is pressed in carefully. This holds the glass more firmly, and the panes are not so easily broken.

VENTILATION. The upper sash should always be made to let down, and to be let down easily; for ventilation through the top of the window is more important than through the lower portion.

CURTAIN. The common custom of suspending curtains from the top of the window interferes with the best ventilation and lighting as well as renders the general appearance of the room gloomy. It is better for the eyes and adds more to cheerfulness to have the light come in from as high a point as possible. Therefore the window curtain should be suspended to a cross-piece or bar, made ornamental if desired, at one end of which is a spring, so that it can be set in between the jambs at any point below the top of the window. The very idea of curtaining a window, in the first place, is to conceal from outward observation; and since high windows have come into vogue there is no sense in cutting off your sky-light. Only the lower part needs curtaining, except from the standpoint of custom.

TO CLEAN WINDOW GLASS, see page 571.

WINDOW GARDENING, see Floriculture, especially page 493.

Windrow (win'ro), a ridge of hay raked up in a meadow.

Wind-Sucking: see Crib-Biting, page 758.

Wine. In making domestic wines the process employed is essentially the same as that used in the production of foreign wines. It is better to gather the fruit in fine weather, and not till it is mature, a state that is indicated by its flavor when tasted. If it is used when it is unripe, the wine will be harsh, disagreeable, and unwholesome, and a large quantity of sugar and spirit will be required to render it palatable. The frequent practice of using unripe gooseberries for making wine arises from a total ignorance of the science of wine-making. On the other hand, if the fruit is used when it is too ripe, the wine will be inferior and deficient in flavor. After the fruit has been gathered, it should be picked over, and all that is unripe or damaged carefully separated from the ripe and perfect. It should be next placed in a tub and well bruised. Raisins are usually allowed to soak 24 hours before they are bruised, or they can be minced and bruised in the dry state. The bruised fruit is then put into a vat or vessel, with a guard or strainer placed over the tap hole, to keep back the husks and seeds of the fruit when the must or juice is drawn off. Water is then added, and the whole macerated (steeped) for 30 or 40 hours, more or less, during which time it is frequently stirred up with a wooden stirrer. The liquid portion is next drawn off, and the residuary pulp is placed in hair bags, and undergoes the operation of pressing to expel the fluid it contains. The sugar, tartar, etc. (in very fine powder, or in solution), are now added to the mixed liquor, and the whole is well stirred. The temperature being suitable (generally from 75 to 85 degrees), the vinous fermentation soon begins, when the liquor is frequently skimmed and well stirred. After three or four days of this treatment, it is run into casks, which should be well filled, and left open at the bung-hole. In about a week the flavoring ingredients, in the state of a coarse powder, are commonly added, well stirred, and in another week the brandy or spirit is added (if used), the cask filled up, and bunged down close. In four or five weeks more the cask is again filled up; and after some weeks, the longer the better, it is "pegged" or "piled" to ascertain if it be fine or transparent. If so, it undergoes the operation of racking, but if, on

the contrary, it still continues muddy, it must previously pass through the process of fining. Its after treatment is similar to that of foreign wines. The must of the strong-flavored fruits, such as black currants, is improved by being boiled before it is made into wine, but the flavor and bouquet of the more delicate fruits are diminished by boiling.

WINE FROM SWEET, RIPE FRUITS. The following is a general recipe for making wine of ripe saccharine fruits. Ripe fruit, 4 pounds; clear, soft water, 1 gallon; sugar, 3 pounds; cream of tartar dissolved in boiling water, one and one-fourth ounces; brandy, two to three per cent. Flavoring as required. This makes a good family wine. A superior article can be made by using one more pound each of fruit and sugar. If it is desired to make a still stronger wine, add two pounds each of fruit and sugar. This last is good without brandy, but better with it. One and a half pounds of raisins may be substituted for each pound of sugar, as above. Wines according to the preceding directions may be made of gooseberries, currants, mixed fruit (currants and gooseberries, black, red and white currants, ripe, black-heart cherries, and raspberries, equal parts), cherries, Calpress' wine (from apples and mulberries, equal parts), elder-berries, strawberries, raspberries, mulberries (when flavored makes port) whortleberries, blackberries, apricots, apples and grapes.

WINE FROM DRY FRUIT. Dry fruit, four and a half pounds; soft water, one gallon; cream of tartar (dissolved), one pound; brandy, one and a half to two per cent. For a superior article use five and a half pounds dried fruit. A strong wine is made by using seven and a half pounds of dried fruit.

The following recipes for making special wines are added to the above general directions:

CIDER WINE. Let the new cider from sour apples ferment from one to three weeks, as the weather is warm or cool. When it has attained to a lively fermentation, add to each gallon, according to its acidity, from one-half to two pounds white, crushed sugar, and let the whole ferment until it possesses precisely the taste which is desired to be permanent. In this condition pour out a quart of the cider, and add for each gallon one-fourth ounce of sulphite (not sulphate) of lime. Stir the powder and cider until intimately mixed, and return the emulsion to the fermenting liquid. Agitate briskly and thoroughly for a few moments, and then let the cider settle. Fermentation will cease at once. When, after a few days, the cider has become clear, draw off carefully to avoid the sediment, and bottle.

HONEY OR MEAD WINE. Honey, 20 pounds; cider, 12 gallons; ferment, then add rum, ½ gallon; brandy, ½ gallon; red or white tartar (dissolved), 6 ounces; bitter almonds, each ¼ ounce. The process of clearing, fermenting and bottling is similar to the last recipe.

Another: Four pounds of honey and 1 ounce of hops to each gallon of water; boil three hours and skim till clear; when lukewarm add yeast on toast, and when worked, barrel off. Should not be bottled for twelve months; if left in barrel for two years all the better.

HONEY MEAD. Take a quantity of spring water, fully below blood-heat temperature, and dissolve with honey until the compound will bear an egg up to a shilling breadth. Boil for an hour; add the requisite quantity of mace, cloves, nutmegs, cinnamon, and a root of ginger; mix the whole together with a lemon, a sprig of sweet briar and one of rosemary (the latter two being tied together); after a short boil, let the liquor stand on the spices till next day, then strain carefully through a fine sieve into a clean earthenware vessel; let it remain six weeks and then bottle, when it is fit to drink.

WINE FROM UNRIPE FRUITS AND RHUBARB. Here is a specimen process for making wine of unripe grapes, currants, gooseberries and rhubarb: Gather the fruit when it is nearly full grown, but before it shows the least sign of ripening. Any kind will do, but it is desirable to avoid selecting those that will be high-flavored when ripe. All unsound and bruised fruit should be discarded, and the stalks and remains of blossoms removed by picking or rubbing. Take 40 pounds of fruit, and bruise, in small quantities, in a tub which will hold 15 or 20 gallons, sufficient pressure only being used to burst the berries without breaking the seeds or much compressing the skins. Four gallons of water should then be poured on the fruit, which is to be carefully stirred and squeezed with the hands until the whole of the juice and pulp are separated from the solid matter. Let it rest for a few hours, then press and strain through a coarse canvass bag, with considerable force. One gallon of water may be passed through the residue to remove any soluble matter that may be left, and the washing added to the juice. Dissolve 30 pounds of loaf sugar in the juice, and have the total quantity of liquid raised to 10½ gallons by the addition of water. Put the liquor in a tub, spread on a blanket, and cover with a board, placing in a temperature of 55 to 60 degrees, for from 24 to 48 hours, according to the signs it may show of fermentation; then put in a cask to ferment. The cask must be of such size that the liquor will nearly reach the bung-hole, so that the scum may run out as it rises. As the fermentation goes on the liquor will decrease, and the cask may be kept filled nearly to the bung-hole with a portion of the "must" which has been reserved for that purpose. When the fermentation has become a little weaker, which may be known by the hissing noise decreasing, drive in the bung, put in a spile, made of tough wood, in a hole bored in the top of the barrel. After a few days loosen this peg to let out the carbonic-acid gas that may have been generated. This must be done frequently, till there is no more sign of the gas. During the winter keep the wine in a cool cellar, and bottle on a clear day at the end of February or on the first of March. But to insure its fineness it is preferable to draw it off at the end of December into a fresh cask, so as to clear it from

the lees. When it is transferred to the fresh cask it should be fined with isinglass. (See next paragraph but one.) Sometimes it is desirable to rack it off a second time, into a fresh cask, again fining it.

GINGER WINE. Boil 20 pounds of sugar in 7 gallons of water for half an hour, skimming it well; then put 9 ounces bruised ginger in a portion of the liquor, and mix all together. When nearly cold put 9 pounds of raisins, chopped very small, into a 9-gallon cask; four lemons sliced, after taking out the seeds, and pour the liquor over all, with a half pint of yeast. Leave the cask open for three weeks, keeping it filled up with some of the reserved liquor and bottle it from six to nine months.

TO FINE WINE. Take one pound finely shredded isinglass, macerate it in wine, sour beer, cider or vinegar; add more of the liquor as the isinglass swells, until about a gallon has been used; agitate occasionally for the purpose of promoting the solution. As soon as the whole of the isinglass is dissolved, the mixture is reduced to the consistence of thin syrup with wine or the liquids that the finings are intended for. The whole is next strained through a cloth or hair sieve, and at once reduced to a proper state of dilution, by the addition of more liquor. A pound of good isinglass will make 10 or 12 gallons of finings. The same process can be employed in fining cider, ale or porter, using 1 to 1½ pints to a barrel of ale or porter, and 1 quart for a hogshead of wine or cider.

Woodcock.

TO REMEDY ROPINESS IN WINE. Use one pound of bruised berries of the mountain ash, somewhat unripe, stir well in each barrel of wine, agitate, leave to repose a day, and then rack off. Wines after having been cured of ropiness should be immediately fined and bottled.

TO REMEDY SOUR WINE. The only safe remedy for the souring of wine is the cautious addition of a little neutral tartrate of potash. It may also be mixed with a larger quantity of mixed wine of its kind, at the same time adding a little good brandy. Wine treated in this way should be fined after having stood two or three weeks, and then immediately bottled, and consumed as soon as possible; for it will never prove a good keeping wine.

TO REMOVE MUSTINESS. The disagreeable taste in wine, generally known as mustiness, is occasioned by the presence of an essential oil. This may generally be removed by adding a little sweet or almond oil, and afterwards violently agitating the wine. The fixed oil attracts and seizes the essential oil, and rises with it to the surface, when it is easily skimmed off, or the liquid under it drawn off. A few slices of toasted bread, or a little bruised mustard seed, or coarsely powdered charcoal, will often have the same effect.

Wire-Worms, the larvæ of spring beetles. See page 850, and the respective plants most infested with them.

Witch Grass, called also "quick," "couch," and "quack" grass, etc., is the most troublesome grass known. Although it is excellent forage, it is often desirable to kill it, which is very difficult to do. Constant stirring of the soil will generally be successful, but plowing late in the fall and harrowing early in the spring will do more than any other single plowing and harrowing. Seeding to clover has been known to run it out, and thorough pasturing by sheep has also accomplished the same result. Going over the ground frequently, during a summer fallow, and picking up every root and spear visible will hasten the work of destruction.

Withe, a tough, slender switch, generally hickory or willow, used as a cord in binding. Hickory withes are better for being heated.

Withers, the ridge between the shoulder-bones of a horse.

Wolf Teeth. This is a term used to designate those permanent teeth of the horse which make their appearance by the side of the milk teeth, instead of forcing them out.

Wood. See Forestry, Fuel and Timber. In setting rails in a fence, in "cording up" wood, etc., where it is exposed to the weather, if you desire so to leave it that the bark will remain on tight, place the pieces with the bark side up; if you desire it to work off soon, place that side down. On all fire-wood the bark should be preserved, as it is of more value than the sap-wood.

Woodcock. This bird, which is 11 inches long, is mainly nocturnal in its habits, seldom taking wing in the full light of day unless disturbed. It walks about by day, however, and feeds by day as well as by night. Its food is mainly earth-worms, of which it swallows as many in a day as would equal its own weight: hence its favorite resort is where these worms are obtained in abundance. The moist ground which these birds frequent are perfectly filled with bill-holes which they have made in probing for worms. These holes become a guide to the hunter, who looks at their frequency and freshness when he would find good shooting. When flushed by the hunter or the dog, the woodcock ordinarily flies but a short distance, plunging into a clump of bushes or thicket near by, or a thicker part of the swamp. It spends the winter in warm climates, but feeds from the Carolinas to Nova Scotia.

Among the several curious habits of the woodcock, its practice of carrying its young is perhaps the most interesting. The nests of the woodcock are laid on dry ground and often at a distance from moisture; in the latter case, as soon as the young are hatched, the old bird will sometimes carry them in her claws to the nearest spring or green strip. In the same manner when in danger she will rescue those which she can lift.

Wool. In the articles Mutton and Sheep, we have spoken of the best breeds of sheep for wool-growing purposes; and in the article Sheep-shearing, referred to the time the wool should be sheared, etc. In this article we will give directions for the mode of washing and shearing. In general wool-growing is a profitable business. Although the price of wool in the markets is quite variable, yet there is always a certainty that it can be sold for something near its real value. Wool is a standard article of commerce, and has a certain instrinsic value.

Washing Sheep. The custom of washing sheep a few days previous to shearing, which was formerly the universal practice, is of late years growing into disuse. It is considered cruel and unhealthful to the sheep, and indeed useless, as the manufacturer cleans the wool before he uses it. Yet, as at the return of each spring season comes to the sheep-grower the consideration of putting wool upon the market "in the grease" or in fleece-washed condition, this question is not always to be answered separately from that other one, the best time for shearing; for, if the wool is to be washed, or the sheep, the washing must necessarily be done a week or more in advance of the shearing. For such washing there must be found not only suitable water, but favorable weather for drying the wool, and for insuring the workmen and stock from the damage resulting from exposure, as "sheep washing" in a cold stream, in the early spring season, cannot properly be deemed conducive to the health and comfort of laborers or animals.

The question is, then, Can enough be realized for the fleece-washed wool, over and above what it would sell for in an unwashed condition, to repay the expense of washing, the damage to the animals, and the risk of health involved in the exposure of the laborers? It is difficult to determine how this can be done without presupposing that one party to the transaction is getting the better of the bargain. An intelligent buyer bases his estimate of value of the fleece upon the percentage of wool such fleece will yield when cleansed in readiness for manufacture. If he knows his business, and is as honest as he insists that the wool-grower should be, he will pay as much for the cleansed percentage before the fleece is washed as he will afterwards. In either case the process of scouring by the manufacturer is the same. The policy of washing before shearing is thus left to be determined largely by the convenience to the point of manufacture, as the expense of transporting the dirt and grease is properly chargeable to the wool, whether sold at home or in a distant market, and cannot be accurately determined except as each locality is considered separately. In such estimate, then, are to be taken into account the expenses above enumerated, while against them is to be set the cost of transporting to market the difference in weight between the washed and unwashed wool. Under this rule most of the wool would be sold without washing. But the fact is, that quite a percentage is still washed before shearing—a fact for the solution of which the inquirer must look to the ignorance of buyers who pay arbitrary prices, trusting that the average will save them from loss. Hence it is that the grower is left as his own judge of the profitableness of washing. If he has a rule, let it be not to wash his sheep, varying from this rule only when he has good prospect of getting well paid for so doing.

Some large sheep-raisers have tanks and other conveniences on their farms for washing their sheep. The usual custom is, however, to wash the sheep in ponds or streams. It should be done on a warm day, during the latter part of May. The sheep should be led into the water and their fleece thoroughly saturated, after which they are led ashore. As soon as they commence steaming from the heat of the body and the sun, they are again taken into the water and washed clean. When they are brought out the last time the fleeces should be squeezed as nearly dry as possible by hand. As the object of washing is simply to get the wool as clean as possible before shearing, the farmer can devise any manner of doing it to suit his own convenience.

Shearing. Shearing is a process which can be well performed only by an experienced hand. The fleece should be taken off not too close to the skin,

care being taken not to cut the skin, nor the wool twice. Machines for shearing, which perform the operation rapidly, have been invented, and may eventually supersede hand-shearing on large farms. After shearing, the sheep should have protection from storms, and shelter at night for a week or ten days.

The time which should elapse between washing and shearing depends altogether on circumstances. From four to six days of bright, warm weather is sufficient; if cold, or rainy, or cloudy, more time must intervene. Sometimes the wool remains in a condition unfit for shearing for a fortnight after washing. "The rule to be observed" says Jennings, "is, that the water should be thoroughly dried out, and the natural oil of the wool should so far exude as to give the wool an unc'uous feeling, and a lively, glittering look. If it is sheared when dry, like cotton, and before the oil has exuded, it is very difficult to thrust the shears through, the umer is checked, and the wool will not keep so well for long periods. If it is left until it gets too oily, either the manufacturer is cheated, or, what more frequently happens, the owner loses on the price.

"The manner of shearing varies with almost every district; and it is difficult, if not impossible, to give intelligible practical instructions, which would guide an entire novice in skilfully shearing a sheep. Practice is requisite. The following directions are as plain, perhaps, as can he made:

"The shearer may place the sheep on that part of the floor assigned to him, resting on its rump, and himself in a posture with his right knee on a cushion, and the back of the animal resting against his left thigh. He grasps the shears about half-way from the point to the bow, resting his thumb along the blades, which gives him better command of the points. He may then commence cutting the wool at the brisket, and, proceeding downward, all upon the sides of the belly to the extremity of the ribs, the external sides of both sides to the edges of the flanks; then back to the brisket, and thence upward, shearing the wool from the breast, front, and both sides of the neck, but not yet the back of it, and also the poll, or fore part, and top of the head. Then 'the jacket is opened' of the sheep, and its position, as well as that of the shearer, is changed by the animal's being turned flat upon its side, one knee of the shearer resting on the cushion, and the other gently pressing the fore-quarter of the animal, to prevent any struggling. He then resumes cutting upon the flank and rump, and thence onward to the head. Thus one side is complete. The sheep is then turned on the other side—in doing which great care is requisite to prevent the fleeces being torn—and the shearer proceeds as upon the other, which finishes. He must then take the sheep near to the door through which it is to pass out, and neatly trim the legs, leaving not a solitary lock anywhere as a lodging-place for ticks. It is absolutely necessary for him to remove from his stand to trim, otherwise the useless stuff from the legs becomes intermingled with the fleece-wool. In the use of shears, the blades should be held as flat to the skin as possible, the points not lowered too much, nor should more than from one to two inches be cut at a clip, and frequently not so much, depending on the part, and the compactness of the wool.

"The wool should be cut off as close as conveniently practicable, and even. It may, indeed, be cut too close, so that the sheep can scarcely avoid sunscald; but this is very unusual. If the wool is left in ridges, and uneven, it betrays a want of workmanship very distasteful to the really good farmer. Great care should be taken not to cut the wool twice in two, as inexperienced shearers are apt to do, since it is a great damage to the wool. This results from cutting too far from the points of the shears, and suffering them to get too elevated. In such cases, every time the shears are pushed forward, the wool before, cut off by the points, say a quarter or three-eighths of an inch from the hide, is again severed. To keep the fleece entire, which is of great importance to its good appearance when done up, and therefore to its salableness, it is very essential that the sheep be held easily for itself, so that it will not struggle violently. No man can hold it still by main strength, and shear it well. The posture of the shearer should be such that the sheep is actually confined to its position, so that it is unable to start up suddenly and tear its fleece; but it should not be confined there by severe pressure or force, or it will be continually kicking and struggling. Clumsy, careless men, therefore, always complain of getting the most troublesome sheep. The neck, for example, may be confined to the floor by placing it between the toe and knee of the leg on which the shearer kneels; but the lazy or brutal shearer who suffers his leg to rest directly on the neck, soon provokes that struggle which the animal is obliged to make to free itself from severe pain, and even, perhaps, to draw its breath.

"Good shearers will shear, on the average, 25 Merinos per day; but a new beginner should not attempt to exceed from one-third to one-half of that number. It is the last process in the world which should be hurried, as the shearer will, in that case, soon leave more than enough wool on his sheep to pay for his day's wages. Wool ought not to be sheared, and must not be done up with any water in it. If wounds are made, as sometimes happens with unskillful operators, a mixture of tar and grease ought to be applied."

The grower is justified in making his wool clip as presentable as possible, without deceiving the intelligent buyer. That is, he may roll it in the most presentable manner, and otherwise display it to the best advantage, so long as he avoids deceiving the examiner, who is presumed to know what is the general rule for preparing wool for market. Where the clip is to be retained for sale at home, it should be nicely piled, so as to preserve, as far as possible, the most presentable form of the fleece, and be kept covered from the action of wind and dust, with a fair average of the whole within ready access of those who may wish to inspect it. When it is to be sent to market

for sale, so far as possible the packing should be done so as to admit of the best possible presentation of fleeces when the sale loft is reached—fleeces of different grades and conditions being kept together so far as can be. The manner of doing it up is explained in the article Fleece.

For his own satisfaction, and as a check upon his broker, the grower should carefully weigh each bail of wool before it is shipped, and mark the weight upon such bail, keeping a memorandum of both weights and numbers. A comparison of these with the returns of the broker often afford material for profitable study and calculations in the future.

DIFFERENT QUALITIES OF WOOL UPON THE SAME SHEEP. The classification of the "stapler" or sorter of wool is founded to a certain extent upon the difference in the quality of wool according to the part of the sheep's body upon which it has grown. In dividing the fleece it is spread upon the table with the sheared side down, and the various parts removed, and thrown into their appropriate places. The finest wool is obtained from the back—the portion marked

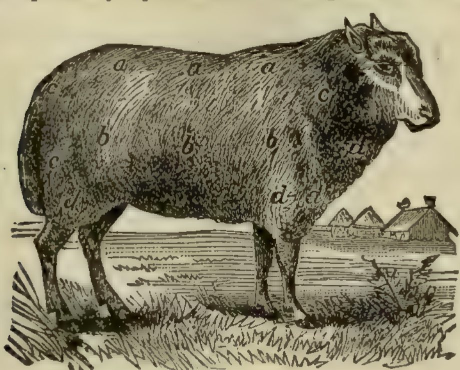


FIG. 1.—*Wool Regions on a Sheep.*

a, *a*, in Fig. 1. The next best quality extends from the thighs to the shoulders and covers the flanks, marked *b*, *b*. The neck and rump give the third grade, *c*, *c*, and the fourth is produced upon the lower part of the neck and the breast and extremities, *d*, *d*. The principal differences that are kept in mind in grading the wool are: strength of fiber, fineness, and the curl. The last point is a more important one than might seem at first sight. A long straight waive, as shown at *a*, in Fig. 22, is not desirable; neither is the curl shown in *b*, where the fiber folds back abruptly upon itself. The greatest elasticity and strength is found in the regular and fine crimping shown at *c*.

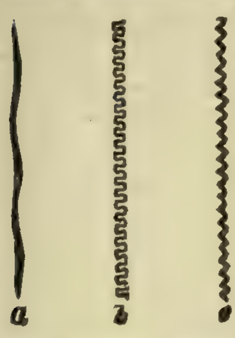


FIG. 2.—*Curl in Wool.*

When examined with the microscope the wool fibers are found to be traversed with fine oblique lines, which gives them a rough or scaly surface; it is this which renders woolen fabrics so strong and durable.

TO RESTORE THE COLOR TO FLANNEL When flannels become yellow from neglect in washing, they can be restored by this process: Mix 1 pound of flour in 2 gallons of water, and stir it over the fire till it boils; then put the flannels into a tub and pour half the mixture over them; after standing half an hour, wash them without using soap; rinse twice through clean cold water; do not wring, but hang them up 20 minutes to drain. Then pour over them the remainder of the flour and water, which must be kept boiling, and repeat the process; after which hang out to dry without wringing.

WOOLEN FABRICS. To distinguish wool from cotton in a piece of cloth, boil a small fragment in a strong solution of caustic soda, and this will dissolve away the wool, without affecting the cotton: the proportions can then be calculated. A magnifying lens, costing only a dollar or two, is useful not only for examining fabrics, but also for many other purposes.

See Cloth, Dyeing, Stains, Bleaching, Carpet, Laundry and Hygiene.

Worming, an operation performed on dogs, consisting of the removal of a vermiform ligament from under the tongue. See page 353.

Worms. All animal bodies are supposed to afford habitations for other animals. There are three kinds that infest the intestinal canal of man. These are the *Lumbricus* or the round worm, the *Oxyuris* or the pin or thread worm and the *Tænia* or tape-worm. The round worm is from 12 to 15 inches in length, the pin worm is never more than an inch long, while the tape-worm is from 3 to 20 feet long, and often 30 to 40 feet in length. The round worm exists sometimes in great numbers, and is commonly found in the small intestines, and occasionally in the stomach. Hence, sometimes it is vomited up, or even discharged through the nose by its entering the posterior nares. Its presence is indicated by uneasiness in the stomach or bowels, irritation, and itching of the nostrils; a paleness and puffed state of the lips; foul breath; choking sensation in the throat; bloated abdomen; periodic or occasional paroxysms of fever, etc. But the only sure sign is their appearance in some of the evacuations.

The tape-worm is flat, half an inch or an inch wide, and is full of joints. This worm infests the upper part of the bowels, and feeds on the chyle. It produces a voracious appetite and great emaciation of the flesh; and this enormous desire for food, which is never satisfied, is, no doubt, occasioned by the immediate consumption of the chyle, or the worm feeds upon the extracted nourishment of the food.

The pin-worms infest the lower end of the bowels, are of a yellowish white color, and frequently creep out at the fundament. These worms produce an intolerable itching, and in children are often the cause of convulsions or fits, and frequently produce fever, irritation, and many other serious disorders of chidlhood.

The round worm and pin worm mostly infest children between the time of weaning and that of puberty. The tape-worm is more common to grown persons, but it has been known to affect children likewise.

Treatment. To get rid of worms, two important remedies are necessary—purgatives and tonics. The first, which is purgatives, is to clear away the animals which infest the human body; the second, which is tonics, is to correct the debility which usually favors their existence. The principal indication is the removal of worms and to excite a healthy action of the digestive organs. It is owing to a derangement of these that they exist. All bitter substances are the best medicines to expel worms in children. Wormseed, mixed with molasses, may be given in the dose of a tea-spoonful twice a day. The dose for an adult is a tea-spoonful and a half of the seed. Wormwood tea destroys worms; thoroughwort tea, or tansy tea, is also a good physic; and pink-root and senna is a sure remedy. An ounce of each should be steeped in water, and a quarter of the liquor given at a time, once a day, for four days in succession. The best plan of giving the pink-root, medically called *Spigelia*, is first, for a day or two before administering it, to give a dose of castor oil or aloes, rhubarb, or sweet oil, increasing or diminishing the dose according to the age of the patient. Wormwood is an excellent domestic bitter, and will destroy worms. Children may take from 10 grains to ½ dram of the leaves, or as a weak tea.

For the tape-worm, and also the round-worm, the most powerful medicine is the spirits of turpentine; half a table-spoonful, mixed with milk, may be given to a child between two and seven years of age, for a number of days in succession. Adults, or grown persons, may take one table-spoonful at a time, mixed with an equal portion of castor oil.

The pin worm, which infests the rectum or lower bowels, may be destroyed by a dose or two of the Elixir Proprietatis, which can be bought at a drug store, with directions; or by giving a dose or two of aloes. An injection of aloes, dissolved in warm water, will dislodge them. Aloes is a sure and certain remedy for this kind of worm; or an injection of common salt and water will frequently have the effect to remove them.

A specific for tape-worm is pumpkin seed, taken as follows: Pulverize the seed (the fresh seed of the common pumpkin) and after fasting for a day, take large doses (2 ounces each) of the seed every four hours for three or four days; then take a brisk purgative. This is claimed to expel the entire worm.

To Drive Earth-Worms from Lawns, etc., give a dressing of fresh lime.

Wormseed, Jerusalem oak, goosefoot. This is an indigenous perennial plant, with an herbaceous, erect, branching, furrowed stem, which grows from two to three feet high. It is found in every part of the country, growing plentifully around door-yards, in old fields and by the roadsides. It flowers in June and July. The whole plant has a strong peculiar smell, very offensive to some.

The wormseed, as it is commonly called, is an excellent vermifuge. The oil, which is the usual form in which the medicine is used, may be given in doses of from three to eight drops to a child two or three years old. The dose should be repeated two or three times day, for two days, when it should be followed by an active cathartic. For this purpose, castor oil is commonly used. Wormseed oil is often combined, by physicians, with castor oil, and put up in ounce phials, and sold as a popular vermifuge.

Wormwood, a well known bitter herb, found in some gardens, deriving its name from its supposed virtue in expelling worms from the alimentary canal. For this purpose, however, it is comparatively inefficient. It is more effective as a tonic. The oil of wormwood possesses narcotic properties.

Wounds. A wound is called incised when made by a cutting instrument; when by a pointed instrument, punctured; when the parts are torn or broken down by the wounding body, the injury is called laceration; when, in addition to the wound, there is some venomous or poisonous substance introduced, as by the bite of a serpent, the injury is called a poisoned wound; when the injury is inflicted by an obtuse or blunt body, it is called a contusion; and when caused by a bullet or other body projected from fire-arms, it receives the name of gunshot wound.

In the treatment of a wound the first thing to do, especially where blood-vessels are severed, is to stop the bleeding. If the bleeding is but slight, or there is no artery severed, a free application of cold water may be sufficient to check it; or salt and water, or a solution of alum in water. If these fail, and the wound is open or lacerated, sprinkle on a portion of powdered burnt copperas; to make which, burn upon a hot shovel a portion of copperas, until it decomposes and becomes dry and of a red color; then pulverize it, and it is ready for use. It forms an excellent styptic for such purposes. After sprinkling on a quantity of this, enough to thinly cover the surface of the wound, or the parts of it from which the hemorrhage proceeds, place over it a bunch of lint or cotton, or a bit of old muslin folded, and apply a bandage.

If an artery has been severed, which you will know by the blood being of a bright red color, and coming out in jets or spurts, caused by the pulsations of the heart, the only certain way to stop it is to tie the artery. If it can not be done and the bleeding is very profuse, you must send for a physician. If the wound is upon either of the extremities, you can stop the flow of arterial blood for the time being, and until a physician can be brought, by tying a cord tightly around the leg or the arm, as the case may be, so that it be above the knee or the elbow, as well as above the wound. There being but a single bone in the thigh and in the upper arm, you can, if you make the ligature tight enough, stop the flow of arterial blood entirely, in the parts below it. But if the wound is in some other

part of the body, as on the trunk, the head or neck, and the patient is likely to bleed to death, if the hemorrhage is not soon stopped, you must look for the artery, get hold of it, and tie it. This you can do if you will but try sufficiently. Wash out the wound with cold water, and then watch for the place where the light red blood spurts out; get hold of the artery either with a pair of forceps, or tweezers, or with your fingers; if you do not succeed the first time, keep trying till you do; draw it out a little, and have some one to tie it with a silk or flax thread. This you will leave long enough for the ends to hang out of the wound, by which the thread can be drawn out when the artery sloughs off and the wound is sufficiently healed. If a large vein is severed, instead of an artery, the blood will be of a dark purple color, and will flow out in a steady stream. If you can not stop it by other means, it must be tied, the same as an artery.

After having stopped the hemorrhage, and removed any foreign substances that may have been in the wound, if the wound be large send for a surgeon. Should you have adhesive plaster, bring the edges of the wound together, and hold it by putting the plaster over it in strips of about ½ inch in width. Cold water is about all that is needed to be applied to a flesh wound. Tincture of arnica might be added to the water to advantage. A deep punctured wound should not be allowed to heal at the surface first, and therefore must not be closed with adhesive plaster.

Lacerative wounds seldom bleed very much. After having stopped bleeding bring the part and edges together as well as you can and retain them by means of adhesive plaster, and if necessary with stitches or with needle and thread. Then to prevent inflammation wash the whole with a solution of ten grains of nitrate of silver to one ounce of water. Continue to apply a little of this once a day by pouring it into the wound, and once a day the tinctures of aloes and opium, one in the morning, the other at night.

Bruises should be treated with the tincture of arnica, or cold water, or both, mixing 30 to 40 drops of arnica to a pint of water. Keep the wound wet by wetting the compress several times a day.

In the case of gunshot wounds, if at all severe, a surgeon must be immediately sent for.

Wrench, a violent twist, or a pull with twisting; a sprain, or injury by twisting, as in a joint; an instrument, often a simple bar or lever with jaws or angular orifice either at the end or middle, for exerting a twisting strain, as in turning bolts, nuts, screw-taps, etc. A "monkey-wrench" is one with adjustable jaws.

Writing. To restore faded writing, to make it legible, cover the letters with prussiate of potash, with the addition of a diluted mineral acid, upon the application of which the letters change very speedily to a deep blue color of great beauty and intensity. To prevent the spreading of the color, which by blotting the parchment detracts greatly from the legibility, the alkali should be put on first, and the diluted acid added upon it. The method found to answer best has been to spread the alkali thin with a feather or a bit of stick cut to a blunt point. If then the corner of a bit of blotting paper be carefully applied near the letters, so as to imbibe the superfluous liquor, the staining of the parchment may be in a great degree avoided. Care must be taken not to bring the blotting paper in contact with the letters, because the coloring matter is soft while wet, and may be easily rubbed off. The acid chiefly employed is muriatic, but both the sulphuric and nitric succeed very well; they should be so diluted as not to be in danger of corroding the parchment. See also Letter-Writing.

Wrought (rawt), old past tense of "work:" preserved chiefly in the phrase "wrought iron," denoting iron that has been wrought, or worked. This is the purest form of iron known, and is soft, tenacious, malleable, ductile and can be welded. When beaten into bars it is known as bar iron or merchant bars. It has a bluish-gray color, and always contains some carbon.

X

XANTHIC (zan′thic), tending toward a yellow color, or to one of those, green being excepted, in which yellow is a constituent, as scarlet, orange, and the like. Xanthic flowers are those which have yellow for their type, but can pass into red or white, though not into blue. Xanthic oxide is an insoluble white powder obtained from a rare variety of urinary calculus. Xanthic acid is a heavy, oily, fluid substance.

Xanthium (zan′thi-um), the scientific name of the cockle-bur, sometimes called also clot-bur and smaller burdock.

Xanthoxylum (zan-thox′y-lum: sometimes spelled as pronounced), the scientific name of the prickly ash, a shrub growing in the woods of the United States, and bearing aromatic berries. The bark is used as an arterial stimulant and diaphoretic; is good in toothache and chronic rheumatism. Dose, for the latter, 10 to 30 grains of the pulverized bark.

Y

YAM, the tuber of a climbing, liliaceous vine, which resembles a sweet potato in appearance and taste, and for which it is a substitute.

Yarn, spun wool or woolen thread; also, large, loosely spun thread of cotton, flax, hemp, silk, etc, called "cotton yarn," "flax yarn," etc.

Yarrow, a tansy-like plant, common along roadsides and in old pastures, meadows and waste grounds. The leaves are finely divided, and has hence been called milfoil, that is, thousand-leaf..

Yawn, to open the mouth wide, involuntarily, and accompanied with a stretching of the muscles generally. Among laborers generally denotes a need of a little exercise; sometimes it proceeds from the incoming of a fever.

Yeast: see Bread.

Yellows, a disease of the peach-tree; see page 1008; also a disease of the horse; see page 785.

Yoke, To Make: see page 1000.

Z

ZERO, naught; also a point in thermometers from which the scales of heat and cold are graduated. In Fahrenheit's (pronounced in English, fair′en-hite) thermometer, the one in common use in this country, the zero point is 32° below freezing point, and is the degree of coldness produced by mixing snow and salt.

Zinc, a silver-white metal, devoted to many important uses. An alloy of zinc and copper constitutes brass. Sulphate of zinc is "white vitriol;" see Vitriol. Oxide of zinc is "zinc white," a beautiful white paint, not so poisonous as white lead.

The best way to polish zincs under stoves is by the use of dry paper, rather than by washing with soap-suds. Whiting or French chalk will be a good aid.

Zymotic (zi-mot′ic), of, pertaining to or caused by fermentation. Zymotic diseases are, therefore, such as small pox, scarlet fever, measles, mumps, hooping-cough, diphtheria, influenza, all the general fevers and Asiatic cholera.

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